Research on rising competences in technical education by implementing dual system´s elements under El Salvador conditions in the field of Mechatronic

PhD-Work for getting the academic title

Doktor der Philosophie (Dr. phil.)

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Dresden, November 2013

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Abbreviations

Abbreviations

ADB	Asian Development Bank
ASET	Applied Science, Engineering and Technology
AMCHAM	American Chamber of El Salvador
APTAMAI	Asociación de Propietarios de Talleres de Mantenimiento Industrial [Owners Association of Industrial Maintenance Workshops]
BBC	British Broadcasting Corporation
BBiG	Vocational Training Act
BCR	Banco Central de Reserva de El Salvador [Central Reserve Bank of El Salvador]
BIBB	Bundesinstitut für Berufsbildung [Federal Institute for Vocational Education and Training]
BMBF	Bundesministerium für Bildung und Forschung [Federal Ministry of Education and Research]
BP	The Bologna Process
CA	The Constraints Analysis (CA)
CEDEFOP	European Centre for the Development of Educational Training
CEPAL	Comisión Económica para América Latina y el Caribe [United Nations Economic Commission for Latin America and the Caribbean (UNECLAC or ECLAC)]
CIM	Centrum für Internationale Migration und Entwicklung [Centre for international Migration and Development]
CINTERFOR	Centro Interamericano para el Desarrollo del Conocimiento en la Formación Profesional [The Inter-American Centre for Knowledge Development in Vocational Training]
CONALEP	Colegio Nacional de Educación Profesional Técnica año 2, N° 5, octubre de 2011 [National College of Technical Professional Education Year 2, No. 5, October 2011]

CPC	Confederación de la Producción y del Comercio [Confederation of Industry and Commerce of Chile]
DIGESTYC	Dirección General de Estadística y Censos [Department of Statistics and Censuses of El Salvador]
DSE	German Foundation for International Development
EACEA	Education, Audiovisual and Culture Executive Agency
EAEA	European Association for the Education of Adults
ECTS	European Credit Transfer and Accumulation System
ECVET	European Credit system for Vocational Education and Training.
EHPM	Encuesta de Hogares de Propósitos Múltiples [Household Survey and Multiple Purposes]
EQF	European Quality Framework
FDI	Foreign Direct Investment
FEPADE	Fundación Empresarial para el Desarrollo Educativo [Enterprise Foundation for the Educative Development]
FESTO	Factory and Process Automation German Company
FUSADES	Fundación Salvadoreña para el Desarrollo Económico y Social [Salvadoran Foundation of Economic and Social Studies]
GDP	Gross Domestic Product
GIZ	Gesellschaft für Internationale Zusammenarbeit [Society for International Cooperation]
GOES	Government of El Salvador
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GMBH
HEI	Higher Education Institutes
HES	Higher Education Systems
IACML	Inter-American Conference of Ministers of Labor
IIEP	International Institute for Educational Planning
ILO	International Labor Organization [in Spanish OIT]
INA	Instituto Nacional de Aprendizaje [National Training Institute]

INCAE	Is a Business School that has the main campus located in Costa Rica
INSAFORP	Instituto Salvadoreño de Formación Profesional [Professional Training Salvadoran Institute]
ISCED	International Standard Classification of Education
IT+B	The Institute Technology and Education (ITB), University of Bremen
ITCA	Instituto Tecnológico Centroamericano [Central American Technological Institute]
KAtLA	Kooperative Ausbildung im technischen Lehramt [Cooperative education in technical teaching]
KMK	Kultusminister Konferenz
LLL	Lifelong Learning
MEGATEC	Modelo Educativo Gradual de Aprendizaje Técnico y Tecnológico [Educative Gradual Model of Technical and Technological Learning]
MEP	Ministerio de Educación de Costa Rica [Ministry of Education of Costa Rica]
MINEC	Ministerio de Economía de El Salvador [Ministry of Economy of El Salvador]
MINED	Ministerio de Educación de El Salvador [Ministry of Education of El Salvador]
MTPS	Ministerio de Trabajo y Previsión Social de El Salvador [Ministry of Labor and Welfare of El Salvador]
NQF	National Qualifications Framework
NVQ	National Vocational Qualification
OAS	Organization of American States
OECD	Organisation for Economic Co-operation and Development
OEI	Organización de Estados Iberoamericanos para la Educación, la Ciencia y la Cultura [Ibero American States Organization for Education, Science and Culture]
OREALC/UNESCO	Oficina Regional de Educación para América Latina y el Caribe [The Regional Bureau of Education for Latin America and the Caribbean]

PAES	Prueba de Aptitudes y Aprendizajes para Egresados de Educación Media [Testing Skills and Learning for Media Education to graduate students]
PFG	Partnership for Growth
PNUD	Programa de Naciones Unidas para el Desarrollo [United Nations Development Program UNDP]
PPP	Public Private Partnership
PROESA	Salvadoran Investment Promotion Agency
QA-agencies	Quality Assurance Agencies
QF-EHEA	Qualifications Frameworks in the European Higher Education Area
RREE	Ministerio de Relaciones Exteriores de El Salvador [Ministry of Foreign Affairs of El Salvador]
SOFOFA	Confederation of Industry and Commerce in Chile (CPC) and Non Profit Trade Union Federation
SPSS	Statistical Package for the Social Sciences
TVET	Technical and Vocational Education and Training
UAO	Universidad Autónoma de Occidente [Autonomous University of the West]
UIL	UNESCO Institute for Lifelong Learning
UNAB	Autonomous University of Bucaramanga
UNDP	United Nations Development Program [PNUD in Spanish]
UNESCO	United Nations Educational, Scientific and Cultural Organization
USACH	Universidad de Santiago de Chile [University of Santiago de Chile]
USAID	United States Agency International Development
USG	United States Government
UTB	Universidad Tecnológica de Bolivia [Technological University of Bolivia]
VET	Vocational Education and Training
WEF	World Economic Forum

Glossary

Glossary

Bachelor The Bachelor's degree as a first higher education degree provides basic qualification for a profession. It can be obtained after a standard period of study (*Regelstudienzeit*) of at least three and at most four years at universities and equivalent institutions of higher education, at colleges of art and music, and at Fachhochschulen.

Berufsschule Vocational school at upper secondary level generally provides part-time instruction in general and vocational subjects to trainees receiving vocational education and training within the dual system.

Bologna process Is a European reform process aiming at establishing a European Higher Education Area. The overarching aim of the Bologna Process is to create a European Higher Education Area (EHEA) based on international cooperation and academic exchange that is attractive to European students and staff as well as to students and staff from other parts of the world.

Decent work Sum up the aspirations of people in their working lives. It involves opportunities for work that is productive and delivers a fair income, security in the workplace and social protection for families, better prospects for personal development and social integration, freedom for people to express their concerns, organize and participate in the decisions that affect their lives and equality of opportunity and treatment for all women and men.

Diploma The Diploma degree as a higher education qualification provides qualification for a profession. It may be obtained both at universities, and at equivalent institutions of higher education, at colleges of art and music, and at Fachhochschulen.

Education The processes by which societies deliberately transmit their accumulated information, knowledge, understanding, attitudes, values, skills, competencies and behaviors across generations. It involves communication designed to bring about learning (UNESCO, 2011).

European It is a common reference framework into the European Community in

Qualifications Framework	order to help Member States, education institutions, employers and individuals compare qualifications across the European states diverse education and training systems. It is a tool for developing a European employment market.
Fachhochschule	University of applied sciences. It is a type of higher education institution established in the 1970s, which has the particular function of providing application-oriented teaching and research, particularly in engineering, business, administration, social services and design.
Formal education	It is defined as education that is: institutionalized, intentional, planned through public organizations and recognized private bodies, and in their totality, make up the formal education system of a country. Formal education programs are thus recognized as such by the relevant national educational authorities or equivalent, e.g. any other institution in co-operation with the national or sub-national educational authorities. Formal education consists mostly of initial education. Vocational education, special needs education and some parts of adult education are often recognized as being part of the formal education system. Qualifications from formal education are by definition recognized and are therefore within the scope of ISCED. Institutionalized education occurs when an organization provides structured educational arrangements, such as student-teacher relationships and/or interactions, that are specially designed for education and learning.

Formal education typically takes place in institutions that are designed to provide fulltime education for pupils and students in a system designed as a continuous educational pathway. This is referred to as initial education defined as formal education of individuals before their first entrance to the labor market. Formal education also includes education for all age groups with program content and qualifications that are equivalent to those from initial education. Programs that take place partly in the workplace may also be considered formal education if they lead to a qualification that is recognized by national educational authorities or equivalent. These programs are often provided in cooperation between educational institutions and employers (UNESCO, 2011).

Formal learning takes place in education and training institutions, leading to recognized diplomas and qualifications; formal learning has dominated policy thinking, shaping the ways in which education and training are

provided and coloring people's understandings of what counts as learning (European Commission, 2000).

GDP Gross Domestic Product. The total market value of all final goods and services produced in a country in a given year, equal to total consumer, investment and government spending, plus the value of exports, minus the value of imports.

GDP per capita An approximation of the value of goods produced per person in the country, equal to the country´s GDP divided by the total number of people in the country.

GIZ The Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH was formed on 1 January 2011. It brings together the long-standing expertise of the Deutscher Entwicklungsdienst (DED) gGmbH (German development service), the Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH (German technical cooperation) and Inwent – Capacity Building International, Germany.

Gymnasium Type of school covering both lower and upper secondary level (grades 5-13 or 5-12) and providing an in-depth general education aimed at the general higher education entrance qualification.

Hauptschule Type of school at lower secondary level is providing a basic general education. Compulsory school, unless pupil is attending a different type of secondary school, usually comprising grades 5-9.

Human Development Index (HDI) Global index utilize to rank the development of countries by examining the achievements of the inhabitants of the country. The index factors in three important elements: standard of living, life expectancy, and literacy level.

Informal learning Informal learning is defined as forms of learning that are intentional or deliberate, but not institutionalized. It is consequently less organized and less structured than either formal or non-formal education. Informal learning may include learning activities that occur in the family, in the work place, in the local community, and in daily life, on a self-directed, family directed or socially directed basis. Like formal and non-formal (UNESCO, 2011).

Informal learning is a natural accompaniment to everyday life. Unlike formal and non-formal learning, informal learning is not necessarily intentional learning, and may well not be recognized even by individuals

themselves as contributing to their knowledge and skills. Informal learning is likely to be missed out of the picture altogether, although it is the oldest form of learning and remains the mainstay of early childhood learning. The fact that microcomputer technology has established itself in homes before it has done so in schools underlines the importance of informal learning. Informal contexts provide an enormous learning reservoir and could be an important source of innovation for teaching and learning methods (European Commission, 2000).

Learning	It is an individual acquisition or modification of information, knowledge, understanding, attitudes, values, skills, competencies or behaviors through experience, practice, study or instruction (UNESCO, 2011).
Learning outcomes	Learning outcomes are a "set of knowledge, skills and/or competences an individual acquired and/or is able to demonstrate after completion of a learning process" (Tissot, 2003, p. 79).
Level of retention	The percent of student that are hired in the enterprise where they did the practice.
Magister	The Magister degree, as a higher education qualification providing qualification for a profession may be obtained at universities and equivalent institutions of higher education (particularly in arts subjects).
Master	The Master's degree as a further higher education degree provides an advanced qualification for a profession and can be obtained after a standard period of study of one to two years at a university or equivalent institution of higher education, at colleges of art and music, as well as at Fachhochschulen.
National framework of qualifications (higher education)	The single description, at national level or level of an education system, which is internationally understood and through which all qualifications and other learning achievements in higher education may be described and related to each other in a coherent way and which defines the relationship between higher education qualifications (Bologna Framework, 2005).
Non formal education	It is defined as education that is institutionalized, intentional and planned by an education provider. The defining characteristic of non-formal education is that it is an addition, alternative and/or a complement to formal education within the process of the lifelong learning of individuals. It is often provided in order to guarantee the right of access to education for

all. It caters for people of all ages but does not necessarily apply a continuous pathway-structure; it may be short in duration and/or low in intensity; and it is typically provided in the form of short courses, workshops or seminars. Non-formal education mostly leads to qualifications that are not recognized as formal or equivalent to formal qualifications by the relevant national or sub-national educational authorities or to no qualifications at all. Nevertheless, formal recognized qualifications may be obtained through exclusive participation in specific non-formal educational programs: this often happens when the non-formal program completes the competencies obtained in another context.

Depending on the national context, non-formal education can cover programs contributing to adult and youth literacy and education for out-of-school children, as well as programs on life skills, work skills, and social or cultural development. It can include training in a workplace for improving or adapting existing qualifications and skills, training for unemployed or inactive persons, as well as alternative educational pathways to formal education and training in some cases. It can also include learning activities pursued for self-development and thus is not necessarily job-related (UNESCO, 2011).

Non formal learning takes place alongside the mainstream systems of education and training and does not typically lead to formalized certificates. Non-formal learning may be provided in the workplace and through the activities of civil society organizations and groups (such as in youth organizations, trades unions and political parties). It can also be provided through organizations or services that have been set up to complement formal systems (such as arts, music and sports classes or private tutoring to prepare for examinations). Non-formal learning, by definition, stands outside schools, colleges, training centers and universities. It is not usually seen as 'real' learning, and nor do its outcomes have much currency value on the labor market. Non-formal learning is therefore typically undervalued (European Commission, 2000).

OECD   Forum where governments work together to address the economic, social and environmental challenges of globalization. The OECD is also at the forefront of efforts to understand and to help governments respond to new developments and concerns, such as corporate governance, the

	information economy and the challenges of an ageing population. The Organization provides a setting where governments can compare policy experiences, seek answers to common problems, identify good practice and work to co-ordinate domestic and international policies.
PROESA	This office promotes international investments in El Salvador.
Qualification in higher education	Any degree, diploma or other certificate issued by a competent authority attesting that particular learning outcomes have been achieved, normally following the successful completion of a recognized higher education program of study (Bologna Framework, 2005).
Remittance	It is a transfer of money by a foreign worker to his or her home country.
Technische Hochschule / Technische Universität	It is a type of higher education institution equivalent in status to university. Focus traditionally lies in natural science and engineering.
Technical and Vocational Education and Training (TVET)	The term adopted by UNESCO (1999) at the Second International Congress on Technical and Vocational Education in Seoul and at the 30th session of the General Conference of UNESCO in Paris, was: Technical and Vocational Education and Training (TVET) is the combined process of education and training and recognize the common objective of employment as their immediate goal.
	Technical and Vocational Education and Training (TVET) is concerned with the acquisition of knowledge and skills for the world of work (Power, 1999). There are various terms to describe elements of the field that are now conceived as comprising TVET. These include: Apprenticeship Training, Vocational Education, Technical Education, Technical-Vocational Education, Occupational Education, Vocational Education and Training, Professional and Vocational Education, Career and Technical Education, Workforce Education, Workplace Education, etc. Several of these terms are commonly used in specific geographic areas (UNESCO-UNEVOC, 2010).
The Constraints Analysis (CA)	Indicated that the issues limiting El Salvador's productivity in tradable are factors of productivity -physical capital (infrastructure), human capital, and financial capital- and the institutional environment in which tradable firms operate development (USG & GOES, 2011).

The Partnership for Growth (PFG)	Is a relationship that strengthens this GOES -driven process with the goal of steering it towards an historical era of investment and broad-based the economic growth. in this way, the PFG is a critical contribution to strengthening the process and creating a valuable opportunity for Salvadoran development (USG & GOES, 2011).
Tradable	Are those goods and services which are or can be traded internationally and whose prices are set on world markets development (USG & GOES, 2011).
Underemployment	A situation in which a worker is employed, but not in the desired capacity, whether in terms of compensation, hours, or level of skill and experience. While not technically unemployed, the underemployed are often competing for available jobs.
Unemployment	It occurs when a person who is actively searching for employment is unable to find work.
Unemployment rate	Percentage of total workforces that is unemployed and they are looking for a paid job.
UNESCO	Its mission is to contribute to the building of a culture of peace, the eradication of poverty, sustainable development and intercultural dialogue through education, the sciences, culture, communication and information.
Vocational training	Vocational training in the European Community means any form of initial vocational education or training, including technical and vocational teaching and apprenticeships. This contributes to the achievement of a vocational qualification recognized by the competent authorities in the Member State[1] in which it is obtained, as well as any continuing vocational education or training undertaken by a person during his or her working life. Usarralde Martinez (2001) in his article related to European vocational training system and its challenges, has pointed out the need to train more and more people inside and outside of the academic environment, and with the best cost-effectiveness, for the increasingly complex production systems and technologies in the immediate work environment; as well as, the need to create an adaptable workforce to meet the needs of a changing marketplace at a dizzying pace. In addition, these educational systems have the responsibility in achieving important goals for adequate

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[1] Member of European Communities.

basic social cohesion, such as reducing long-term unemployment and youth unemployment who still seeking their first job.

Abstract in German

Untersuchung der ansteigenden Kompetenzen in der technischen Ausbildung durch die Umsetzung von Elementen des Dualsystems und Rücksicht auf die Gegebenheiten El Salvadors im Bereich der Mechatronik

Schlagworte: Dualsystem, Beschäftigungsfähigkeit, Kompetenzen, deutsches System, Bildung El Salvador, Teilnahme des Industriesektors.

Die Beschäftigungsfähigkeit ist einer der größten Anliegen in El Salvador, besonders für Jugendlichen (UNPD, 2008). Außerdem betont die Studie über die Herausforderungen des Bildungssystems in El Salvador die Notwendigkeit, eine Anknüpfung zwischen Akademie und Industrie zu haben (Barraza, 2008). In diesem Kontext begann El Salvador in 2008 die Umsetzung von einigen Elementen des Deutschen Dualsystems (neues System) im Bereich der technologischen Ausbildung, mit der Absicht, einen Versuch zu machen ob dieses System bessere Kompetenzen bei Studenten entwickelt, welche ihnen bessere Arbeitseinsatzmöglichkeiten anbietet. Im Dualsystem wird die Ausbildung von der Akademie und Industriesektor geleistet.

Grundsätzliche Ziele waren: (1) Analyse der Einflüsse zur Ansteigung der Beschäftigungsfähigkeit unter Gebrauch einer besseren Kombination von Theorie und Praxis während des Studiums – Möglichkeiten einer Dualerfahrung aus Deutschland unter den Bedingungen in El Salvador (2) Analyse der Möglichkeiten und Probleme unter Berücksichtigung des Kompetenzschwerpunktes für die Entwicklung und Beschäftigungsfähigkeit der Studenten; (3) Festlegung, ob die Studenten mit Studienausgang in 2008-2010, die im Dualsystem teilgenommen haben, bessere berufliche Kompetenzen zur Einsetzung im Produktivprozess erlangt haben im Vergleich zu diejenigen aus dem traditionalem System (ohne Unternehmenserfahrung); (4) Festlegung der Einflussfaktoren die den Industriesektor an der Teilnahme am Dualsystem motivieren; und (5) Darstellung der Folgen aus der Umsetzung dieses Systems unter den salvadorianischen Gegebenheiten und Anregungen zu deren Anpassung zu entwickeln.

Bei der Untersuchung ging es um die Erstellung eines Vergleichs zwischen Studenten der Studienrichtung Mechatronik mit Ausgang in 2008 – 2010; ein Student aus dem Dualsystem und einer aus dem traditionellen System. Die angewandte wissenschaftliche Methodologie war eine Verknüpfung von einer quantitativen und

qualitativen Methode mit Fragebogern, Interviews und Messungen der Kompetenzen, nötige Zeit zum Erwerben einer Arbeitsstelle und Gehaltsbedingungen

Die Ergebnisse der Untersuchung waren: (a) Beide Gruppen hatten ähnliche Kompetenzen laut ihrer akademischen Benotung, aber bessere Kompetenzen für die Duale Gruppe wenn Arbeitsbedingungen eingeschlossen sind. In Bezug auf die Motivation der Entscheidungsträgern hat die Untersuchung folgendes erwiesen: (1) Vorherige Kenntnis über das System (2) Personen sind mit bessere Kompetenzen bedarfsgerecht für die Industrie ausgebildet; (3) Minderung des Risikos, falsche Leute aufzunehmen; (4) Optimierung der Ausbildungskosten, (5) Innovation einer neuen Studienrichtung die vom Unternehmen benötigt wird; (6) Soziale Verantwortung; und (7) Verbesserung der Produktivität und Qualität. Schlussfolgerung ist, das Dualsystem könnte eine Möglichkeit für die Verbesserung der Kompetenzniveaus als auch für die Beschäftigungsfähigkeit der Studenten in El Salvador sein, jedoch bringt es neue Herausforderungen für das technologische Ausbildungssystem.

Chapter 1: Introduction

1. Introduction

The background about El Salvador's conditions, related to the social, economic and educative problematic that affect in negative way the youth employment are presented in the first part of this chapter. From these situations, aims, and the scientific problem related with them, the hypotheses and methodological concept are developed into the next sections.

1.1 Background and scientific problem

El Salvador is a tropical climate country located in Central America; it is the smallest country of Central America, with the greater population density. In the year 2009, the Household Survey and Multiple Purposes (EHPM) register (See Table 1.1-1) that the total population were 6,150,953 inhabitants, distributed in the 21,040.79 km² in the national territory with a population density of 292 inhabitants per km². It was reported that 59% of the population is between 15 and 29 years; these facts, reveals that the Salvadoran population is quite young. Most of the population is located in urban cities, and the distribution between men and women are similar (MINEC & DIGESTYC, 2010).

Table 1.1-1. Demographic characteristics of El Salvador in 2009

Characteristics	Data
Total	6,150,953 inhabitants
Male	47.3%
Female	52.7%
Urban	63.2% (3,884,432 inhabitants)
Rural	36.2% (2,266,521 inhabitants)
Youth	59% (1,695,176 are between 15 and 29 years old)

Source: Own elaboration, data from EHPM (MINEC & DIGESTYC, 2010)

Economic and social conditions of El Salvador

El Salvador's economy has been traditionally agricultural[2], but services and industry now employ a greater percentage of the workforce and account for a much higher percentage of the gross domestic product. El Salvador's economy was adversely affected by its 12-year civil war during the decade of 80´s (The Columbia Electronic Encyclopedia, 2007).

During the last two decades, El Salvador has achieved average economic growth of 3.5% for the period 1990 - 2009. In 2009, gross domestic product (GDP) contracted by 3.5% and grew very moderate (1%) in 2010 (CEPAL, 2011); it has a diversified economy, being reported in 2009 the contribution to GDP by major sectors as follows: manufacturing 24.1%, commerce 21%, infrastructure, 14.7%, 12.3% financial, and other 8.5% (See Graph 1.1-1).

Graph 1.1-1. El Salvador: GDP contribution in 2009
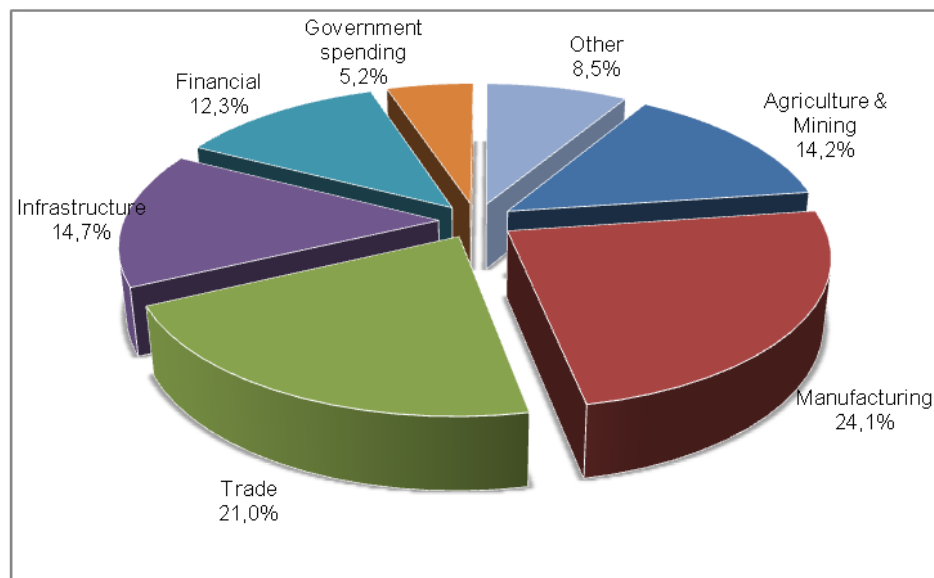
Source: BCR, 2010

It is a country with high levels of migration, currently about 3 million of Salvadorans are living abroad (Ministerio de Relaciones Exteriores, 2010), who contribute to the Salvadoran economy through remittances, which in 2010 accounted for 16.2 % of annual GDP (BCR, 2010). The deficit in trade of El Salvador is financed largely by

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[2] About half of the land is used for either crops or pasturage. Corn is the chief subsistence crop, and rice, beans, oilseeds, and sorghum are also grown; coffee and sugar are the major commercial crops.

remittances (CEPAL, 2011), which are mostly used for consumption in the household economies (Cáceres & Saca, 2006).

Based on the Global Competitiveness Index (WEF, 2010), El Salvador was in the rank 82, showing deterioration in competitiveness; from 2005 - 2006, El Salvador has dropped 19 places in a constant sample of 119 countries in this index (INCAE, 2010).

Among the strengths, the WEF's report highlights the efficiency of the property market and infrastructure development (roads, air and mobile communication), and certain macroeconomic conditions (in particular, a controlled inflation rate), the quality of local suppliers, and labor flexibility. However, the country is constrained by its limited capacity to innovate and weaknesses of public institutions and the quality of the education system. For investors and executives, crime, instability of the policies and access to financial resources are the main obstacles to doing business in the country (WEF, 2010).

The unemployment and the young people

The poor developments of the Salvadoran economy and the social problems have affected the young people; there are big problems with the delinquency, the phenomenon of "Maras" (youthful bands) and the unemployment. People who are specially affected by this situation are the youngest between 14 and 24 years that approximately represent 20% of the population.

In fact, El Salvador has been catalogued like one of the most violent country in the world with over 60 deaths per 100,000 populations; between 2004 and 2009, more people died violently according to the 2011 Global Burden of Armed Violence report (Geneva Declaration, 2011).

Recently studies from UNPD, remark that for young people, the main challenges and opportunities are given in terms of job creation, their difficulties for insertion into the labor market is evidenced by high rates of underemployment and unemployment, 62% in 2009 (UNPD, 2010), that are significantly higher than those of any other age group (See Graph 1.1-2).

Most of the young people in vulnerable conditions come from families that have in average incomes for approximately US$275.00 (GTZ, 2004). Actually minimum wage is US$219.30 (Ministerio de Trabajo y Previsión Social, 2011).

Education and employability for youth

Based on the world ranking, El Salvador is not in a good position in education and competitiveness; according the Global Competitiveness Index, the country has weaknesses in the quality of the education system (WEF, 2010).

Graph 1.1-2. Underemployment and unemployment rates in El Salvador for 2009
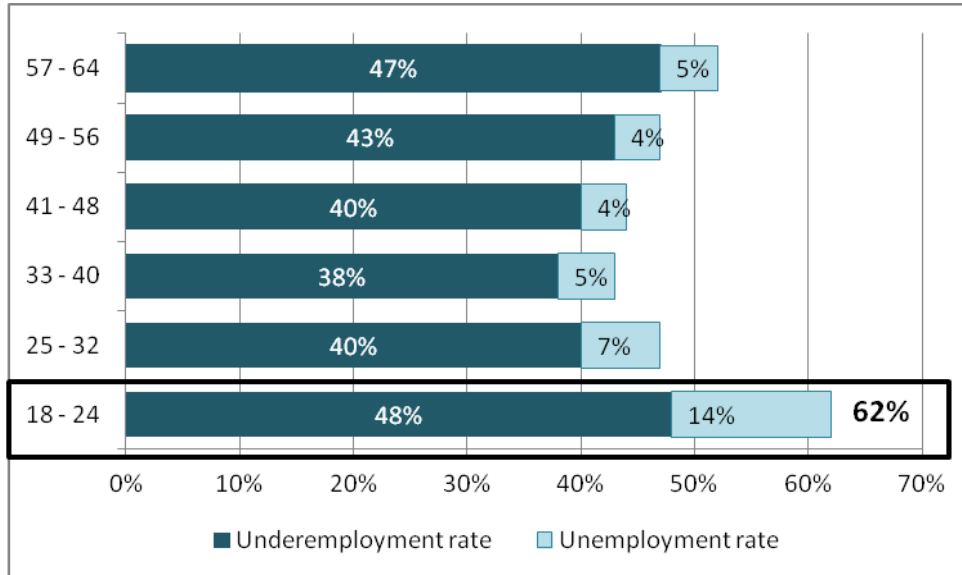
Source: Reedited with data from (UNPD, 2010)

On the other hand, the same situation is presented for All Development Index (EDI) (UNESCO, 2010a), where in the year of 2007 had the position 121 and 124 of 139 countries, in the evaluation of the education system and the quality of teaching in science and math, respectively.

Moreover, in a workshop developed in El Salvador in 2008 with the stakeholders of the education, there was an evaluation, which has included the perception and aspirations of the students and parents about the education. In this, parents expressed that their expectation, are that education will enable their children pursue a career and have a decent job. But they consider that most graduates do not receive sufficient preparation to succeed in the workplace, they believe that the curricula of schools are not congruent with the demands of work. For their part, students between 13 and 19 years old expressed their expectations, among pointed out that they hope to graduate from high school, attend university, and have a decent job that allows them to improve their living conditions and their families (Comisión de

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Seguimiento Plan Nacional de Educación 2021 [Following Commission for the National Plan of Education 2021], 2008).

In the other hand, a recently survey conducted by USAID and GIZ in the year 2011 about the private sector (enterprises) and the youth employment, where 21 enterprises and 5 people from business association were interviewed, has showed the demands to the educational system, related with the formation process, and the preparation of the students for the labor life. One fact the report presented the companies needs about to strengthen the strictness of study plan and align the curriculum of the education system (basic education, high school, higher and technical education) with the labor needs of the private sector and must, at a time, mechanisms of rapprochement between the public institutions involved, training institutions and private enterprise. Also, pointed to the need, in order to begin exposing youth to real opportunities in the market through career counseling and internship opportunities (USAID & GIZ, 2011).

Similar situation has been presented by the American Chamber of El Salvador, in some studies related with the needs from enterprises point of view about the labor force, finding that enterprises demand from higher education institutions (HEI) to adapt their process of formation according the enterprise's needs (AMCHAM, 2011).

A recent World Bank study (World Bank, 2011) notes that, the quantity and quality of employment in El Salvador have improved very little. This is because a significant deficiency of human capital, which is reflected in a poorly educated population, low employability and vulnerable. At the same time the Salvadoran economy has a very limited capacity to adopt and develop new technologies, which translates into a low capacity to generate quality jobs. Besides, the study remarks that the employment in El Salvador has a precarious labor panorama, especially for youth, which increased just 1%, which is insufficient to absorb new cohorts who entered the labor market.

Technical education

Technical education in El Salvador has been developed with the purpose to prepare youth for the labor life. Most of them are two years programs. In this kind of education, the Instituto Tecnológico Centro Americano (ITCA) has been conformed as a network of technical institutions managed by the Fundación Empresarial para el Desarrollo Educativo (FEPADE). The main objective of the institution is to train

competent professionals in technological fields for which there are both demand and opportunities in the local, regional, and global markets[3].

In 1969, ITCA formally arose with the goal of training young men and women at a higher level of technical education (though non-college), aimed at strengthening the economic and social development of the country. In 2008, ITCA was established as a specialized institute for higher education in science and technology and adopted the name of the Specialized School of Engineering. For its operation receives public subsidies of state contributions to public higher education (ITCA, 1998).

At ITCA, in the year of 2009 the enrolment was 6040[4]. It represented 27% of the total population registered in all technical education, according to the registries of the Ministry of Education for year 2009 (MINED, 2010). This population means 4% of total student population in the higher education system of El Salvador. The technical programs are distributed as follows: five campuses offer a total of 32 technical degree programs and three universities degree programs in the field of engineering (MINED, 2011).

According the ITCA annual report from 2009 and other reports, the educative model of the Academy has been designed in order to get connection between theory and praxis, making relationship with the enterprises in order to get from the advices about the curricula design and student practice.

The educational method is based in the "learn by doing" strategy, which implies that study plans demand a high percentage of practical knowledge. Students spend most of their time in the laboratories and shops, be it observing, experimenting, matching theory against application, reassuring their knowledge and strengthening their competencies[5]

In this system, students have to do practice insides of the enterprises for one and a half month (260 hours) like an internship at the end of the career; this practice represents 7.4% percent of total of programmed hours average for its formation[6]. This system is called for this research "Traditional system". According the Annual

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[3] ITCA is called the Academy for the purposes of this research.

[4] Annual Report 2009 (ITCA, 2010).

[5] Idem.

[6] The average estimation of hours was taken from the presented Curricular Maps in Student Guide (ITCA, 2008e).

Report about Results 2007 (ITCA, 2008d) and the Annual Report 2009 (ITCA, 2010), the employment rate for graduated technician in this system has been close to 80% for the last 10 years. The average salary could vary from US$241.00 to US$416.00 depending of the career and the region according the Annual Report (ITCA, 2010)[7].

Dual system in technical education

Even though, the Traditional system had good employability comparing with the unemployment rates for youth people in El Salvador, as has been presented before; It was necessary to implement actions in order to increase the employment rate and to improve the employability conditions. It could assure that students were well prepared for the labor life giving them the chance for a decent job[8].

These actions had to assure the improvement of the quality of the education, implementing a system where the level of competences of the students were improved according to the demands of the industry. It means that had to be more connection between the schools/academy and the companies. Dual system was an option, but considering that conditions of this country are different from Germany, for example, this is not well knowing system, relationship with the enterprise and the academy are not enough strong, teacher and student do not have experience, and there is not a legal framework for the apprenticeship. Always is to remark, that it is not possible to make an easy transfer of the Dual system in Germany to other countries (Stockmann, 1999).

Under these conditions, in 2008 started in technical education the implementation of Dual system, called a new system too, that combines the formation between the academy and the enterprise[9], as a strategy to increase the competence level for the students in order to prepare them for the labor life, with the expectation to improve their labor conditions.

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7   Better job opportunities are presented in the metropolitan area; this in the capital of El Salvador and the cities that are close to this region.

8   Some of the expectations are better salary conditions, less time to get job and employment in the field that have been formed.

9   More information about Dual system is developed in the next chapter. For ease of reading in this investigation the words "dual system", is used instead of "elements of the dual system", when referring to it simple implementation in El Salvador.

This system was introduced in Mechatronic career, with the support from GTZ[10], the German International Cooperation in El Salvador, under FORTALECE program[11]. The main purpose of the new system was to decrease the problems of employability of its students through developing higher competencies according enterprise requirements.

Actually in both methods, the traditional and the new system, the Academy maintain connection with enterprises, but this is more intensive in the new system, where students have to make enterprise practice for 10 months (1760 hours)[12], and where they have tutors that help them with their apprenticeship according to the student guide developed with the curricula of the career. In other words, the new system is getting more connection with enterprises.

Scientific problem

It is important to recognize that at this moment, for technological education this is the first experience with dual system in this country. The incorporation of the Dual System in Mechatronic and its impact on the level of competences, developed by students and the incidence on the employability of technicians formed in the first cohort, are the main purpose of this study.

With the implementation of the New System is important to investigate its results comparing with traditional system, identifying if dual system has developed better competences in order to improve the employability level of students and deduce the consequences of its implementation under El Salvador conditions.

Depending of the results, Dual system could be an alternative for improving the quality in the higher education, reaching a better connection with the enterprises.

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[10] The Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH brings together the long-standing expertise of the Deutscher Entwicklungsdienst (DED) gGmbH (German development service), the Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH (German technical cooperation) and Inwent – Capacity Building International, Germany.

[11] To reduce the unemployment problem, different programs have been implemented with the support of cooperating agencies; in this context the German International Cooperation, started in 2002 the program for the Strengthening of the Economy and Employment (FORTALECE in Spanish) with the aim of development and institutionalization of useful instruments for promoting systemic economic and employment at regional and national levels (El Salvador and Central America). One component of the program was the Youth Employment, aimed at increasing employability among young men and women aged 14 to 25 years.

[12] In the Traditional system are one and a half month (260 hours) like an internship at the end of the career.

This scientific following is necessary, because the dual system not always has given the good results as in Germany, like is pointed by Reinhard Stockmann in the article about "The implementation of Dual Vocational Training Structures in Development countries" where he analyzed the lower impact of these kinds of projects[13].

If this research demonstrates that the implementation is successful and feasible, the replication of the model to other technical careers will benefit more young people; and still more, it can serve as model for the implementation in other educative centers.

If the benefits are significant, could have important incidences in the formative processes of El Salvador, to be considered by the national authorities in the matter of formation, as it is the Ministry of Education of El Salvador (MINED).

1.2   Aims, scientific questions and hypotheses

After to have presented a brief about the conditions where Dual system has been implemented in technological education, the aims, scientific questions and hypotheses are developed in this section.

Aims

The main purposes for the investigation are:

1. To analyze influences to rise employability under using of better combination of theory and practice in studies - possibilities of dual experiences from Germany for El Salvador`s conditions.

2. To analyze possibilities and problems using competences approach for student's development and employability.

3. To determine if the students of cohort 2008-2010 who study under using dual system`s elements acquire better professional competences to be inserted in the productive process that those of the traditional system.

4. To determine the factors that motivates the industrialists to participate in the student's formation by using elements of dual system.

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[13] Stockmann Reinhard, 1999, The Implementation of Dual Vocational Training Structures in Developing Countries: An Evaluations of "Dual Projects" Assisted by the German Agency for Technical Cooperation, International Journal of Sociology, vol 29, no, 2, Summer 1999, pp. 29-65.

5. To show consequences of implement dual system elements under the Salvadoran reality and develop suggestions its adaptation.

Scientific questions

Related with the aims, the research was conducted in order to find the answers to these scientific questions are:

1. Which are the consequences for employability of using a combination of theory and practice in studies?

2. Which are the possibilities of dual experiences from Germany to El Salvador's conditions?

3. How the dual system could be a possibility for raising competences on student's development and employability?

4. Which are the problems using dual system for raising competences on student's development and employability?

5. Under which conditions does the Dual system contribute to raise the competences level and improve the employability on students in technical education?

6. How is the point of view of students and tutors about the new system?

7. Which are the industrialist motivations to be part of Dual system?

8. How do the employers support the new system?

9. Under which conditions the system could be implemented in El Salvador?

10. How could the Dual system improve the quality of technical education?

11. How can the new system improve the linkage between the academy and the enterprise?

Questions 1 and 2 are related with the aim 1, where the purpose is to analyze influences to raise employability under using of better combination of theory and practice in studies. Dual system is addressed like a strategy for competence approach in order to raise the level of competence on students; to identify possibilities and problems of implementations are included in questions 3 and 4.

The questions 5 and 6 have connected with aim 3, comparing the level of competences and job opportunities; besides the opinion about the new systems and the implementation process, since the students and tutors point of view. Besides, support and motivation from industrialist opinion were in questions 7 and 8.

Finally, the questions 9, 10 and 11 were the guide for the aim related with the consequences of implementing the Dual system, and how it can be implemented.

The relation between the aims and the scientific question is developed in Table 1.2-1.

Table 1.2-1. Relation between aims and scientific questions

Aim	Scientific question
1. To analyze influences to rise employability under using of better combination of theory and practice in studies - possibilities of dual experiences from Germany for El Salvador`s conditions.	1. Which are the consequences for employability of using a combination of theory and practice in studies? 2. Which are the possibilities of dual experiences from Germany to El Salvador's conditions?
2. To analyze possibilities and problems using competences approach for student's development and employability.	3. How the dual system could be a possibility for raising competences on student's development and employability? 4. Which are the problems using dual system for raising competences on student's development and employability?
3. To determine if the students of cohort 2008-2010 who study under using dual system`s elements acquire better professional competences to be inserted in the productive process that those of the traditional system.	5. Under which conditions does the Dual system contribute to raise the competences level and improve the employability on students in technical education? 6. How is the point of view of students and tutors about the new system?
4. To determine the factors that motivates the industrialists to participate in the student's formation by using elements of dual system	7. Which are the industrialist motivations to be part of Dual system? 8. How do the employers support the new system?
5. To show consequences of implement dual system elements under the Salvadoran reality and develop suggestions its adaptation.	9. Under which conditions the system could be implemented in El Salvador? 10. How could the Dual system improve the quality of technical education? 11. How can the new system improve the linkage between the academy and the enterprise?

Hypotheses

For the empirical part, two hypotheses were defined as follow:

Hypothesis H1

Students of Cohort 2008 to 2010 that were formed under some elements of the Dual System (new system), have acquired better competences than students in the same cohort that were formed in the traditional system.

For methodological reasons and to facilitate the analysis and comprehension of data and results, this hypothesis has been sub divided in two sub hypotheses being established as follow:

Sub hypothesis H1.1

The students from cohort 2008 – 2010, that were formed in the new system (Dual system), got better competences than those of the same cohort who were formed in the traditional system.

Sub hypothesis H1.2

The students from cohort 2008 – 2010, that were formed in the new system (Dual system), got job in less time and better salary in the first 6 months after the graduation, than those of the same cohort who were formed in the traditional system.

Hypothesis H2

The factors that motivate the industrialists to participate in the dual system are expectation to get people with better competences, to reduce training costs and to take part of student´s formation.

1.3   Methodical concept

The results of the investigation for implementing the new system were for students of cohort 2008 - 2010, comparing two groups of students of the Mechatronic career, where a group was studying under the new system (using elements of dual system) and the other group under the traditional system.

The population of this study were the students of the career of Mechatronic of the Cohort 2008-2010 made up of 56 students, where 39 belonged to the dual system (70%) and 17 to the Traditional System (30%).

During the students' formation process there were other actors whose' perception in relation to the new system implementation that has been considered. In this process were 28 tutors from 22 companies, 9 technical teachers and the German expert advisor.

To reach the aims in this research the scientific methodology to apply were a combination of **quantitative and qualitative method** with questionnaires, interviews and measurements about competences, time to get a job and the salary conditions (See Illustration 1.3-1).

Illustration 1.3-1. Methodological approach
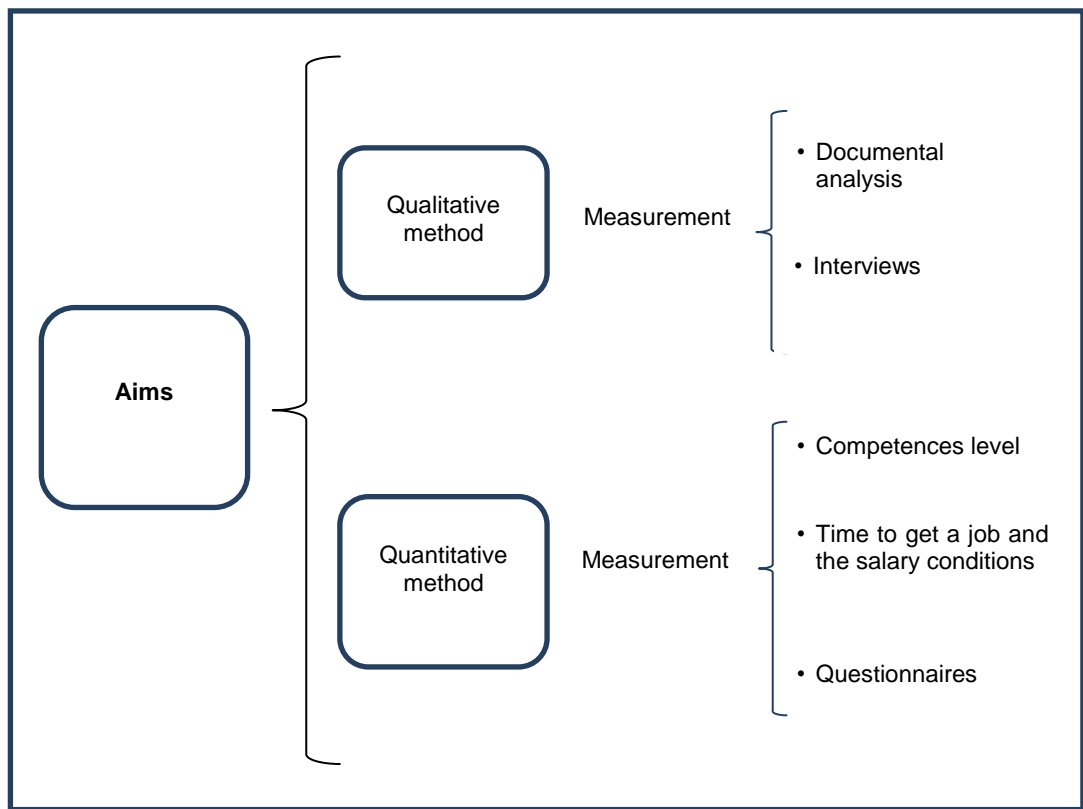
The hypothesis about the competencies (H1.1) was proved evaluating the competences by grades, significant tasks, and watching student's behavior. Besides the opinions about students development were taken from students, tutors and the teachers. Three measurements were collected, one per year, on order to follow the

improvement in the student´s competencies and the studies that the German Advisor has done (See Illustration 1.3-2).

Illustration 1.3-2. Methodological approach for Sub hypothesis 1.1

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┌─────────────────────────────────────────────────────────────────────┐
│                                                                       │
│            ┌──────────────────┐                  • Significant test   │
│            │ Evaluation    of │                    for two group of   │
│            │ Competences by   │   Measurement       students          │
│            │ grades,          │   per                                 │
│  ┌───────┐ │ significant tasks│   competences                         │
│  │ H1.1  │ │ and watching of  │   area                                │
│  │ Higher│ │ behavior         │                                       │
│  │compet-│ └──────────────────┘                                       │
│  │ences  │                                       • Questionnaire       │
│  └───────┘                                                            │
│            ┌──────────────────┐                  • Depth Interview (   │
│            │ Students and     │   Measurement      Students and their  │
│            │ tutors opinions  │   per year         tutors)             │
│            │ on students      │                                        │
│            │ development      │                  • Expert study        │
│            └──────────────────┘                                        │
│                                                                       │
└─────────────────────────────────────────────────────────────────────┘
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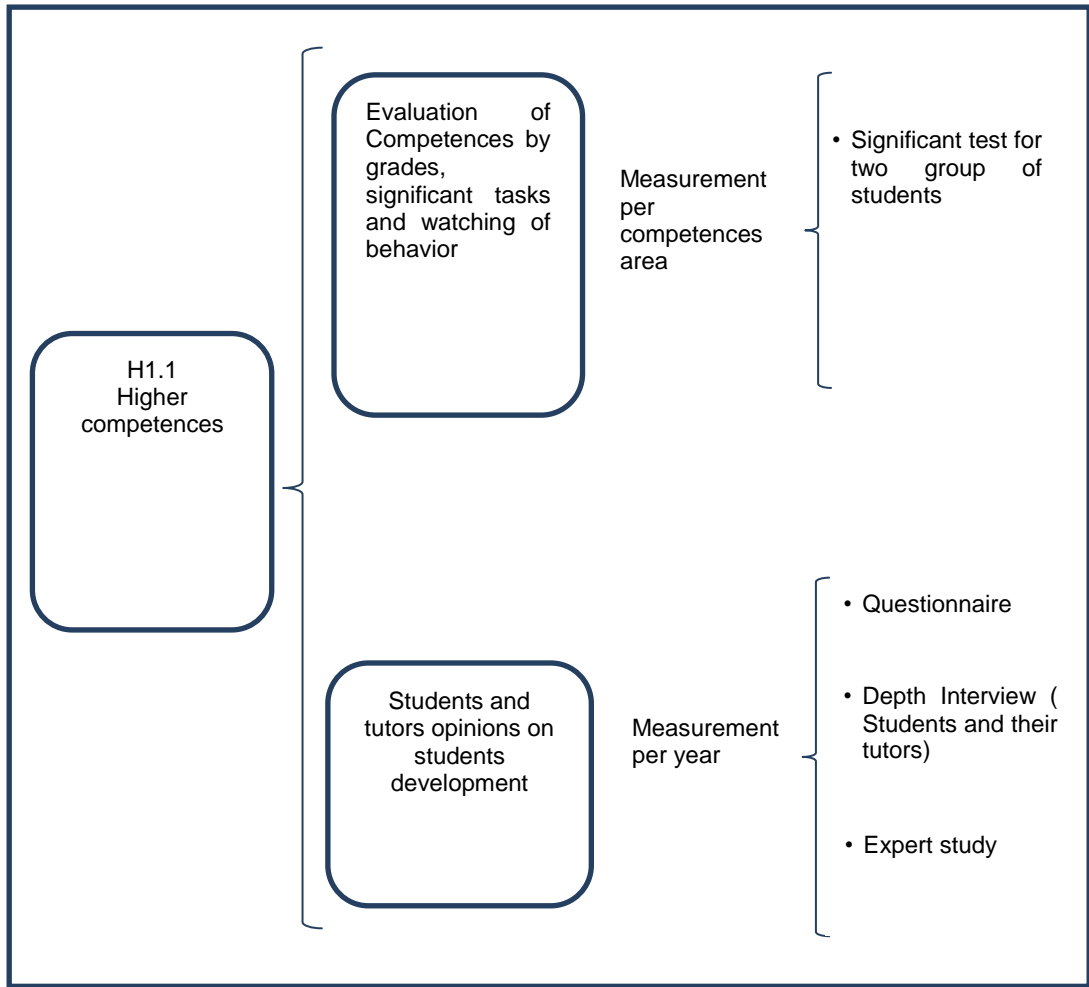
To prove the Sub hypotheses 1.2, the methodological approach applied the statistical technique significant test for the two groups of students (T-student), and the analysis of level of job placement and retention. The source of data was the dates when student got a formal contract and its salary (See Illustration 1.3-3). Two conditions of employability are measured (time to get job and the salary) for this sub hypothesis.

Illustration 1.3-3. Methodological approach for Sub hypothesis 1.2
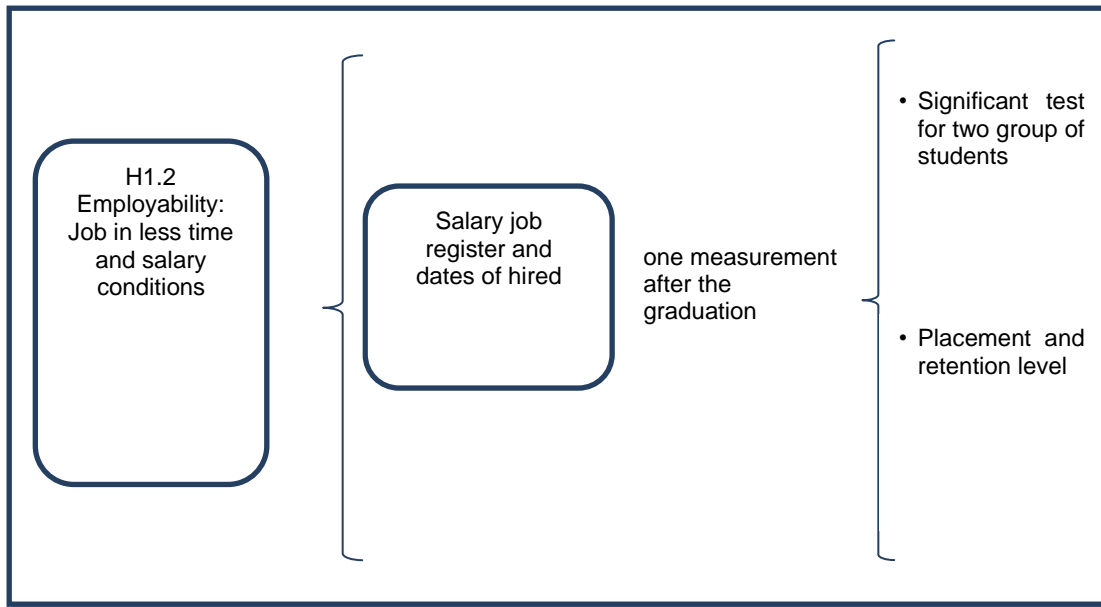
H1.2
Employability:
Job in less time
and salary
conditions

Salary job
register and
dates of hired

one measurement
after the
graduation

• Significant test
for two group of
students

• Placement and
retention level

Interviews were the instruments used, in order to get the industrialist opinions about their participation on the student´s formation and reports prepared by the German adviser responsible for the Implementation system to prove the hypothesis 2 (See Illustration 1.3-5).

Illustration 1.3-4. Methodological approach for Hypothesis 2
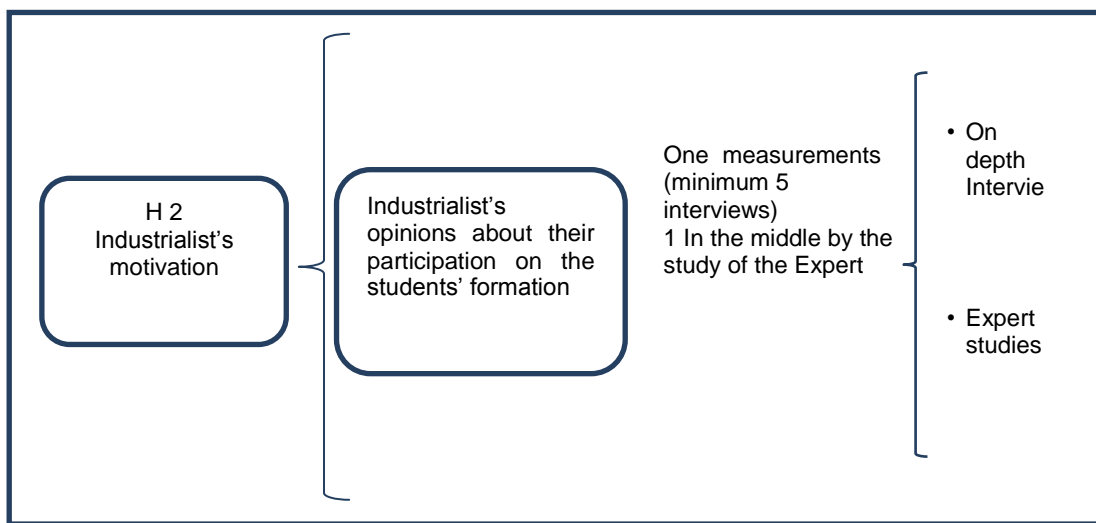
H 2
Industrialist's
motivation

Industrialist's
opinions about their
participation on the
students' formation

One measurements
(minimum 5
interviews)
1 In the middle by the
study of the Expert

• On
depth
Intervie

• Expert
studies

Besides, documental exploration about Dual system, have done in order to know how this system works in other countries and conditions of its implementation in El Salvador. In other hands, interviews were done to people who work in key areas, who can influence in the course of education in the country (See Illustration 1.3-5).

Illustration 1.3-5. Methodological approach for Aims 1 to 5
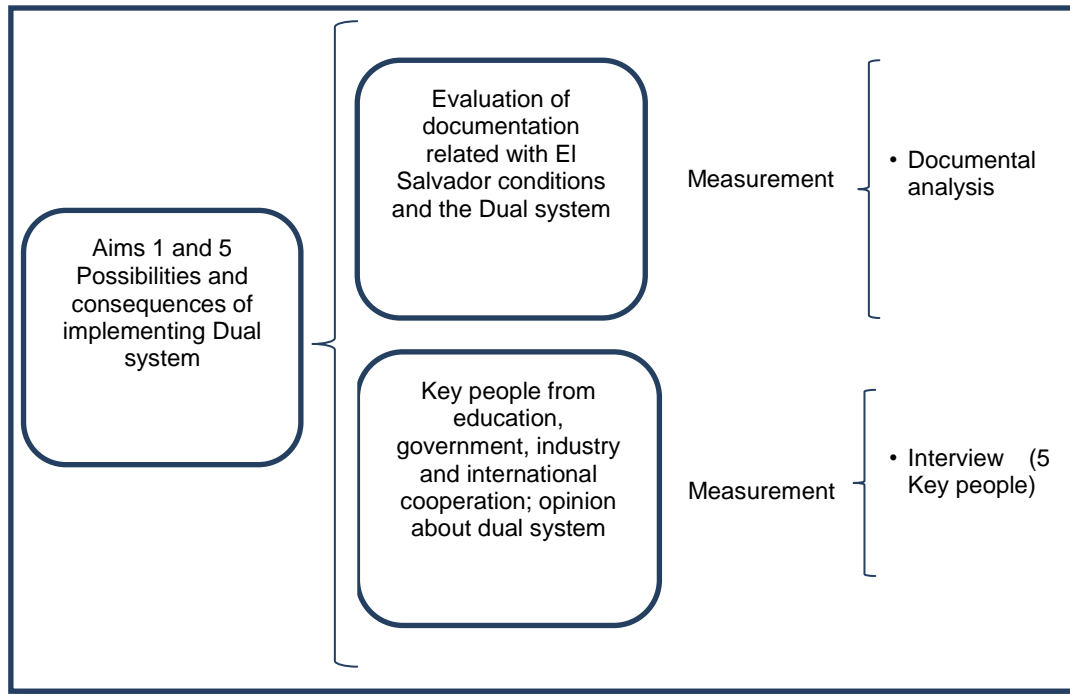
Chapter 2: Theoretical approaches

2. Theoretical approaches

The theoretical approaches are described in this chapter, addressing at first, the Dual system in Germany, its history and development, and the benefits and concerns about it; then, the competences approaches, the measurements, its possibilities and difficulties; after that, there is a section about quality in technical education, the higher education and lifelong learning. Basic terms, for the scientific investigation in this work are presented in each section. The definition or understanding of them is important for the context that they are used in this document.

Identify if the Dual system has developed better competences and improve the employability conditions of the students, is one of the most important aspect in this investigation, for this reason is necessary to analyze the dual system, its elements, advantages and problems with its implementations. Other factor that is important to reflect in what competences means, how they are developed and its measurement. Other terms included are employability and lifelong learning, linkage between academy and enterprise.

2.1 Dual system in Germany

According to the International Standard Classification of Education (UNESCO, 2011), Dual system educational programs are programs that combine school or college, and work based education. Both components are substantial (i.e. go beyond a single internship or occasional class), although the work-based part usually occupies 50% of the program time or more.

The system is called 'dual' because vocational training takes place both in the company and in part-time vocational school. The company provides the apprentice mostly with practical training. Part-time vocational school supplements company-based training by theoretical instruction. It has been implemented in tertiary education too. Dual system could be fine in different articles or literature as dual education, dual training, and German dual system of vocational training.

In the dual system, a combination of learning and working provides the basis for teaching vocational stills. The system seeks to teach theory and practice, and to impart structured knowledge and active competence, in their proper context. The different learning sites involved, the company and the vocational school, interact in keeping with their different emphases, but their tasks are not rigidly divided: school is not reserved solely for teaching theory, and in-company training involves more than simply practice. Under the dual system, vocational schools and companies have a joint educational responsibility. Trainees spend one or two days in vocational school and three or four days in their company (BMBF, 2003).

The German dual system of vocational training is seen as a cooperative-type system where the state lays down the framework for the vocational training provided by private companies and other private entities. This is a market model driven by the state, which emerges as a measure to modernize the artisanal sector (Greinert, 1998).

To form competences of students that prepared them to the labor life is the main objective of the German dual system. This system has developed the cooperation between the schools (or academies) and the enterprises like a two complementary places for the students learning. By this way, students do the theoretical studies and laboratory practice in the school/academy, and the real practice in the enterprises.

The dual system is far and away the largest educational area within secondary; two-thirds of each age group learn a recognized occupation requiring formal training. The great majority of graduates of dual-system training then work as skilled employees – and many later make use of opportunities for vocational further training. Under certain circumstances, graduates of such training can also acquire a university entrance certificate, in a year of full-time schooling, and then go on to university studies. And successful participants in vocational further training are also increasingly being admitted to university studies. Among all vocational (full-time) schools, the full-time vocational schools known as «Berufsfachschulen» have the largest numbers of pupils. These schools prepare pupils for occupations or for vocational training – usually within the dual system; senior technical schools (Fachoberschulen) and senior vocational schools (Berufsoberschulen) normally build on vocational training within the dual system (BMBF, 2003).

Elements of dual System

Principal elements of dual system are according to BMBF (2003):

- Teaching makes connection between theory and practice, and to impart structured knowledge and active competence, in their proper context.

- The different learning sites are involved, the company and the vocational school; both have a joint educational responsibility, alternating time study between school and companies.

- The state co-ordinates its framework regulations for training in companies and training in vocational schools.

- Include a final examination where trainees must show that they have acquired the necessary skills, abilities, practical and theoretical knowledge.

The system's central aim is to promote employability in a changing workplace – a workplace that is shaped both by technical development and by the people who work in it.

Decker[14] (1991) has explained the dual system as an educational program that's proven highly successful at hundreds of companies throughout Germany, that give the skilled and motivated employees to compete in Global Marketplace, where private companies and public Vocational Training Schools share the responsibility for quality education. He presented that German companies stay involved, subsidizing the students' education for almost four years and as he has considered, that commitment is long enough to teach good skills, long enough to make a sense of motivation, long enough to build a strong bond. With this shared approach to education, the students see benefits, the companies see benefits, and the nation (as a whole) reaps important rewards. Besides, the dual system allows students to develop social competences where they have relations with different work teams and customers (Cassidy, 2011).

History of Dual system in the Germany

Elements of a dual training type is evident from the 1900's in Germany, but the name "dual system" goes back to the years 60 (Greinert, 1998), and after the promulgation

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[14] Hans Decker was the Vice Chair (1991–1993) and President and CEO (1971–1990) of the Siemens Corporation USA, based in New York.

of the Law on Vocational Training (BBiG) in 1969, in the Federal Republic of Germany is beginning to recognize as a structured and planned system. According Kutscha (1996), the dual system was a product of the dissolution of the socialization system in the old guild system when a new place of instruction, namely the school, was introduced.

The consolidation phase of the dual training was, in the period from 1920 to 1970, with apprenticeship and vocational school, characterized by the development of structures, which are strengthened in 1969 with the new law of Vocational Training (BBiG). The German Bundestag adopts the Vocational Training Act as a national legal framework for all provisions governing dual training. The Illustration 2.1-1 shows history of vocational training, considering that Dual system is one of the most important of this type of education.

Illustration 2.1-1. The history of vocational training
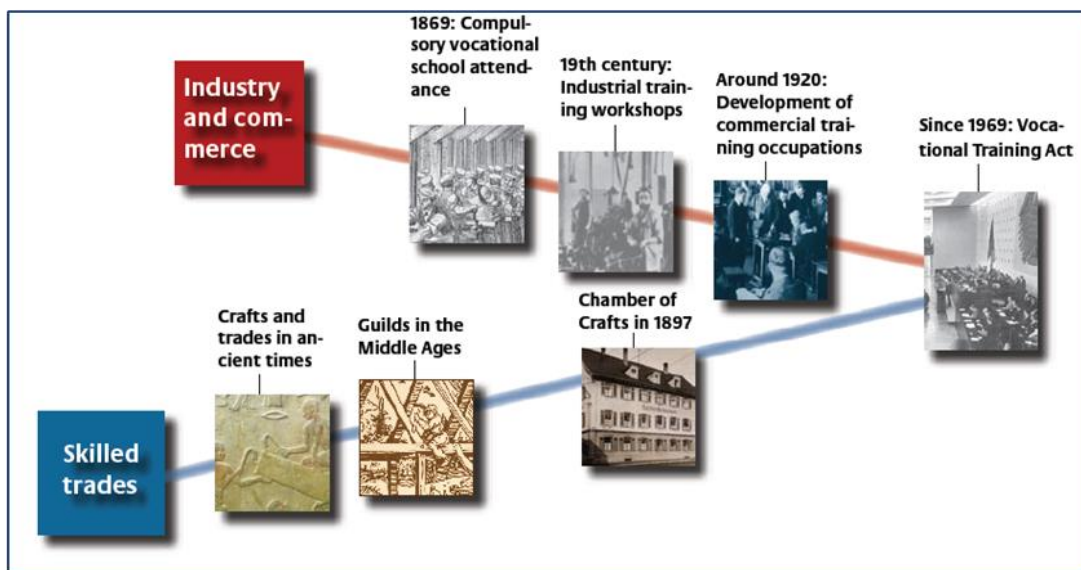
Source: (BMBF, 2003)

Responsibilities in Dual system

According Vocational Training Act (BBiG), the Dual system is regulated by Federal government and the States, supervised by chambers and school supervision institutions. It is organized by private and public sector; it is conducted in companies and part time vocational schools. It is carried out as training at the work place and classroom tuition. At company there is a training contract and the attendance is compulsory at vocational schools. Employers and unions are part of the industry,

they work in draft proposals for the creation of new and the updating of existing training occupations (See Illustration 2.1-2).

Illustration 2.1-2. Division of responsibilities in Dual Training
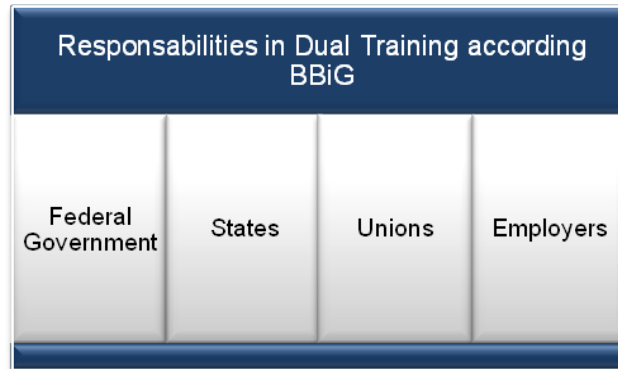
Besides, every student has a contract with the enterprise, that cover topics like the nature, syllabus, timetable and purpose of the initial training, and in particular the form of occupational activity for which initial training is to be provided; the payment of an allowance and the rate to be applied; the conditions under which the initial training contract may be terminated; among others; it has trainees and employers obligations.

Training in the company is also governed by labor law provisions such as the German Civil Code (BGB), Protection of Young Workers Act (JASchG), Protection of Working Mothers Act (MSchG).

Dual system in educational structure of Germany

The Dual system is part of the formal structure of educative German system, which begins from the second level of secondary (Berufsschule and Fachschule) and tertiary education level (Berufsakademie). The German education system is mainly responsibility of states while the federal government plays only a minor role.

Berufsfachschulen are full-time vocational schools differing in terms of entrance requirements, duration and leaving certificates. Basic vocational training can be obtained during one- or two-year courses at Berufsfachschulen and a vocational qualification is available at the end of two- or three-year courses.

The Fachschulen has to cater for vocational continuing education (1-3 years duration) and as a rule require the completion of relevant vocational training in a

recognized occupation and subsequent employment. The Berufsakademie is a tertiary sector institution in some States offering "academic" (a high level of training but not like universities) training at a Studienakademie (study institution) combined with practical in-company professional training in keeping with the principle of the dual system. The basic structure of the Educational System in the Federal Republic of Germany is described in Annex 2.

Table 2.1-1. Dual training, vocational school and Higher education

	Dual education	Full-time vocational schools	Higher education
Places of learning	Company and part-time vocational school	School, additional practical work placement, if applicable	Institutions of higher education, practical work placements included in some cases
Final qualification	State-recognized training occupation (chamber certificate)	State-recognized occupation (school certificate)	Bachelor, Master, Magister Artium, Diplom, Staatsexamen
Prerequisites	Full compulsory education (no leaving certificate required)	Completion of general education, further requirements for specific occupations	University entrance qualifications
Duration	Two, three or three and a half years	Two or three years	Between three and five years

In the Table 2.1-1. **Dual training, vocational school and Higher education**, there is a summary about basic differences among Dual training, Full time vocational schools and Higher education, comparing places of learning, the final qualification, prerequisites and duration.

Reasons for dual system as a part of vocational education in Germany

As it was pointed before, vocational continuing education require the completion of relevant vocational training in a recognized occupation and subsequent employment; moreover, Dual system aim is to form competences of students that prepared them to the labor life, with in cooperation between the schools (or academies) and the enterprises like a two complementary places for the students learning. By this way, students do the theoretical studies and laboratory practice in the school/academy, and the real practice in the enterprises.

Important results of Dual system in vocational education in Germany can be observed through job opportunities for young people, in terms of the number of occupations, students enrolled, benefits for enterprises, among others. As Decker[15] (1991) said "With this shared approach to education, the students see benefits, the companies see benefits, and the nation (as a whole) reaps important rewards. Some of these benefits are follows:

a. Opportunity for young people: Low rate of youth unemployment

A majority of young people learn in dual system, roughly 60%, that means about 1.6 million trainees. Data from 1998 to 2001 shows that unemployment for graduated in the Dual system has decreased (See Graph 2.1-1. Unemployment rate in dual system). Cost of this kind of education is supported mainly by enterprises; in 2007, reports from BMBF showed the Net cost borne by the companies of €14.7 billion (87%) and federal states of €2.8 billion (16%) (BMBF, 2007).

Graph 2.1-1. Unemployment rate in dual system per year
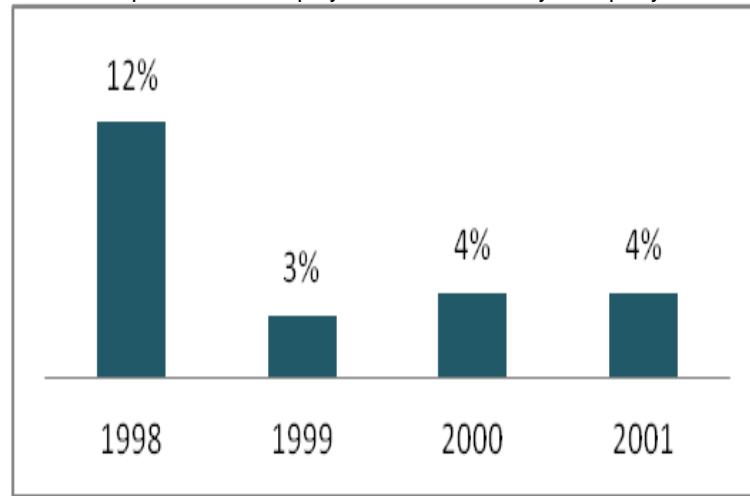
Source: Reedited form (BMBF, 2007).

b. Training occupations for different sectors of the economy

Vocational training in the dual system is based on the occupational concept: occupations requiring formal training should be oriented to the groups of qualifications that are typical for the relevant work processes. Vocational training should prepare people for specific occupations, to be pursued immediately after the

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[15] Hans Decker was the Vice Chair (1991–1993) and President and CEO (1971–1990) of the Siemens Corporation USA, based in New York.

completion of training, but it should also prepare people for further learning. Vocational training must build «bridges to further training». For this reason, two of its important components include promoting willingness to learn and fostering personality development (BMBF, 2003).

There are training occupations for all sectors of the economy and administration, and these are continuously updated, new occupations are created. Every program shows different degrees of specialization, are differentiated in keeping with actual needs and training is centered on vocational competence (BMBF, 2007).

Germany's dual vocational training system offers training for some 350 occupations, and these are frequently updated, or BIBB is creating news according change in the industry, services and commerce. Working together with experts designated by industry associations and trade unions, BIBB has developed a total of 82 new occupations and up-dated another 219 in the years since 1996 (Kremer, 2009).

c. Chance to show in an enterprise the competencies - employability

Advantages of Dual System according the report ¨Dual training at a glance¨ are: Companies that are in Dual system has some advantages to secure the skilled labor needed, reduces cost of settling-in, increases motivation and loyalty to company, job-specific qualification and productive performance of trainees. Besides, argument in favor for student pointed that it allows students to have good prospect on the labor market, recognize certificate, practical orientation and payment of an allowance.

Other benefits are: match between supply and demand, because students must have an space into the companies, comprehensive range of competencies in a lot of professions, maximum exposure to job reality and better employability (BIBB, 2005).

d. Benefits under enterprises point of view

Enterprise benefits are supported in last survey of 2007, which BIBB has conducted about costs and benefits of dual vocational training (Wenzelmann, Schönfeld, Pfeifer, & Dionisius, 2009). The survey has explored topics like costs, trainees' productivity, retaining trainees, and other enterprises motivation for been in dual training system (See Graph 2.1-2. Priorities advantages for companies in Germany). This study shows the three most important facts for being part s follow:

- **Productivity of trainees at enterprises**

Trainees generate not only costs for the firm providing their training. As a rule, they also make a significant contribution to their company's regular production and services. This productive work lowers the company's costs and therefore has to be considered a gain and deducted from the gross costs. One finding was, that using a qualified skilled worker as a yardstick, their level of productivity is some 30% lower, particularly during the first year of training, than it is for trainees in three-year training programs.

Graph 2.1-2. Priorities advantages for companies in Germany
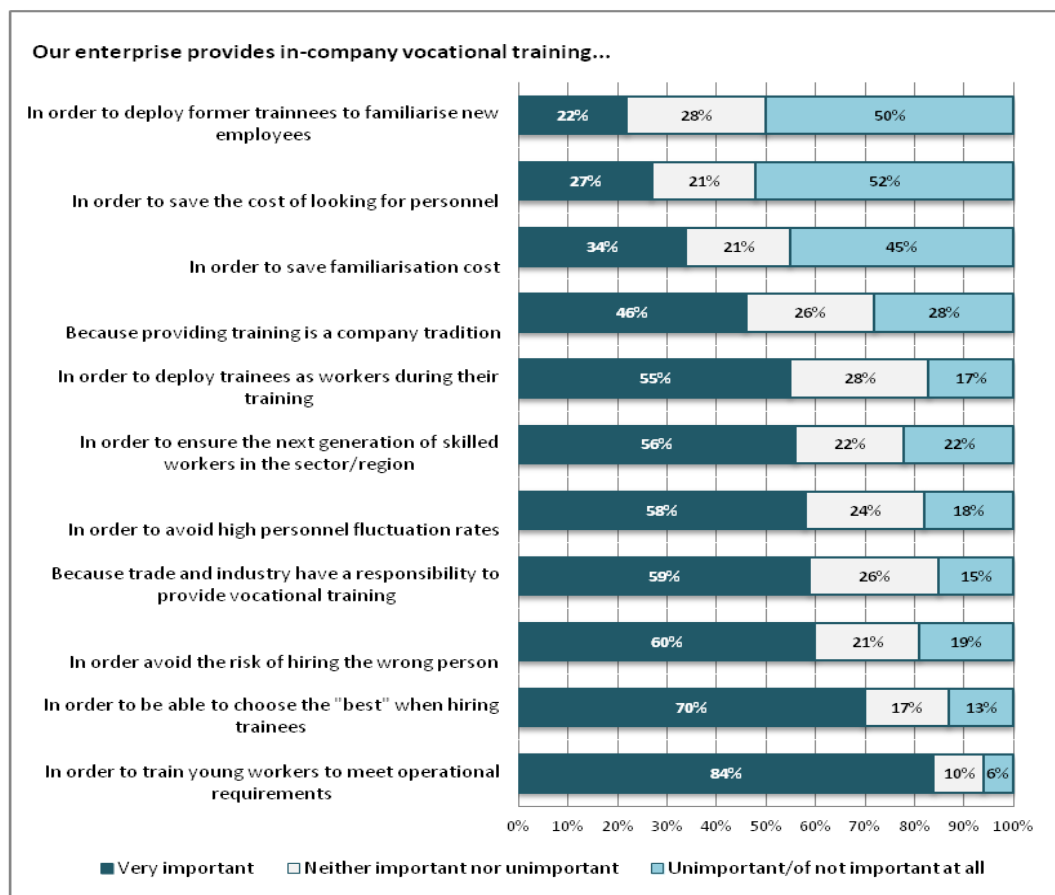
Source: Reedited form (Wenzelmann, Schönfeld, Pfeifer, & Dionisius, 2009)

- **Retaining trainees**

When a company hires one of its own trainees, the risk of hiring the wrong person for the position is smaller because the company has had the opportunity to observe the individual trainee's performance for a longer period. More than half of the firms that

provide in-company vocational training in Germany (57%) retained at least one of their graduate trainees in 2007.

- **Develop young employees**

Even though the opportunities are not only for young people, when employers were asked about the reasons for providing in-company vocational training, 84% of the sample agreed with the statement that an enterprise provides in-company vocational training in order to develop young employees who meet the company's particular requirements, making this the most-cited reason by far.

e. Students point of view about Dual system in Germany

Student's point of view has been taken from the survey of BIBB to about 6,000 trainees in 2008 (Beicht, 2009). This survey revealed the strengths of the dual vocational training system as well as areas that work on quality development; some important findings were about:

- **Quality training in companies**

About the quality training in companies, in general there were good perceptions of the quality, especially with topics related to instructor aptitude and conduct, and material conditions. The opinion is less favorable with the companies' organization (See Graph 2.1-3. The German student opinion about training in companies).

Graph 2.1-3. The German student opinion about training in companies
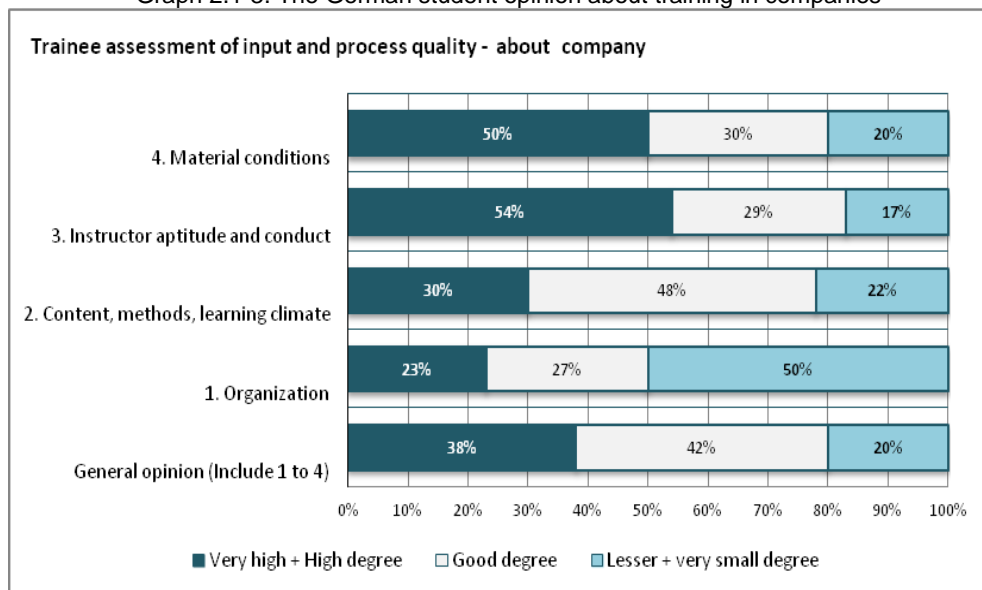
- **Quality at vocational schools**

Students presented the most favorable opinion about the learning climate during the training process. The materials conditions at vocational schools were rated more negatively than they were at training companies (See Graph 2.1-4). Beicht (2009) pointed out that trainees also felt that the professional qualifications of vocational school teachers and their ability to explain learning content in an understandable way did not measure up to the level seen among in-company instructors.

Graph 2.1-4. The German student opinion about training at schools
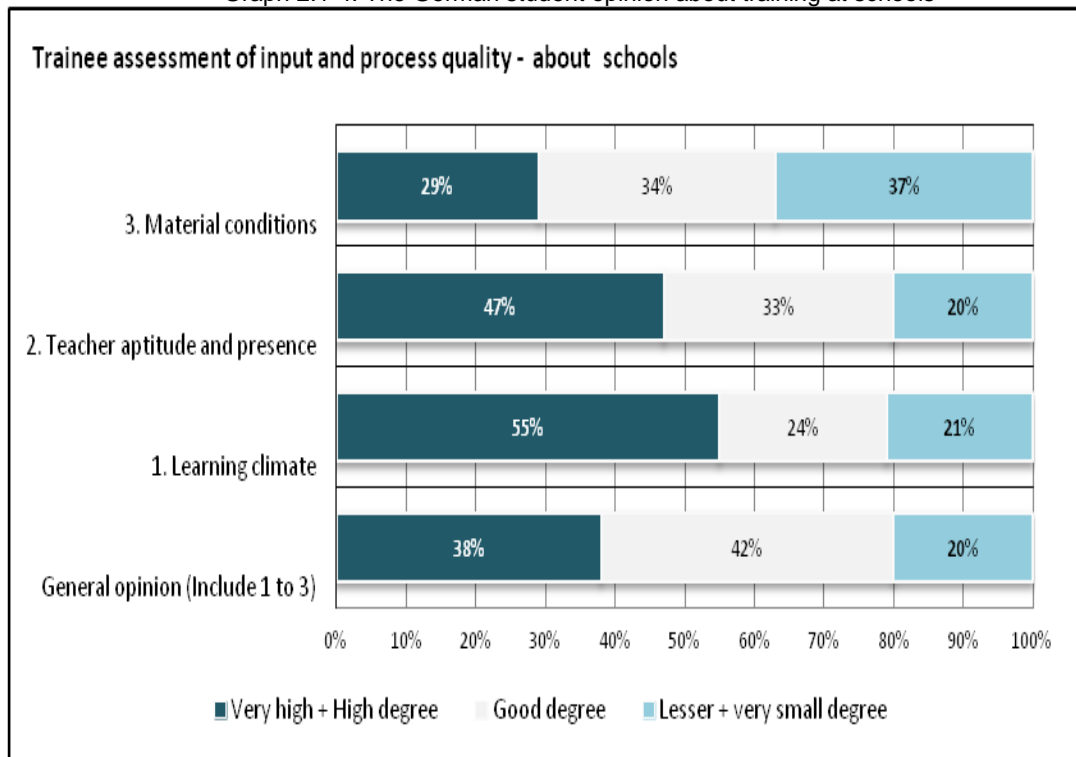
- **Relation Academy - Enterprise**

  This kind of system allows the opportunity to have the appropriated relation between academy and enterprise, since both has to work in a strong collaboration in order to reach their own aims. In this topic, the students gave the least favorable rating to the quality of collaboration between their training company and their vocational school (See Graph 2.1-5. The German student opinion about collaboration); in this way, this is one of the most relevant aspects pointed by students that must be worked.

Graph 2.1-5. The German student opinion about collaboration

Trainee assessment of input and process quality - about schools and enterprises collaboration

Collaboration between learning venues: 11% | 32% | 57%

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

■ Very high + High degree   □ Good degree   ■ Lesser + very small degree
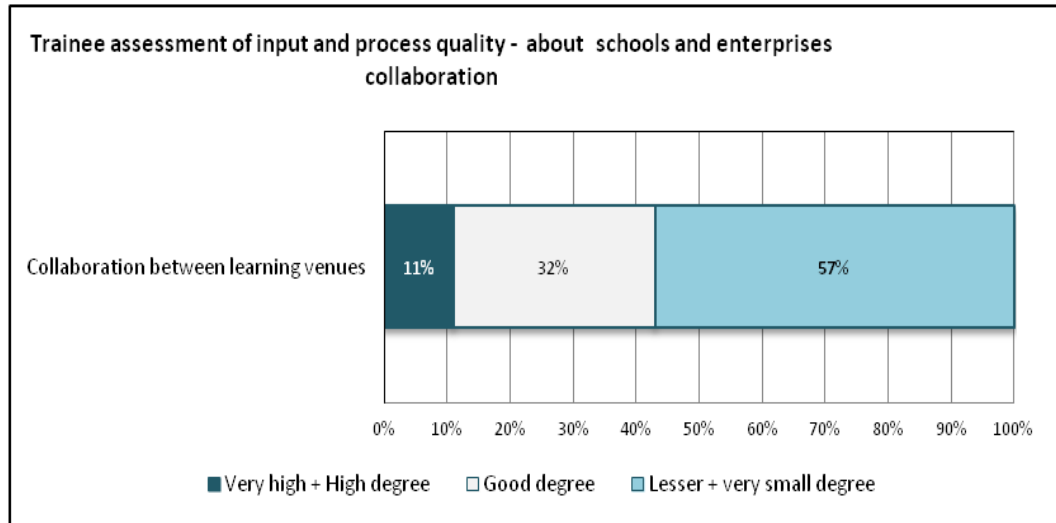
Changes in the industry

Because, the dual system in Germany is frequently accused of failing to have achieved the leap into the knowledge and service society and of remaining too rigidly aligned to the production sector (Walden, 2009); It has been changes from manufacturing to services economy in the latest decades. The dual system has become part of the service and knowledge society to this extent, the main focus of dual training is on the primary service occupations. The future of the dual system within the service sector will in the same way as the development of the system as a whole, depend on the extent to which it succeeds in covering the demand of young people for in-company training.

Better qualified worker/academics and higher education

In Germany there are many technical universities, which have the roll to prepared the academics in technical field that the country needs for the future (Cassidy, 2011); a growth in the number of employees who have completed higher education is also frequently associated with corresponding increases in skilled workers who have been trained in-company. Between 1996 and 2004, this sector experienced an increase in employees both in number of persons with a University of Applied Sciences degree or other higher education degree and the number of persons with intermediate vocational qualifications; the growth figures being 13.1% and 9.9% respectively. Models involving the link and cooperation of dual training in higher education are growing, but according with Walden (2009), this should be further

developed and improved (Walden, 2009). One example of this is the Katla project at TU Dresden.

KAtLA project at TU Dresden

According to the information published in the Website of Technical University of Dresden (TU Dresden), recently in 2011, TU Dresden has started KAtLA project, with a cooperative education in technical teaching. The aims are well qualified teacher in technical field, who has also learned the worker´s qualification. Studies are at the University for every Module and Internships with educational service providers and enterprises. The co-operative education has begun in four industrial-technical vocational fields and leads to a corresponding chamber tested skilled worker qualification. The students acquire the degree of the "higher teacher training in vocational schools" in one of four vocational technical disciplines of Chemical Engineering, Electrical Engineering or metal timber and machine technology. The Project has begun with 50 students enrolled in the teaching profession-oriented Bachelor's degree and vocational schools with cooperative education (TU Dresden, 2011).

2.2   Possibilities and problems using Competences approach

One of the main concerns about using competences approach is the way of understanding what is a competence. How competences can be implemented and measured into a globalization world. In a paper of DeSeCo Project, explored the different theoretical approaches to the concept of competence, and related terms such as meta competence and key competencies.

The paper pointed out, that there are many different theoretical approaches about competences (OECD, 2003b), some of these were described as follows: (a) general cognitive ability; (b) specialized cognitive skills; (c) competence-performance model; (d) modified competence-performance model; (e) motivated action tendencies; (f) objective and subjective self-concepts: (g) action competence: (h) key competencies: (i) meta competencies (Weinert, 2001).

Competence terms

Because of that, the definition of competencies is not convenient in this moment when there are a lot of discussions about these terms, but, for purpose of this

research the terms used by European Commission (2003b), OECD and John Erpenbeck and Lutz von Rosenstiel, will be the guide to understand how to measure and identify the achievement of the competencies.

DeSeCo Project refers to the term competence as the ability to successfully meet complex demands in a particular context. Competent performance or effective action implies the mobilization of knowledge, cognitive and practical skills, as well as social and behavior components such as attitudes, emotions, and values and motivations (OECD, 2003b). The DeSeCo Project (OECD, 2005) report states that a competency is more than just knowledge and skills. Key competencies are defined by the demands of modern life, and conceptualized as contributing to a successful life and a well- functioning society, as expressed by universal values such as respect for human rights, integrated economic, environmental, and social development, and democratic processes (Rychen & Salganik, 2003).

On the other hand, the European Commission (2003b), use the term like a key competencies, that represent a transferable, multifunctional package of knowledge, skills and attitudes that all individuals need for personal fulfillment and development, inclusion and employment. These should have been developed by the end of compulsory school or training, and should act as a foundation for further learning as part of Lifelong Learning.

The other term is the explanation about competencies developed by John Erpenbeck and Lutz von Rosenstiel in their book "Handbuch Kompetenzmessung" (p. XI) where they describe competencies as "…dispositions of self-organized acting, as self-organizational dispositions". These authors accentuate also, that there is a deep connection between competences and performance. And therefore is used in this thesis an understanding of competences on the basic of four features (Wiesner, 2008)[16]"

- Competence is a disposition of, which appears in complex situations; unity of knowledge, ability and will.

- Competence is apparent in doing of a person, which takes place in typical professional problem situations.

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[16] Wiesner, Gisela (2008), Workshop about Competences and Competence Measurement (power point presentation) at ITCA, El Salvador.

- A competence could exist in different grades.

- Competences could be acquired in different ways".

The concept of disposition comes from the work of the French sociologist Pierre Bourdieu, and relates to the way in which individuals have subconscious (or tacit) attitudes to and ways of approaching life (see, Bourdieu and Wacquant, 1992). Our 'dispositions' develop and change as we grow and are affected by a whole range of life experiences. c, p. 39).

DELORS (1998) in the report to UNESCO of the International Commission on Education for: Learning The Twenty-first Century, the treasure within has pointed out that, competences has to be developed in relation with the four pillars: learning to know, learning to do, learning to live together and learning to be. These pillars include: (a) Learning to know, by combining a sufficiently broad general knowledge with the opportunity to work in depth on a small number of subjects. This also means learning to learn, so as to benefit from the opportunities education provides throughout life; (b) learning to do, in order to acquire not only an occupational skill but also, more broadly, the competence to deal with many situations and work in teams. It also means learning to do in the context of young peoples' various social, and work experiences which may be informal, as a result of the local or national context, or formal, involving courses, alternating study and work; (c) learning to live together, by developing an understanding of other people and an appreciation of interdependence , carrying out joint projects and learning to manage conflicts, in a spirit of respect for the values of pluralism, mutual understanding and peace; and (d) learning to be, so as better to develop one's personality and be able to act with ever greater autonomy, judgment and personal responsibility. In that connection, education must not disregard any aspect of a person's potential: memory, reasoning, aesthetic sense, physical capacities and communication skills.

Skills and competence term

Skills and competence term are treated, as the synonymous in some context, but, a competence is not synonymous of skill (OECD, 2003b), as has been cited by Hipkins (2006), unlike skills, competencies focus on all the requirements of a task and this includes what It is need to know, not just what it is can do; competencies include the skills, knowledge, attitudes and values needed to meet the demands of a

task; and competencies are performance-based and manifested in the actions of an individual in a particular context. Grierson, Schnurr, & Young (2002), use the term skills as a generic term subsuming formal and informal forms of vocational and technical education and training. Skills are understood to comprise the capabilities needed to successfully enter the work of work, which means to secure a livelihood.

Differences between qualifications and competencies

To establish the difference between qualification and competencies is necessary because is frequently to confuse both terms. In this case, this differences are those which are described

(See Table 2.2-1. Qualifications and competences)[17]. More description about competences are presented further on.

Table 2.2-1. Qualifications and competences

Qualification	Competence
Learning as (formal) learning in educational institutions.	Learning as (formal, non-formal and informal) learning during lifetime and on different settings.
Referring to profession and function.	Referring to variable and complex situations of society.
According to the demand of human resources.	According to the individual.
Professional abilities/ skills are in the focus.	Holistic view to a person is predominant.
Objective checkable function parameters are described.	Action ability is described, which is checkable in realization only.

Vocational competences in Dual system

The Vocational Training Act (BIBB, 2006), establish that vocational training's primary aim is to help young people acquire comprehensive vocational competence that will enable them as gainfully employed persons not only to perform tasks autonomously, on their own responsibility and in cooperation with others, but also to perform them efficiently, effectively and in innovative ways. The range of qualifications in Dual

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[17] Ibidem.

system (Dybowski, 2005), are in the different phases of planning, monitoring and execution: Personal, social, occupational and methodological competence.

The Law defined the competence approach as model of learning, expressing: "Vocational training shall, through a systematic training program, impart the vocational skills, knowledge and qualifications (vocational competence) necessary to engage in a form of skilled occupational activity in a changing working world. It shall also, enable trainees to acquire the necessary occupational experience" (BBiG, Section 1).

These qualifications seem to be aligned with the European Qualifications Framework, with the reference level where, learning outcomes are referred for three categories as knowledge, skills and competence. It has included theoretical knowledge, practical and technical skills, and social competences where the ability to work with others (European Commission & Education and Culture, 2008). As has been pointed out by Tissot (2003, p. 79), the learning outcomes are a "set of knowledge, skills and/or competences an individual acquired and/or is able to demonstrate after completion of a learning process".

Competences Measurement

Competences are developed in a period of time, that could be in short, medium term and long term and these have to be measured in that different periods. The observation of competencies can be understood both an objective measurement process and as well as a subjective estimated process. The investigation of competences can be done by qualitative or quantitative method. Measurement competences are not an easy work. Competences are to find out on watching activities and attributing competences on this basic. Erpenbeck; von Rosenstiel (2003/XI) say: "Competence is always a form of attribution on the basic of evaluation by a visitor. We attribute the physical and mental self-organized actor dispositions as competences on the basic of certain watched behavior.

And therefore it is a condition for measurement competences, to develop tasks (on the basic of formulated aimed competences for the Mechatronic students) for watching/evaluating different kinds of competences. In this case should be used the following classes of competences (in following of the classes in the model of Erpenbeck; von Rosenstiel, 2003, p XV ff):

The competence types set to deal with the problem-solving processes. When it comes to competence type 1 problem-solving process in which the target is known, so that technical and methodological skills are required. Type 2, however, the competence in target openness is important because in this case, personal, social, communicative, and activity-based skills are required. Accordingly, it comes at the competence type 1 primarily to the self-control and the competence Type 2 on the self-assembly. (Cf. Erpenbeck / von Rosenstiel, 2003, p XIII ff). With the division in competency, classes are distinguished:

- Personal competences

- Activity and implementation-oriented competencies

- Technical and methodological competences

- Social and communicative competences

For competences, development is also important whether the competences are measured as instantaneous consumption (example job interview) or as temporal evolution with an input and an output measure (example skills training).For perennial competence measurements (example competence biographies) are placed on the combination of state and measurement development. (Cf. Erpenbeck / von Rosenstiel 2003, pp. XVIII f)

The type of observation skills on the one hand as objective skill assessment will be sought, where the foreign observation is paramount. On the other hand, you bet on the designated self-assessment of subjective assessment methods. The methods of objective measurement expertise are primarily in the contrasting groups of competence on qualifications, technical and methodological skills in classes and in the case of target-oriented competence type 1 is used. In the measurement of the other skills classes and groups takes you back to the more subjective assessment methods. (Cf. Erpenbeck / von Rosenstiel 2003, pp. XIX f)

The dimensions of the skill assessment values were finally obtained the relevant skills and understanding of the nature of the competence type that the developer at the center of their procedure. This in turn follows the strict definition of competency classes and groups, focusing on the moment or development perspective on subjective or objective methods of qualitative and quantitative research or. (Cf. Erpenbeck / von Rosenstiel 2003, pp. xxii f)

In the present time is open if also will be used activity-oriented competences. For the tasks, which have to be watched, are to develop criteria with the aim to decide in which level the competence is reached. The quantitative methods to investigate competences are focus on measurability and scalability of them. Experiment, test, questionnaire between other are such research methods. This is elemental, objectively oriented and focus on external perspective.

In the other hand, qualitative method is interested in configuration and quality of competence, is focus on the context. Its research methods are observations, interviews and biographical methods. It is holistic, subjectively oriented and focus on internal perspective. A good concept to measure the competences is described by Erpenbeck and von Rosenstiel." and should be used in main points for the investigation, because it can help to identify special groups and classes of competences.

Possibilities of using competences

Using competence approach gives the possibility to improve the quality education; to facilitate the mobility; and to strengthen the aim for lifelong learning between the countries that implemented it. The framework will serve as a guide for the planning and implementation of a coherent, long-term strategy, for assessments and indicators of key competencies among young people and adults, in order to make a contribution to a successful life and a well- functioning society, as expressed by universal values such as respect for human rights, integrated economic, environmental, and social development, and democratic processes.

Competences are used in most VET national systems to describe the expected professional profile of the learners. Professional competences are linked to the tasks that the learner will have to fulfill when holding a position in an enterprise and are directly linked to his job; these are also described as 'occupational competences or professional-technical competences'. Social competences are those linked to labor, the workplace and the ability to work in a team and are closely linked to the notion of self-competences. (Mouillour, 2005).

The framework of Key competencies, the possibility for improves the quality in education and mobilization.

The OECD's Definition and Selection of Competencies (DeSeCo) Project, has provided a framework that guide the longer-term extension of assessments into new competency domains, analyzing which key competencies are necessary under the context of the globalization and modernization of the world. DeSeCo define a competence as the ability to meet individual or social successfully, or to carry out an activity or task. This external demand-oriented, or functional approach has the advantage of placing at the forefront the personal and social demands facing individuals, This demand-oriented definition needs to be complemented by a conceptualization of competencies as internal mental structures – in the sense of abilities, capacities or dispositions embedded in the individual. Each competence is built on a combination of interrelated cognitive and practical skills, knowledge (including tacit knowledge), motivations, value orientation, attitudes, emotions, and other social and behavioral components that together can be mobilized for effective action. Although cognitive skills and the knowledge base are critical elements, it is important not to restrict attention to these components of a competence, but to include other aspects such as motivation and value orientation (OECD. 2003a).

DESECO project underline that a competence is developed through action and interaction in formal and informal educational context. Thus, competence development does not only refer to school-related teaching and learning. Besides, the education system other institutions are also responsible for the transmission and development of the necessary competencies; the family, the workplace, the mass media, religious and cultural organizations and so on.

The DeSeCo Project's conceptual framework for key competencies classifies such competencies in three broad categories, which are the key findings results (Rychen & Salganik, 2003) about interacting in socially heterogeneous groups, acting autonomously, and using tools interactively are indispensable prerequisites for an individually successful life and for sustainable socio-economic and democratic development of society. A short description of these categories has been taken from OECD report (2003a), as follows:

First, Using tools interactively, individuals need to be able to use a wide range of tools for interacting effectively with the environment both physical ones such as information technology and socio-cultural ones such as the use of language. They

need to understand such tools well enough to adapt them for their own purposes; to use tools interactively.

Second, interacting in socially heterogeneous groups are particularly relevant in pluralistic, multicultural societies. Individuals need to learn how to join and function in groups and social orders whose members are from diverse backgrounds and how to deal with differences and contradictions.

Third, acting autonomously, this category includes key competencies that empower individuals to manage their lives in meaningful and responsible ways by exercising control over their living and working conditions. The ability to act within the big picture or the larger context; to form and conduct life plans and personal projects; and the ability to defend and assert one's rights, interests, limits, and needs are critical competencies for participating effectively in different spheres of life – in the workplace, in one's personal and family life, and in civil and political life (See Illustration 2.2-1).

Illustration 2.2-1. The DeSeCo Project. Key competencies categories
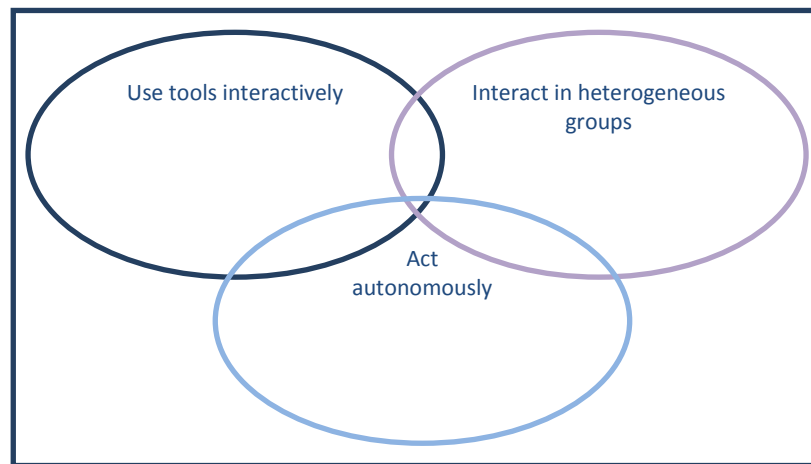
Source: OECD DeSeCo Project (2005)

To act autonomously incorporate two central interrelated ideas: the development of personal identity, and the exercise of relative autonomy in the sense of deciding, choosing and acting in a given context. The concept concerns enabling and empowering individuals to develop and express a sense of self, exercise rights, and take responsibilities in the different spheres of life. It means that individuals manage their lives in meaningful ways by exercising control over their living and working conditions and by playing an active part in making their own lives (OECD. 2003a).

A framework of key competencies consists of a set of specific competencies, bound together in an integrated approach. Key competencies involve a mobilization of cognitive and practical skills, creative abilities and other psychosocial resources such as attitudes, motivation and values. At the center of the framework of key competencies is the ability of individuals to think for themselves as an expression of moral and intellectual maturity, and to take responsibility for their learning and for their actions.

Key competencies are important across multiple areas of life and that contribute to an overall successful life and a well-functioning society. The definition and selection of key competencies is influenced by what society value and by what individuals, groups, and institutions within those societies consider important. Successful participation in the world of work, in the surrounding community and society, and in family and other social fields requires competent individuals (OECD. 2003a).

An underlying part of this framework is reflective thought and action. Thinking reflectively demands relatively complex mental processes and requires the subject of a thought process to become its object. Thus, reflectiveness implies the use of metacognitive skills (thinking about thinking), creative abilities and taking a critical stance. It is not just about how individuals think, but also about how they construct experience more generally, including their thoughts, feelings and social relations. This requires individuals to reach a level of social maturity that allows them to distance themselves from social pressures, take different perspectives, make independent judgments and take responsibility for their actions. People living in different situations will draw to varying degrees on various competencies according, for example to cultural norms, technological access, social and power relations.

Key competencies and the possibilities in lifelong learning

Lifelong learning means all general education, vocational education and training, non-formal education and informal learning undertaken throughout life, resulting in an improvement in knowledge, skills and competences within a personal, civic, social and/or employment-related perspective. It includes the provision of counseling and guidance services (EACEA, 2006).

The importance of flexibility, adaptability, mobility, creativity and lifelong learning in a globalized, changing world is a leading theme in current national and international discourses on education and training. Adults of the 21st century are expected to fulfill

many different roles – as students, learners, workers, citizens, family members, consumers; act and navigate in and across variegated contexts, and meet multiple complex challenges in a responsible manner.

The framework (OECD, 2005) applies equally to the competencies that need to be nurtured at school and those that can be developed throughout the course of life. It therefore also provides a single frame of reference for school-based assessments and assessments of adult competencies. Central to the concept of lifelong learning is the assertion that not all of life-relevant competencies can be provided by initial education. Developmental psychology shows that competence development does not end at adolescence but continues through the adult years. In particular, the ability to think and act reflectively, central to the framework, grows with maturity.

This understanding has important implications for both education and assessment. An evolutionary model of human development provides a theoretical foundation for the purpose of adult education. Furthermore, it offers a compelling rationale for assessing the competencies of individuals throughout life against a common set of criteria, and thus to design a coherent overall assessment strategy that spans young people and adults (OECD, 2003b).

At the same time the three-fold categorization offers a valuable basis for establishing priorities about which new competencies should and could be included in future international assessments, and thus guide the systematic extension of future assessment instruments toward capturing a wider range of key competencies. In that sense, DeSeCo's framework will serve as a guide to the OECD for the planning and implementation of a coherent, long-term strategy for assessments and indicators of key competencies among young people and adults (Rychen & Salganik, 2003).

Problems using competence approach

Competence is recognized in the context of the real world; the development of competences is also based in real-world experiences and takes into account the full spectrum of learning opportunities (informal, non-formal and formal learning) throughout the life span. Competencies are broader than knowledge or skills, and are acquired in an ongoing, lifelong learning process across the whole range of personal, social and political contexts. So, one of the challenges for education is to identify competencies which are the key to successful life in the twenty-first century;

and competencies for learning to learn and for citizenship are widely accepted candidates (Deakin, 2008).

According Deakin (2008), other challenge is the developing indicators and assessment tools to evaluate and measure competence, because this is even more than of a political act because they constitute the technology of control. In other words, beyond merely defining outcomes, the act of creating and using assessment tools formalizes and structures what is valued in that particular community and bestows value, success and status, or failure and exclusion, depending on how the tool is used.

Like has been developed by Flores (2011) in his article about complexity and education, it is not enough to change the method or the curricula, but it is necessary a change of thought and the mental constructs. The competence approach has to be addressed from the complex reality that includes integral aspects as the acting, the suitability, flexibility and performance. The set of competencies and knowledge are a manifestation of complexity, while, it is necessary for interaction in a complex universe.

As has been pointed out by Bonilla (2010) in his article "The common biases in education and training based on competency standards" where he has presented the results of the theoretical research, of an extensive database of terms and concepts related to the competence, of the people in the world of education and work. The competency-based approach must be addressed in a conscious and responsible way, avoiding handling the term competencies as part of a common vocabulary, in which assume shared understandings, regardless any reflection and background knowledge. With the need to raise the level of competencies of the labor force - in the area of organizations, productive sectors, countries and regions-emerging educational and training initiatives that ignore or underestimate the difficulties inherent in training systems for competencies, a situation that causes serious inconsistencies and errors, from conception and design of these initiatives. His research identified eight common biases, as follows:

- Reductionist conception of competency-based training:

The reductionist conception of competency-based training: Due to the diversity and complexity of the factors involved in developing competencies of individuals and

groups, there is a natural tendency to oversimplification of two fundamental concepts in this area: that of competencies and competency-based training. In particular, the conceptual confusion between the education based on standards of competences, and competences development in the broadest sense (beyond standard conceptions), that far from promoting the flexibility and openness to learning throughout life, can lead to the rigidity and decreased of it in the social structure. This is because the models that promote standardized competencies do not see the people competences, if not by the canons (judgments, criteria, precepts, formulas) that adhere to the models themselves. Thus, the emphasis on learning outcomes, rather than on the processes and contexts of it, through the use and application of competency standards (academic, employment or training), may discourage the learning through life. These references indicate, first, what a person should know to do (competence criteria) to be competent and, secondly, in addition, the evidence to prove it (evidence of competition).

- Emphasis on performance and results

Emphasis is on performances and results. Another bias of plans and programs of education and training based on competence standards is the emphasis on performance and results of work, which for purposes of evaluating the inherent knowledge standards, this position may be correct, but, in the training people is necessary a broader vision, in the context of concrete social entities (individuals, groups, organizations, educational systems).

- Focus on one type of competencies

The concentration in one type of competence: The education and training initiatives based on performance standards usually favor of one type of competencies, not more of them. Although it is desirable gradual and consistent development of a wide range of knowledge, skills and values relevant to learning and training of people, their relationship is far from addressed comprehensively and continuously through the education and training systems with this approach. Moreover, plans and policies for skills training programs, both in academia and at work, often favoring one type of competency (basic, key, academic, professional, labor), regardless of the extent and diversity of knowledge, skills and values involved in the promotion of competencies itself.

- Focus on individual skills

This distinction is important because one thing are the competencies of each person, in the field of teams, organizations, productive sectors, or workforces, and another, which the people by themselves, together, can do. It is necessary to work on both individual and collective competencies. Generally, individual competencies lead, but not equivalent, to the group competences.

Therefore, it must be considered that, competencies are dimension its significance, use and application, from the individual to the collective, and the collective to the individual, and that this occurs in the interrelation of two essential aspects: the recognition of problems and needs of a social entity (team, organization, production sector, professional association, community, society) that concern, in one way or another, to all its members; and promoting training profiles that lead to the development of from the competences, both individually and group.

- Discontinuity between education, training and work experience

The problem lies in the segmented notion of the spaces and times when competences are acquired, developed and improved. Thus, although the vast majority of people cannot dissociate their formation from the education-training-experience, without negative impact on the training and competencies involved, rarely the academic sectors, professional and labor, participate in a concerted manner and consistent in the systems of training.

- Misrepresentation conceptual skills and competencies

Often, there is confusion with the word "skills" and competences. The word "skills" in English is used, without distinction, to refer to abilities, skills, competencies, qualifications, aptitudes and / or talents, so its meaning is closely linked to the context of the word so in English, "skills" the same can refer to one of the terms mentioned that more than one, or all.

However, in Spanish there is no a generic equivalent for "skills", and if several that relate to it. Many times, the Spanish translations bypass this situation, or are difficult to resolve, even with the best approximation. As a result, for example, where in English is spoken of abilities, in Spanish is referred as competencies, or vice versa, when it is about competences, the translation is like skills.

- Omission of contexts and values

One of the main properties of training models based on competency standards is the transferability. Transferability to competency standards involves decontextualized from the standardization process. The des contextualization involves subtracting the contexts (political, social, economic, and physical) where the competences are forged and implemented, as well as the values of the social partners directly involved in the training process. Because this the result of des contextualization, the standards of competence usually lack specific contexts regarding of specific cases

- Subject to the market forces

Faced the deep and vast transformations exerted by globalization processes in the context of the information age and the knowledge society, the development of a person is not limited to the academic formation, also includes their work history, institutional and life.

The economic and social effects of globalization have gone beyond the areas of education and employment; this means reconfiguration of the structure and functioning of both spheres, changing its sense, its relationships and its dimensions.

2.3   Quality in Higher Education (HE) in Europe

In the implementation of any educational system is necessary to work in the quality in order to improve the education results, the quality of the process, of the teachers, of the infrastructure, the equipment and the quality of professionals. In that sense, for this research it is necessary to understand the quality in higher education, considering that in El Salvador, Dual system has been implemented in technical higher education; and this is the focus of this investigation. The topics addressed are about the ways of understanding or quality in HE, the dimension of quality, the frameworks of qualifications, the credit system and the teaching and learning process. These topics are as follows:

Understanding Quality in HE

As has been exposed by IIEP-UNESCO (2011), There are some difficulties to define quality precisely, because it is a relative concept that means different things to different people. For instance, while discussing the quality of an HEI, students may focus on the facilities provided and the perceived usefulness of education for future

employment. Teachers, on the other hand, may pay attention to the teaching-learning process. Management may give importance to the institution's achievements. Parents may consider the achievements of their children. Finally, employers may consider the competence of the institution's graduates. Each stakeholder has a different approach to defining quality. It is not possible, therefore, to talk about quality as a single concept. Any definition of quality must be defined in terms of the context in which it is used. In the case of HEIs, we should bear in mind that an institution may be of high quality in relation to one factor or in the perspective of a category of stakeholders, but of low quality in relation to another.

Considering these factors, IIEP-UNESCO (2011) have cited Harvey and Green (1993) and Green (1994) about how they have identified many approaches to the viewing of quality. Green (1994) lists five different approaches to quality in the field of higher education. She considers that it can be viewed: (a) in terms of the exceptional (highest standards); (b) in terms of conformity to standards; (c) as fitness for purpose; (d) as effectiveness in achieving institutional goals; and (e) as meeting customers' stated or implied needs. Short explanation about these approach are in the same document as follows, taking in count that there is no one right definition for quality. All the concepts below (and others) are valuable:

- **Quality as exceptionality**

This is the more traditional concept of quality. It is associated with the notion of providing a product or service that is distinctive and special, and which confers status on the owner or user. In higher education, an institution that demonstrates exceptionally high standards is seen as a quality institution. Quality is achieved if the standards are surpassed (Harvey & Stensaker, 2008).

- **Quality as conformance to standards**

This view has its origins in the quality control approach of the manufacturing industry. Here, the word "standard" is used to indicate pre-determined specifications or expectations. As long as an institution meets the pre-determined standards, it can be considered a quality institution fit for a particular status. Focuses on process and sets specifications that it aims to meet. Quality in this sense is summed up by the interrelated ideas of zero defects and getting things right first time (Harvey & Stensaker, 2008).

- **Quality as fitness for purpose**

This approach is based on the view that quality has no meaning except in relation to the purpose of the product or service. The purposes may be determined by the institution itself, by the government, or by a group of stakeholders.

- **Quality as effectiveness in achieving institutional goals**

This is one version of the fitness for purpose approach mentioned above, in which the purposes are determined by the institution. In this approach, a high quality institution is one that clearly states its mission (purpose) and is efficient in achieving it. This approach may raise issues such as the way in which the institution might set its goals (high, moderate or low), and how appropriate those goals could be. Quality meaning transformation, i.e. quality necessarily involves a change from a current to an ideal end state (Harvey & Stensaker, 2008).

- **Quality as meeting customers' stated or implied needs / Quality as transformation**

This is also a variation of the fitness-for-purpose approach. This is where the purpose is customer needs and satisfaction. The issue here is whether customer satisfaction can be equated with what is good for the customer. This view sees quality as a process of change, which in higher education adds value to students through their learning experience. Education is not a service for a customer but an ongoing process of transformation of the participant (Harvey & Stensaker, 2008).

Quality Assurance in the European Higher Education Area

The primary responsibility for quality assurance lies with each institution. Internal quality assurance involves all procedures undertaken by higher education institutions to ensure that the quality of their programs and qualifications meets their own specifications and those of other bodies legitimately empowered to make specifications. External quality reviews undertaken by quality assurance agencies (QA Agencies) provide feedback to institutions and information to stakeholders. Taken together, internal quality assurance and external quality review aim to implement the Standards and Guidelines for Quality Assurance in the European Higher Education Area (European Commission, 2009).

QA agencies develop their procedures for quality assurance from the notion of quality. To do so, they use a variety of terms, such as statistics, indicators, criteria, standards and benchmarks. Indicators can be either qualitative or quantitative. They can be measures of many aspects of quality of an institution or program.

Some QA agencies distinguish between Input Indicators, Process Indicators and Output Indicators. They thus assume that the education process resembles a production process that transforms inputs with processes into outputs and outcomes. Input indicators relate to the resources and factors employed to produce an institution's outputs (financial resources, physical facilities, and student and staff profiles). Process indicators relate to the ways in which resources and factors are combined and used in order to produce an institution's output (management of teaching, research and services). Output indicators describe the outputs produced by institutions (products of teaching, research and services). To these may be added Throughput Indicators and Outcome Indicators. Outcome indicators are the effects of outputs (e.*g.* employment rates). Performance indicators provide measures of performance aspects (IIEP-UNESCO, 2011).

The higher education institutions and quality assurance agencies working in **the European Higher Education Area** (EHEA), are implementing the standards and guidelines for internal and external quality assurance. The standards and guidelines are based on a number of basic principles as follows (European Commission, 2009):

- Providers of higher education have the primary responsibility for the quality of their provision and its assurance;

- the interests of society in the quality and standards of higher education need to be safeguarded;

- the quality of academic programs need to be developed and improved for students and other beneficiaries of higher education across the EHEA;

- there need to be efficient and effective organizational structures within which those academic programs can be provided and supported;

- transparency and the use of external expertise in quality assurance processes are important;

- there should be encouragement of a culture of quality within higher education institutions;

- processes should be developed through which higher education institutions can demonstrate their accountability, including accountability for the investment of public and private money;

- quality assurance for accountability purposes is fully compatible with quality assurance for enhancement purposes;

- institutions should be able to demonstrate their quality at home and internationally;

- Processes used should not stifle diversity and innovation.

The objectives of the standards and guidelines are:

- to encourage the development of higher education institutions which foster vibrant intellectual and educational achievement;

- to provide a source of assistance and guidance to higher education institutions and other relevant agencies in developing their own culture of quality assurance;

- to inform and raise the expectations of higher education institutions, students, employers and other stakeholders about the processes and outcomes of higher education;

- to contribute to a common frame of reference for the provision of higher education and the assurance of quality within the EHEA.

Quality Cultural in HE

A new approach about quality in HE has been noted by Ehlers (2009), cited by Harvey & Stensaker (2008), referred to the Quality Cultural in HE, as a new era in quality management for higher education, that is characterized by an emerging understanding that quality development, in essence, demands for the development of an organizational culture based on shared values, necessary competencies and new professionalism.

Ehlers (2007) has referred to a quality development as a constant negotiation process in which all stakeholders should participate in a common effort to define and implement quality in a continuous, improved way. He used the concept of quality "literacy" related relate to knowledge about quality but goes beyond this, towards the concept of competencies. Quality Literacy in this sense is seen as a basic prerequisite to acting professionally in quality development contexts. On the first

step, information about quality and quality development or related fields is interconnected and linked to knowledge. On the second step, they are applied and result in abilities. This is the step where individuals have practical experiences with applying or using quality strategies, tools, or instruments. These abilities are transformed in activities through motivation and will. Competence, however, demands an additional evaluation about whether the performed activity is suitable in a given context. For this, an individual usually needs standards against which he or she can assess whether something is suitable in a specific context.

For quality development, these can be societal norms, legal rules, criteria that are agreed on in the specific organizational context, or set of standards for individual behavior, and the professionalism, which relates to the responsibility towards clients and society. Quality literacy, therefore, is more than knowledge or abilities. Quality literacy can be seen as a set of four central competencies that contribute to carrying out successful quality development in education, as follows:

Dimension one: Quality knowledge

This dimension addresses the "pure" knowledge about the possibilities of today's quality development and up-to-date quality strategies in e-learning and education. The term "quality strategies" refers to all guidelines, structures, rules, tools, checklists, or other measures that have the goal of enhancing the quality.

Dimension two: Quality experience

This dimension describes the ability to use quality strategies with a certain intention. It is based on the experiences that actors have with quality development and with applying quality measures and strategies to educational scenarios. It can be differentiated from the instrumental knowledge dimension because it refers not only to the pure application of quality strategies or tools but also covers the processes of feedback analysis and initiating improvement.

Dimension three: Quality innovation

This dimension relates to the ability that goes beyond the simple use of existing instruments and strategies. It refers to the modification, creation, and development of quality strategies and/or instruments for one's own purpose. An innovative and creative aspect is important for this dimension. Within this dimension, "adaptation" and "creativity" mean further development and reorganization of existing quality

strategies within a given context. "Innovation" means thinking up and developing new strategies for quality development.

Dimension four: Quality analysis

Quality Analysis relates to the ability to critically analysis the processes of quality development in light of one's own experiences and to reflect upon one's own situation and context. It enables actors to evaluate different objectives of quality development and negotiate between different perspectives of stakeholders. Doing critically analysis means, to differentiate between and reflect upon existing knowledge and experiences in light of quality development challenges. For learners, this means being aware of their responsibility for quality in education as a co-producer of learning success. For providers, this means enabling flexible negotiation processes in educational offerings and respecting individual objectives and preferences as well as societal contexts and organizational structures in their definition of quality objectives for education.

About this, Harvey & Stensaker (2008) has noted that applying 'quality culture' in a higher education setting should be done with caution. In the process of identifying potential challenges, the following nine caveats should still be kept in mind. First, there is often an implicit cultural imperialism associated with quality culture. This ranges from the presumption that quality culture is necessary through to an assumption that best practice is transferable from one context to another: usually, in higher education, from north-west European or North American practices. Second, one should be careful in seeing quality culture as pre-defined, rather viewing it as a way of life. Third, if the latter, quality culture is not mechanistic or codified, a system produced by specialists for adoption by others but an iterative, indeed dialectical, process of evolution that does not just focus on internal processes but relates them to a wider appreciation of social and political forces and locates them historically. Quality culture is not a panacea, something that can be disengaged from a wider lived reality. Fourth, the dialectical evolution is compatible with a democratic notion of quality culture as a lived, learned experience that itself generates knowledge, rather than simply processes it. Fifth, a quality culture is not just about checking outputs at each stage but is also a frame of mind, as much of the management literature implies. However, sixth, this is not just a matter of raising consciousness but a fundamental question of ideology. A quality culture is an ideological construct,

a fact that cannot be glossed by a set of prescriptions or recipes for implementation. Seventh, a quality culture is not likely to be constructed irrespective of the context in which it is located, which again limits the possibilities for knowledge transfer. Eight, a quality culture is nothing if it isn't owned by the people who live it, which raises the issue, ninth, of resistance to and engagement with quality cultures, that will be endemic in higher education if academics see quality culture as a ¨managerialist fad¨, as a means to reduce their academic freedom or as in any other way disempowering.

Qualifications Frameworks in the European Higher Education Area (QF-EHEA)

QF-EHEA has adopted by Ministers of the Bologna Process in May 2005. It covers higher education qualifications and is valid for all 46 members of the European Higher Education Area, whether these are members of the European Union or not. It provides the framework within which the national qualifications frameworks in these countries will be developed as far as their higher education qualifications are concerned, and it represents the "face" of European higher education qualifications towards the rest of the world (Bologna Process, 2010).

According Bologna Process (2010), the QF-EHEA is an instrument in developing the European Higher Education Area (EHEA). A qualifications framework encompasses all the qualifications in a higher education system; it shows what a learner knows, understands and is able to do on the basis of a given qualification, that is, it shows the expected learning outcomes for a given qualification. It also shows how the various qualifications in the education or higher education system interact, that is how learners can move between qualifications. Qualifications frameworks therefore focus on outcomes more than on procedures, and several learning paths, including those of lifelong learning, may lead to a given qualification. Qualifications frameworks play an important role in developing degree systems as well as in developing study programs at higher education institutions. They also facilitate the recognition of qualifications, and they are important for those who make use of qualifications, in particular learners and employers.

Qualifications frameworks are intended to be an instrument that helps learners as well as those who develop higher education programs and the competent national authorities. Qualifications frameworks are therefore important in promoting mobility within education systems as well as internationally. The EHEA Framework is an

instrument that will help European higher education strike a balance between what they have in common and what is particular to each system. In this sense, the EHEA Framework is an instrument that promotes transparency by providing a common framework for the diversity that is one of the strengths of European higher education and hence a framework to help understand diversity.

European Credit Transfer and Accumulation System (ECTS)

ECTS is the credit system for higher education used in the European Higher Education Area, involving all countries engaged in the Bologna Process[18]. ECTS is one of the cornerstones of the Bologna process. Most Bologna countries have adopted ECTS by law for their higher education systems. Among other objectives, the Bologna Process aims at the establishment of a system of credits as a proper means of promoting the most widespread student mobility. ECTS credits are a key element of the Bologna Framework for Qualifications, compatible with the European Qualifications Framework for lifelong learning (EQF) that has presented in the next topic (European Commission, 2009).

If work placements or internships are required to complete the program (or a component), they are part of students' learning outcomes and workload and necessitate an allocation of credit. In such case, the number of credits allocated to the work placement should be included within the overall number of credits for the particular academic year.

As with any other educational component, the teaching staff should define the learning outcomes to be achieved through work placements when designing the curriculum. These learning outcomes should be accompanied by the appropriate assessment methods and criteria. It is important that the assessment methods be compatible with the nature of work placements (e.g. observation and evaluation by a tutor or production of a report by the student). As with any other educational component, credits for work placements have only awarded when the learning outcomes have been achieved and assessed (European Commission, 2011a).

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[18] The Bologna Process aims to create a European Higher Education Area by 2010, in which students can choose from a wide and transparent range of high quality courses and benefit from smooth recognition procedures. The Bologna Declaration was in June 1999. The three objectives of the Bologna process have be: introduction of the three cycle system (bachelor/master/doctorate), quality assurance and recognition of qualifications and periods of study.

ECTS makes teaching and learning in higher education more transparent across Europe and facilitates the recognition of all studies. The system allows for the transfer of learning experiences between different institutions, greater student mobility and more routes that are flexible to gain degrees. It also aids curriculum design and quality assurance. Institutions, which apply ECTS, publish their course catalogues on the web, including detailed descriptions of study programs, units of learning, university regulations and student services. Course descriptions contain 'learning outcomes' (i.e. what students are expected to know, understand and be able to do) and workload (i.e. the time students typically need to achieve these outcomes). Each learning outcome has expressed in terms of credits (European Commission, 2011a).

The process of teaching and learning

Quality has to be in the process of learning; recognizing as has been noted by Colley at all (2003) that, teaching and learning are primarily social and cultural rather than individual and technical activities. They should therefore be studied in authentic settings; this in turn means addressing their complexity, through a cultural perspective on the interrelationships between individual dispositions and agency, and institutional and structural contexts.

The quality in the learning process for further Education (FE) as a synonymous of lifelong learning that include HE, has been addressed by Huddleston & Unwin (2007), where they pointed out the challenge of teaching and learning in the context, where there a wide range of different circumstances, and any one class or group of students will be heterogeneous in nature. In this sense, the work is real mixed-ability teaching. It is not only the ability of the students which differs, however, but also their motivation, prior experience, expectations and the way in which they are funded. The teacher has to be sensitive to this diversity in the planning, preparation and delivery of programs.

The dispositions and motivations of such a diverse range of students will be widely different, and the ways in which students learn will vary in pace and style. This requires a flexible teaching approach from teachers in order to provide for the needs of individual learners. In moving to a more learner center approach, teachers will have to 'manage' the process of learning as a whole and not simply be concerned with transmitting knowledge and skills. The teachers have to know the students'

learning styles[19], in order to choose an appropriate teaching strategy. On the other hand, teachers have to know the teaching style. In this way, they will adopt appropriate pedagogical methods.

In this context, the curricula is an important factor, which design is influences by different stakeholders or situations, like students, employers, parents, schools, universities, teachers, local education authorities, national qualification framework, among others.

Beside, Huddleston & Unwin (2007) have presented how the assignment can affect the quality of the learning process, highlighting the use of assignments as vehicles for encouraging participative, student centered learning has been a central feature of college life for many years. Assignments can enable students to see their program of study as a coherent whole in which all the parts have related to each other and through which they are encouraged to apply their knowledge, understanding and skills. Besides, the assignments have to ensure that the assessment process is transparent, rigorous and consistent over time, and to emphasize the need for external assessment.

As has been pointed out in the Memorandum on Lifelong Learning of European Commission (2000) related with innovation in teaching and learning, where the objective is to develop effective teaching and learning methods and contexts for the continuum of lifelong and life wide learning; the quality of learning experience and outcome is the touchstone, including in the eyes of learners themselves. But little effective change and innovation can take place without the active involvement of professionals in the field, who are closest to the citizen as learner and are most familiar with the diversity of learning needs and processes. Information and Communications Technology (ICT) based learning technologies offer great potential for innovation in teaching and learning methods, although practicing educationalists insist that, to be fully effective, these must be embedded in 'real time' contexts and relationships between teachers and learners. New methods must also take account of the changing roles of tutors and teachers who have separated from

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[19] Honey and Mumford's Learning Styles Questionnaire classified the learning styles in four categories: (1) Activist (rolls up sleeves and rushes into action), (2) Reflector (contemplates the problem and considers how to approach), (3) Theorist (consults 'experts', researches the issues before acting), and (4) Pragmatist (selects the most appropriate form of action given the circumstances).

their students by distance and time. Learning systems must adapt to the changing ways in which people live and learn their lives today.

Improving the quality of teaching, learning methods and contexts, will mean significant investment, that means to adapt, upgrade and sustain the skills of those working in formal and non-formal learning environments, whether as paid professionals, as volunteers or as those for whom teaching activities are a secondary or ancillary function (for example, experienced skilled tradespeople in the workplace or community development workers). Education and training practitioners work in a wide variety of establishments and with very different kinds of learners.

Teaching as a professional role faces decisive change in the coming decades: teachers and trainers become guides, mentors and mediators. Their role – and it is a crucially important one – is to help and support learners who, as far as possible, take charge of their own learning. The capacity and the confidence to develop and practice open and participatory teaching and learning methods should therefore become an essential professional skill for educators and trainers, in both formal and non-formal settings. Active learning presupposes the motivation to learn, the capacity to exercise critical judgment and the skill of knowing how to learn. The irreplaceable heart of the teaching role lies in nurturing precisely these human capacities to create and use knowledge.

In the structural context, it is important for the quality that teachers do the evaluation and reflection about the teaching and learning process. The structured reflection can provide a framework within which they can examine their strengths and weaknesses and identify strategies for improvement. In addition, teachers need to ensure that their specific professional area of expertise has kept up to date. Finally, they have to be connected with community groups, representing the college on education business and lifelong learning partnership committees and so on, for their professional development.

2.4   Lifelong Learning (LLL) and employability

Understanding Lifelong learning

People had different definitions of lifelong learning, how it was presented in the Shanghai International Forum on Lifelong Learning by Ouane (2011), Lifelong

learning is as a comprehensive, integrated and holistic system (formal, non-formal and informal). The roots of the lifelong learning concept comes from the ancient times; the term grew from notions such as "fundamental education", "continuing education", "basic education", "permanent education" and "recurrent education".

At the beginning of the seventies, the Faure report learning to be (1972) advocated lifelong education as the master concept for educational policies in both developed and developing countries. By the mid-1990s, a clear preference emerged for the term "lifelong learning" rather than "lifelong education". There were differing views on the major distinction between these two concepts, but it was generally felt that "lifelong education" reflected a view of education as a prescriptive and normative process, while "lifelong learning" put the emphasis on learner demand and individual choice.

Furthermore, the Report Learning: The Treasure Within (UNESCO, 1996) reiterated the essential role that learning throughout life plays for both society and individuals, equipping them to cope with the evolving requirements of the labor market and the changing timeframes and rhythms of individual existence. Together with the Faure Report, the Delors Report acknowledged lifelong learning as one of the guiding and organizing principles of educational action and reform, as well as a notion that fosters meaningful human life by enabling people to anticipate and tackle whatever challenges they may face in the course of their lives.

The Delors Report, Learning: The Treasure Within recognized that lifelong learning is an essential means of equipping human beings to live meaningful lives and meet whatever challenges they may face along the way. Taking into account the decisive influence of the world markets and the ways in which the world of work had changed, the report reflected a rights-based, humanistic, transformative approach to learning. It underlined the need to foster skills and attitudes that would enable people to overcome their religious and cultural differences and coexist peacefully, while at the same time linking learning to shared human, moral and ethical values. During the 35th General Conference of UNESCO in October 2009, many delegations underlined that Education for all should become Education for All at All Levels throughout Life, implying universal lifelong learning.

Lifelong learning has been considered as a facilitator for social inclusion and for sustainable development. Essentially, inclusion entails ensuring that every individual

receives appropriate, good-quality education within and beyond the school system. As lifelong learning values all kinds of learning experiences, learning outcomes should be recognized and validated independently of how, where and by whom they have acquired. An in-built mechanism of recognition, validation and accreditation for all kinds of formal, non-formal and informal education must be part of lifelong learning.

Organizations like UNESCO and OECD which work in Lifelong learning with the coincidences of this has to be for all, that it should continue throughout life and that there is a need for strong co-operation between the formal, non-formal and informal education sectors.

The European Qualifications Framework (EQF) for Lifelong Learning

As an instrument for assuring social inclusion and sustainable development, the EQF[20] is a common European reference framework, which links countries' qualifications systems together, acting as a translation device to make qualifications more readable and understandable across different countries and systems in Europe. It has two principal aims: to promote citizens' mobility between countries and to facilitate their lifelong learning. The EQF makes easier for learners to describe their broad level of competence to recruiters in other countries, and help employers interpret the qualifications of applicants and so support labor market mobility in Europe. The EQF describes levels of qualifications in terms of learning outcomes as has been explain before in order to in-built mechanism of recognition, validation and accreditation for all kinds of formal, non-formal and informal education. The awarding of qualifications will remain a matter for national qualifications bodies.

It has eight reference levels (See Table 2.4-1) that span the full scale of qualifications, from basic (Level 1, for example school leaving certificates) to advanced (Level 8, for example Doctorates) levels. Like instrument for the promotion of lifelong learning, EQF encompasses all levels of qualifications acquired in general, vocational as well as academic education and training. Additionally, the framework addresses qualifications acquired in initial, continuing education, and training, like a comprehensive, integrated and holistic system (formal, non-formal and informal) as have been referred before.

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[20] The information about EQF has been taken from the web site of the European Commission, Education & Training. http://ec.europa.eu/education/lifelong-learning-policy/doc42_en.htm

Table 2.4-1. EQF for Lifelong Learning

The learning outcomes	Knowledge	Skills	Competence
Level 1	Basic general knowledge	Basic skills required to carry out simple tasks	Work or study under direct supervision in a structured context
Level 2	Basic factual knowledge of a field of work or study	Basic cognitive and practical skills required to use relevant information in order to carry out tasks and to solve routine problems using simple rules and tools	Work or study under supervision with some autonomy
Level 3	Knowledge of facts, principles, processes and general concepts, in a field of work or study	A range of cognitive and practical skills required to accomplish tasks and solve problems by selecting and applying basic methods, tools, materials and information	• Take responsibility for completion of asks in work or study • Adapt own behavior to circumstances in solving problems
Level 4	Factual and theoretical knowledge in broad contexts within a field of work or study	A range of cognitive and practical skills required to generate solutions to specific problems in a field of work or study	• Exercise self-management within the guidelines of work or study contexts that are usually predictable, but are subject to change • Supervise the routine work of others, taking some responsibility for the evaluation and improvement of work or study activities
Level 5	Comprehensive, specialized, factual and theoretical knowledge within a field of work or study and an awareness of the boundaries of that knowledge	A comprehensive range of cognitive and practical skills required to develop creative solutions to abstract problems	• Exercise management and supervision in contexts of work or study activities where there is unpredictable change • Review and develop performance of self and others
Level 6	Advanced knowledge of a field of work or study, involving a critical	Advanced skills, demonstrating mastery and innovation, required to	• Manage complex technical or professional activities

The learning outcomes	Knowledge	Skills	Competence
	understanding of theories and principles	solve complex and unpredictable problems in a specialized field of work or study	or projects, taking responsibility for decision making in unpredictable work or study contexts • Take responsibility for managing professional development of individuals and groups
Level 7	• Highly specialized knowledge, some of which is at the forefront of knowledge in a field of work or study, as the basis for original thinking and/or research • Critical awareness of knowledge issues in a field and at the interface between different fields	Specialized problem-solving skills required in research and/or innovation in order to develop new knowledge and procedures and to integrate knowledge from different fields	• Manage and transform work or study contexts that are complex, unpredictable and require new strategic approaches • Take responsibility for contributing to professional knowledge and practice and/or for reviewing the strategic performance of teams
Level 8	Knowledge at the most advanced frontier of a field of work or study and at the interface between fields	The most advanced and specialized skills and techniques, including synthesis and evaluation, required to solve critical problems in research and/or innovation and to extend and redefine existing knowledge or professional practice	Demonstrate substantial authority, innovation, autonomy, scholarly and professional integrity and sustained commitment to the development of new ideas or processes at the forefront of work or study contexts including research

Source: European Commission (2011d). The European Qualifications Framework for LLL –EQF

The reference levels have described in terms of learning outcomes. In EQF a learning outcome is defined as a statement of what a learner knows, understands and is able to do on completion of a learning process. The EQF therefore emphasizes the results of learning rather than focusing on inputs such as length of study. Learning outcomes are specified in three categories as knowledge (theoretical and factual), skills (cognitive, involving the use of logical, intuitive and creative

thinking; and practical involving manual dexterity and the use of methods, materials, tools and instruments) and competence (Social competences where the ability to work with others will be crucial in terms of responsibility and autonomy).

The relevance of the EQF as the overarching lifelong learning reference framework is confirmed by the action taken by all Member States from European Community for its implementation. By the end of 2010, there was the goal to implement the legal framework for the national qualifications framework in 11 countries (there were four in 2008) and significant progress is being made in developing a national qualifications framework in all other countries (European Commission, 2010c).

Compatibility between QF-EHEA and EQF

The EQF has formally adopted by the European Union in April 2008. It covers all levels of education and is valid for EU countries, EU accession countries and countries of the European Economic Area. One difficulty is that the EQF, which has developed after the EHEA Framework, does not sue the same wording for the higher education qualifications in the framework. The EQF may therefore create the impression that there are two distinct overarching frameworks for higher education in Europe. It is therefore important to underline that while the wording of the EQF is not identical to that of the EHEA Framework, there are no major differences between the two, and that it is possible to develop national qualifications framework that are compatible with the EQF as well as with the EHEA Framework (Bologna Process, 2010).

The EQF is compatible with the qualifications framework for Higher Education developed under the Bologna Process. Specifically, the EQF descriptors at levels 5-8 refer to the higher education descriptors agreed under the Bologna Process. However, the formulation of the EQF level descriptors differs from the Bologna level descriptors developed specifically for higher education needs because, as a lifelong learning framework the EQF also encompasses vocational education and training (VET) and work contexts, including at the highest levels (European Commission & Education and Culture, 2008). The Framework for Qualifications of the European Higher Education Area provides descriptors for cycles. Each cycle descriptor offers a generic statement of typical expectations of achievements and abilities associated with qualifications that represent the end of that cycle, as follows:

- The descriptor for the higher education short cycle (within or linked to the first cycle), corresponds to the learning outcomes for EQF level 5.

- The descriptor for the first cycle in the Framework for Qualifications of the EHEA corresponds to the learning outcomes for EQF level 6.

- The descriptor for the second cycle in the Framework for Qualifications of the EHEA corresponds to the learning outcomes for EQF level 7.

- The descriptor for the third cycle in the Framework for Qualifications of the EHEA corresponds to the learning outcomes for EQF level 8.

ECTS and lifelong learning

As has been explained before, ECTS is widely used in formal higher education and It can be applied to other lifelong learning activities. If students have achieved learning outcomes in other learning contexts or timeframes (formal, non-formal or informal), the associated credits may be awarded after successful assessment, validation or recognition of these learning outcomes. The use of ECTS for lifelong learning enhances the transparency of learning programs and achievements not only when it comes to the main higher education degrees (bachelor, master or doctorate), but for all types of learning activities provided or learning outcomes recognized by higher education institutions.

The fact that all learning achievements have documented and awarded a corresponding number of ECTS credits makes it possible for learners to have this learning recognized with a view of achieving a qualification, when these learning outcomes satisfy the requirements of the qualification (European Commission, 2011a).

Credit based systems were considered the core of lifelong learning provision in HE, they ensure that flexible pathways can be offered and in principle enable part time study of modular courses. This also supports an approach of offering alternative approaches to existing curricula. In some instances, however the lifelong learning offer has made up of specific tailored modules – again enhanced by a credit-based approach. Other advantage of credit-based systems is the portability of credits, enabling students to fit courses around their circumstances, even though in some cases credits will expire after a set period if a final qualification has not achieved.

ECVET and lifelong learning

The European Credit System for Vocational Education and Training (ECVET) is a European instrument to support lifelong learning, the mobility of European learners and the flexibility of learning pathways to achieve qualifications (European Commission, 2011c).

According to European Commission (2011b), the development of ECVET began in 2002 after the Copenhagen Process[21] emphasized the need for a credit transfer system for VET. The ECVET aims to facilitate the validation, recognition and accumulation of work-related skills and knowledge acquired during a stay in another country or in different situations. It should ensure that these experiences contribute to vocational qualifications. Besides, ECVET aims for better compatibility between the different vocational education and training (VET) systems in place across Europe and their qualifications. By 2012, it should create a technical framework to describe qualifications in terms of units of learning outcomes, and it includes assessment, transfer, accumulation and recognition procedures. In 2014 the European Parliament and the Council will review and evaluate the first stage of ECVET implementation and, if required, they will readjust the text of the Recommendation (European Commission, 2010a) ECVET is a European system of accumulation (capitalization) and transfer of credits designed for vocational education and training in Europe. It enables the attesting and recording of the learning achievement/learning outcomes of an individual engaged in a learning pathway leading to a qualification, a vocational diploma or certificate. It enables the documentation, validation and recognition of achieved learning outcomes acquired abroad, in both formal VET or in non-formal contexts. It has centered on the individual, based on the validation and the accumulation of his/her learning outcomes, defined in terms of the knowledge, skills and competences necessary for achieving a qualification. ECVET is a system

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[21] National authorities and social partners from 33 European countries are taking part in the Copenhagen Process to help develop vocational education and training systems. Since 2002, the countries involved have worked together to develop innovative policies and actions. The overall aim is to improve the quality of vocational training and to encourage more individuals to make wider use of vocational learning opportunities, whether at school, in higher education, in the workplace, or through private courses. National education ministers have met every two years to review the process. The latest revision took place in December 2010. The European Ministers for Vocational Training, the European Social Partners and the European Commission met in Bruges, Belgium, to set the priorities of the Copenhagen Process for 2011-2020.

designed to operate at the European level, interfacing with national systems and arrangements for credit accumulation and transfer (European Commission, 2005).

ECVET supports flexibility of programs and pathways to achieve qualifications, enhancing the opportunities for lifelong learning. It makes it easier to recognize the learning achievements that young people or adults have gained in other contexts, be it countries, institutions or systems (for example initial or continuous training) but also formal, non-formal, or informal ways of learning. The improved possibilities for lifelong learning created by ECVET facilitate cooperation between VET providers and companies. This means that ECVET can strengthen the link between education and training and the labor market (European Commission, 2010a).

ECVET and ECTS

The flexibility is one of the most important aims of ECVET, where, an individual's learning outcomes are assessed and validated in order to transfer credits from one qualification system to another, or from one learning "pathway" to another. According to this approach, learners can accumulate the required learning outcomes for a given qualification over time, in different countries or in different situations. The system also allows the possibility to develop common references for VET qualifications and is fully compatible with the ECTS (European Commission, 2005).

The testing and implementation of ECVET has important complementarities with the European Qualifications Framework (EQF) and ECVET share the same approach to learning outcomes. EQF levels also provide a reference for ECVET and European Credit Transfer and Accumulation System (ECTS) for higher education and ECVET will be complementary (European Commission, 2010a).

The CEALF and the LLL

For adult learning, there is the Common European Adult Learning Framework (CEALF), which has the aim to create a framework system that can be developed accordingly; different elements of which can be put to the fore in each country and one that allows the comparability, monitoring development and regular evaluation of adult learning systems within lifelong learning. In the CEALF has been defined the performance indicators and benchmark for adult learning, taking in consideration the European quality indicators of LLL and the Lifelong Learning European Reference Framework (EAEA, 2006).

European Quality Assurance Reference Framework in VET

According to European Parliament and Council (2009) recommendations, the transition to a knowledge-based economy requires modernization and continuous improvement of vocational education and training (VET) systems in response to rapid change in the economy and society, so that they can help increase employability and social inclusion and improve access to lifelong learning for all, including disadvantaged people. This recommendation establishes a European Quality Assurance Reference Framework as a reference instrument to promote and monitor continuous improvement of VET systems. The aim are to contribute to quality improvement in VET and to increased transparency of, and consistency in, VET policy developments between Member States, thereby promoting mutual trust, mobility of workers and learners, and lifelong learning.

The framework should comprise a quality assurance and improvement cycle of planning, implementation, evaluation/assessment and review/revision of VET, supported by common quality criteria, indicative descriptors and indicators. The monitoring processes, including a combination of internal and external evaluation mechanisms, have to have defined by Member States as appropriate in order to identify the strength of systems, processes and procedures and areas for improvement. The framework should include the use of measuring tools to provide evidence of effectiveness.

The Framework should therefore support the implementation of the EQF, in particular the quality of the certification of learning outcomes. It should also support the implementation of other European instruments, such as the European Credit System for VET, and the Common European Principles for the identification and validation of non-formal and informal learning. This recommendation should contribute to modernizing education and training systems, improving the effectiveness of training by seeking to ensure that people do not leave without qualifications, improving the interrelationship of education, training and employment, building bridges between formal, non-formal and informal learning and expanding the awarding of qualifications on the basis of experience acquired.

Critical discussions about Lifelong learning

Even though, a lot of actions and institutions are working for Lifelong Learning, there are critical discussion about different aspect of it. Some of them has been pointed out by the Peer Learning Activity (PLA) on "the role of higher education system in supporting lifelong learning" (European Commission, 2010b), like research, funding, the balance of the demand inside of the institutions, the monitoring and stakeholder roles.

There was overall a consensus that it is difficult to interest the research universities in lifelong learning provision. Partly this is because it has often seen as a "vocational" issue, with a focus on work-related skills, and partly because overall, they do not report against it as a target, and therefore the incentive is low to devote already stretched resources to this area.

About the funding for LLL has consistently cited as a problem. The funding mechanisms for lifelong learning are varied and although there are good systems, some are under threat from competition for resources. There is also the additional barrier of high costs for some lifelong learning and the extra support that has needed for individuals who have taken non-traditional routes into higher education. In some countries, new (mainly private sector) institutions are being set up to provide this type of education; for some of them this does raise complications in funding and resources.

On the other hand, LLL is an issue of interest to many HE institutions, it often remains problematic for institutions to balance the demand for places for school leavers and the need to meet the targets associated with attracting more students from non-traditional backgrounds. This is especially the case since many of the students following the lifelong learning pathways, whether these be full time, part time or distance learning (or any combination of these) need different support and thus extra resources are required that might or might not be matched by funding.

Three issues have raised with regard to monitoring lifelong learning. Firstly, the statistics covering LLL can be misleading; this is a reflection of the quite different interpretations that, exist across Europe even though there are agreed definitions. That being said, the fact of monitoring and reporting on LLL adds visibility to the issue and promotes lifelong learning within institutions – it also helps to overcome the problem of knowledge dissemination between faculties and departments within

individual institutions. Finally, of course monitoring is important in understanding what is working when new systems/pathways/curricula have introduced.

Besides, lifelong learning involves a wide range of stakeholders, from the various staff in institutions, through employers and trade unions to the students themselves. Issues arising in discussion included:

- The role of professors

It is about the importance of engagement of professors in the development and delivery of lifelong learning.

- The key role of industry associations and social partners

This covered a range of educational issues from support and promotion, through curriculum development and quality/certification. It also included issues of funding. An area in which they have sometimes considered less effective was in encouraging people to pursue studies at a higher level, rather than extending their knowledge at the current level.

- The role of students

The systems have still mainly based on traditional full time student patterns. Inevitably, students who are only part time or involved in distance learning will be less engaged with the institution and new ways of involving them will be required.

In other way, in the Memorandum on Lifelong Learning of European Commission (2000) pointed out some further discussion about LLL. Some critical questions about this reflection have presented below:

- About new basic skills for all

Some critical point are about school and college curricula everywhere are already overloaded with ceaseless demands to incorporate new content and new skills. What can be done to relieve this pressure? What principles should inform curriculum organization and content in the Knowledge Age? Can an individual right for all citizens to acquire and update skills through lifelong learning be envisaged? How might a shared European framework for defining the new basic skills required for active participation in the knowledge society and the new economy? How can ensure that young people complete compulsory education and to improve adult access to learning, especially for older workers, those in part-time or temporary employment,

and the unemployed. What kinds of measures would be appropriate and effective to achieve these aims as well as the aim of skills updating, more generally? What could be effective ways to monitor and meet new emerging skills needs – and prevent skills mismatches and recruitment difficulties – through lifelong learning provision?

- Investment in human resources

Some critical questions are about: How can investment in learning be made more tangible and transparent for the individual and for the employer or enterprise, in particular by strengthening financial incentives and removing disincentives? What are promising ways to encourage and enable individuals to co-fund and take control of their own learning?   How could the Structural Funds, and in particular the European Social Fund, be effectively used to target investment in the infrastructure of lifelong learning, most particularly for establishing local learning centers and installing up-to-date ICT equipment? In what kinds of ways do progressive employers provide time and flexibility for taking part in lifelong learning, including arrangements that assist parents and careers to fit learning with their family as well as work responsibilities?

- Innovation in teaching and learning

How can the development of ICT-based pedagogies be effectively combined with the

search for improvement and innovation in human-based pedagogies? How can technical specialists and teachers/trainers work together more effectively to produce quality learning materials and resources? Given the growing scale of commercially produced learning materials and resources, how can their quality and appropriate use be best monitored, including through co-operation at European level? What would be the best way to monitor and analyze the outcomes of transnational projects with a view to producing a report on effective lifelong learning methods for specified contexts, purposes and types of learner? What are the prospects for developing meaningful qualitative benchmarks drawing on comparative case-studies in this area?

- Valuing learning

Innovative forms of assessment and recognition are a priority area for action. In what ways might systematic information on their use and acceptability be developed and exchanged between countries? How can appropriate systems be developed to

recognize competencies gained in non-formal and informal contexts, such as youth and community associations? What measures should be undertaken to improve the recognition of knowledge, qualifications and skills to facilitate mobility and lifelong learning? How can communication and dialogue between the Social Partners, enterprises and professional associations be improved in order to raise mutual confidence in the validity and utility of more diverse forms of recognition?

- Rethinking guidance and counseling

What improvements are needed to provide interconnected European databases on learning opportunities throughout life? What are the implications of emerging 'borderless education' – that is, learning provided in one country and accessed from another – for guidance and counseling services? What can be done to modernize and improve initial and in-service training and professional development for guidance and counseling practitioners? Where are the most urgent needs for enriched training?

- Bringing learning closer to home

The Lisbon European Council conclusions propose turning schools and training centers into multi-purpose local learning centers, all linked to the Internet and accessible to people of all ages. What kinds of projects and provision already exist that could offer promising ways forward and examples of good practice? What kinds of pilot projects should the Community education, training and youth programs support to this end? How can mutually beneficial learning partnerships between education and training providers, youth clubs and associations, enterprises and R&D centers be profitably developed at local and regional levels? What kinds of incentives will encourage local and regional initiatives – such as learning cities and regions – to co-operate and exchange good practice at multiple levels, including the transnational level?

Chapter 3: Dual system in Latin America and a special example in El Salvador: Education and employability

3. Dual system in Latin America and a special example in El Salvador: Education and Employability

In this chapter has developed a short introduction the HE and the employability in Latin America, the Dual system in some countries of the region and the experience of El Salvador in VET and HE, going in depth of dual system in the technical career of Mechatronic.

3.1 HE in Latin America and the employability

HE in Latin America is not homogenous among the different countries. López Segrera (2009) has been classifying the HE in Latin America according the students enrolment[22], as (a) mega systems: with more than four millions, (b)big systems: with more than 2 million and less than four million:, (c) medium systems: between 1.2 million and 500,000 students , (d) small systems: between 500,000 and 150,000 students, (e) Very small - less than 150,000. The classification by country and number of students is in Table 3.1-1

Table 3.1-1. HE in Latin America; classification by number of students

Type	Country	Students enrolment
Mega systems	Brazil	4,275,027
Big systems	Mexico	2,384,858
	Argentina	2,127, 113
Medium systems	Colombia	1,223, 594
	Venezuela	1,049,780
	Peru	909,315

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[22] Data from Statistical Yearbook, for Latin America and the Caribbean, 2007. Available at: http://www.cepal.org

Type	Country	Students enrolment
	Chile	663,694
Small systems	Cuba	471,858
	Bolivia	346,056
	Ecuador	312,769
	Dominican Republic	293,565
	Guatemala	292,458
Very small	Paraguay	149,120
	Panama	126,242
	Honduras	122,874
	El Salvador	122,431
	Costa Rica	110,117
	Nicaragua	103,577
	Uruguay	103,431
	Jamaica	45,770
	Trinidad Tobago	16,920
	Saint Lucia	2,197

Own elaboration. Source: López Segrera (2009) and Tobar, Alfredo (2011)

At the same time, López Segrera (2009) classify by the Gross Enrolment Ratios (GER) of matriculation[23], those countries with: (a) a rate of 50% or more, (b) countries between 30% and 50%, (c) the countries among 20 and 30%, (d) the countries below 20% (See **Table 3.1-2**).

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[23] Ibidem.

Table 3.1-2. HE in Latin America; classification by gross enrolment ratio

Type	Country	Gross enrolment ratio
Rate of 50% or more	Cuba	61%
	Argentina	54%
Between 30% and 50%,	Chile	48%
	Bolivia	41%
	Panama	44%
	Uruguay	41%
	Venezuela	41%
	Dominican Republic	33%
	Peru	33%
Among 20% and 30%	Colombia	29%
	Costa Rica	25%
	Brazil	24%
	Mexico	24%
	Paraguay	24%
Below 20%.	El Salvador	19%
	Jamaica	19%
	Nicaragua	18%
	Honduras	16%
	Trinidad Tobago	14%;
	Guatemala	10%
	Saint Lucia	12%.

Own elaboration. Source: López Segrera (2009)

In both classifications, El Salvador is located in the last categories, like a small system and below 20% of gross enrolment ratio.

Throughout the region, just 11% of secondary students chose technical professional training. Professional teaching programs have suffered the consequences of funding cuts, insufficient planning, and a weak link to the labor market, which affect quality and diminish their appeal to youth. Many secondary students abandon school not only because of economic problems or difficult life situations but also due to educational options that are irrelevant to their lives and future. OREALC/UNESCO Santiago analyzed curriculum and education policy instruments of countries of the region from the perspective of the four pillars of education identified in the Delors Report: learning to know, learning to do, learning to live together and learning to be. The study discovered that "learning to be" and "learning to do" have less developed regionally. It also found that despite the consensus regarding students' role as protagonists in the construction of their learning, the training they receive in schools does not prepare them to develop fundamental skills such as autonomy, emotion management and leadership (UNESCO, 2010e).

The achievements of the Bologna Process (BP) and the consolidation of the European Higher Education Area (EHEA) have led to debate on the desirability and feasibility of copying and extending the process elsewhere. Latin America has been claimed that, such a process would be unfeasible based on two notions: (a) That a regional harmonization process would result in the standardization, and homogenization of Latin America's higher education systems (HES), reducing levels of national diversity, distinctiveness and singularity; and (b) that intra-regional differences (example dissimilarities between the HES within a given region) and inter-regional asymmetries (i.e. differences between Latin American and European HES in terms of development, academic performance, models and educational practices) constitute insurmountable obstacles to any initiative geared to regional academic integration (Gacel-Ávila, 2011).

That notion systems from the fact that the BP is not solely geared to convergence, but also encompasses a process of academic reform involving the adoption of a three-cycle architecture, the introduction of an academic model revolving around learning outcomes achieved through education geared to the development of general and specific skills, based on a modular curriculum structure, and the

implementation of an accumulated system for transferable credits (Witte, Huisman, & Puerser, 2009).

Education in Latin America has four major problem areas. (a) The level of educational attainment has increased more slowly than in other regions in recent decades because of deficiencies in the scope of secondary education, with children leaving the school system early, especially before completion of their secondary education. (b) The disparity in educational attainment is high because, although younger generations receive more education than older ones, within each generation there are major income, social class and location differences in educational achievement. (c) The returns to education are low for the first years of school and non-university post-secondary education, but high for university education. They are also substantially lower in rural than in urban areas. (d) Educational quality is much lower for students from low-income families; most of them attend public schools and do not have access to better quality higher education.

The human capital component of the productivity and global competitiveness equation has to be seen from a number of perspectives. One of the main constraints in Latin America has been its insufficient supply of educated, trained youth entering the workforce. First, upper secondary graduation rates need to be raised further. Second, the quality of public education needs to be dramatically improved in order for countries and individuals to compete on an equitable basis. Third, post-secondary education has to be more specifically related to the needs of the job market and national productivity.

The main challenge for the Latin American and Caribbean countries, according Carlson (2002) is to keep children in school up to their upper secondary graduation. Raising retention rates in the upper secondary level will have the greatest impact in the short term. Low transition rates from primary to lower secondary and lower secondary to upper secondary are the biggest problems currently confronting public education. The transition from school to work and the labor force participation of young people 15 to 29 years of age, both while they continue their education and after completion of their initial education, are also important issues in Latin American countries. Rising skill requirements of labor markets, an increase in unemployment in recent years and higher economic expectations of individuals and societies have

given rise to growing regional concern with the need to put more emphasis on technical and vocational programs in upper secondary and higher education.

Increasingly, upper secondary education has seen to be as much a route to obtaining skilled and well-paid employment as getting a place in a university. Rising skill demands are making an upper secondary qualification the minimum credential for successful labor market entry. One of the best examples of training for the labor market is the German dual apprenticeship system. Developing dual-system apprenticeship programs at the upper secondary level that are suitably adapted to national circumstances could be a concrete way of expanding technical education in Latin American countries and improving the supply of the necessary skilled labor in the region (Carlson, 2002).

3.2   The Dual system in Latin America

Under the conditions above, dual system has been implemented in different countries of Latin America in VET and HE, as an option to improve the education, making better connection with enterprises in order to prepare people better competences, with the pertinence of the curricula, that give to the students better employability conditions. In every country, it has different way to be developed, with its own consideration according to the economic, social and cultural conditions.

A brief of some experiences in countries like Chile, Colombia, Ecuador, México and Costa Rica are presented below.

Chile: Vocational, technician and higher educational dual system

In Chile in 1991, the Dual system has implemented in technical and vocational training, through an agreement established between the governments of Chile and the Federal Republic of Germany. Since 2001, the program has developed in all regions of the country, under the responsibility of the Ministry of Education.

It develops in middle school (Third and fourth year), where students are a week in the company and another week at school during two years; other way is the students class attend for three days and two days at the company.

Results in the year 2004 (Ascui, 2004) were 7580 students, 180 high schools in vocational technical secondary education, 7322 participating companies from

different economic sectors and specialties (4691 small (64.0%), medium 1644 (22.5%) and 987 major (13.5%). From 1994 to 2003 are accounted for 16310 graduates, where 80% earned a degree and 85% have jobs. In 2008, there were 25000 students (12% of total enrolment), 222 educational institutions and companies participating 9629 (Guzmán, 2008).

This modality of learning is financed by the state, who bears the costs of each student assigned to the program, besides the high school receives state grant; remuneration for apprentices are not considered. The companies provide work experience in accordance with what they learn in high school, through processes of education adapted to the reality of each company and under the direction of a worker qualified for the role of teacher-guide (Sevilla and Balmaceda, 2001, cited by Araya Muñoz (2008, p. 50)).

In 2009 was an agreement between Educational Ministry, Economic Ministry, Labor Ministry, Ministry of the Interior, Confederation of Industry and Commerce in Chile (CPC) and Non Profit Trade Union Federation (SOFOFA) in order to develop the Dual training program, homologous to a higher technician title; the initial goal was to train 1000 youth (Zavando, 2009). At university, there are efforts in order to apply dual system elements, such as Santiago de Chile University through a Cooperative Education Program and Professional Development (USACH, 2011).

Dual education in México

Mexico introduced dual training from the need to improve the formation process in order to attend the human capital demand of qualified personnel. Some companies that work with the dual training system are the representatives of companies such as Volkswagen and Mercedes-Benz, which implements the method according to the manual of the parent company in Germany, while others do, sought to adapt to local conditions. Dual training in Mexico has related to industry of automotive, chemical, electrical and electronic high-tech. Most companies who engage are from Germany (Araya Muñoz, 2008).

CONALEP is a formation center where the dual system has expanded. The Dual System began between the years 1993 and 1998, with the company FAMSA (now Mercedes Benz). Through this initial experience has achieved at 720 students. However, because the system had implemented in a single company, in 1998 was discontinued due to lack of apprenticeship places. In 2009, the project was taken up

again, by the signed cooperation agreement for the implementation of the Dual system, between CONALEP and the Federal Institute of Vocational Education and Training of the Federal Republic of Germany that was renewed in 2011. The careers in the program are Computer Science, Electromechanical, Machines and Tools, Industrial Electronics and Mechatronic. For the future are planning: Autotronics, Diesel Engines, Tourism and Hospitality Food and Beverage (Pliego Platas, 2011).

Dual system in Colombia

The Colombian dual education dates back to 1975, from the German government support, provided through a project with universities and chambers of commerce with the purpose to educate people with knowledge about the country's economic reality. In Colombia, dual education system has been adapted involving the public and private companies and is aimed at technical and university education through a project-based work previously concluded with the company and the academy. The system is expanding, currently, business universities, the University Corporation Alexander Von Humboldt Business from Armenia, and the universities Autónoma de Occidente (UAO), the Technological of Bolivar (UTB) and the Autonomous University of Bucaramanga (Unab), are developing programs in this mode of learning (Araya Muñoz, 2008).

Berufsakademie Network: Colombia, Ecuador and México.

Through technical cooperation agreement between Germany and Colombia, the Chamber of Industry and Trade Colombian-German, with the German Agency for Development Cooperation (GTZ) has included the model of university-enterprise.

In this model, the Dual system has been applied in some universities, associated with local Chambers of Commerce and Chambers of German Industry and Commerce of Colombia and Ecuador. Operates on the "Contract Organizational Business Berufsakademie University System", where members agree to apply the German dual training scheme, Berufsakademie. For 2009, nine universities belong to the system in Colombia, Ecuador and Mexico; the Berufsakademie network has 1,500 students, 600 graduates, 1,000 corporations (BA, 2011).

Dual system in Costa Rica

In Costa Rica, dual education is conceived as a systematic process that has been applied recently; the first experience is the Instituto Nacional de Aprendizaje (INA) in

the year 1993, where takes place the first project under this mode with programs like mechanics and graphic Design. Another experience, was with Monseñor Sanabria Vocational School, in the year 1995, which developed the project technical dual career Mechanics Automotive; this activity was coordinated by INA and the Asociación de Propietarios de Talleres de Mantenimiento Industrial (APTAMAI). Besides, there was a friendship and cooperation agreement among the Ministry of Education of Costa Rica (MEP), and the Ministry of Education of the Federal State of Lower Saxony and the German Foundation for International Development (DSE). Another educational institution that has ventured into the dual education is the National University since the year 2000 (Araya Muñoz, 2008).

3.3 Dual system in El Salvador

Formal educational structure of El Salvador

The Educational System of El Salvador has divided into two categories: formal and informal education how it is defined in the General Education Act (MINED, 2005), which establishes:

- Formal Education has taught in educational institutions authorized in a regular sequence of years or school year, subject to guidelines, progressive curriculum leading to degrees and diplomas. Formal education is for the preschool, kindergarten, primary, secondary and higher education (See Illustration 3.3-1 and Annex 1).

- Non-Formal Education is offered with the aim of completing, updating, supplying expertise and training, in academic or work without being subject to the system of levels and degrees of formal education. Is systematic and responds to short-term needs of individuals and society.

It also defines the Informal Education, which is acquired as freely and spontaneously, from persons, institutions, mass media, traditions, customs and other non-structured.

Higher education is governed by the Law on Higher Education (MINED, 2004), has as a prerequisite Secondary education studies or equivalent; offers studies giving the right to the award of diplomas and degrees in areas of Technical Education and Higher Education.

Technical education has as its purpose the training of professionals and technical specialists in the application of knowledge and skills in different areas of science and humanistic. The grade of technician is given to the student who has adopted a curriculum that covers all the essentials for practical knowledge and skills in a scientific or humanistic, art or specific technique.

Illustration 3.3-1. Educational structure of El Salvador
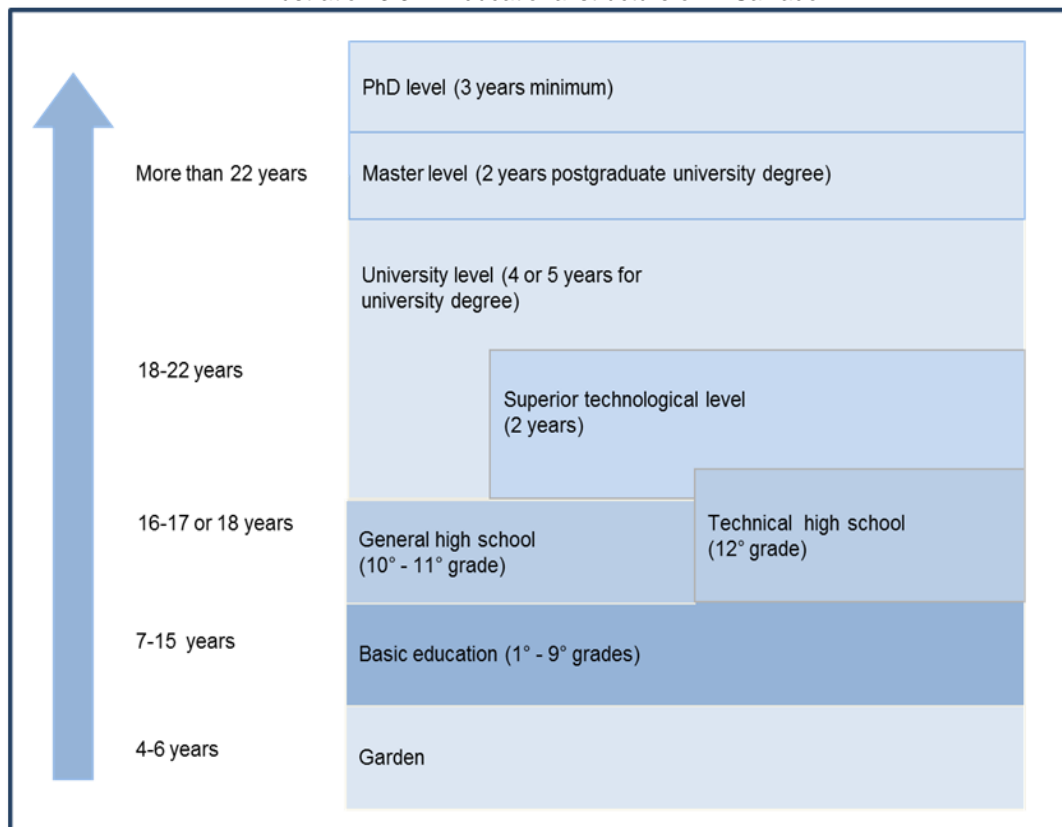
Own elaboration. Source: The General Education Act of El Salvador (amended in 2005)

Fundamental laws in the education system

The education system in El Salvador is mainly regulated by: (a) Constitution of the Republic of El Salvador, (b) the General Education Act of El Salvador (amended in 2005), (c) the Act of Career of Teacher (amended in 2011), and (d) the Higher Education Act (2004). For more detail of these laws see Annex 1.

Technical education in El Salvador

Higher education is delivered in 24 universities (1 public), 9 specialized institutes (4 public) and 6 technological institutes (3 public) 18. In 2009, there were 143,849

students in higher education and 16,168 students graduated. 92 per cent of the students were enrolled in universities and the rest in specialized institutes (6 per cent) and technological institutes (2 per cent) (See Table 3.3-1). The University of San Salvador (public) has 31 per cent of the university students (UNCTAD & CEPAL, 2011). Postgraduate and undergraduate careers are not allowed in technological institutes (MINED, 2004).

Table 3.3-1. Students in higher education by level, 2009

Level of study	Number of students
Postgraduate	2,347
University	119,028
Technical	22,474
Total	**143,849**

Source: (UNCTAD & CEPAL, 2011)

The students enrolled in higher education[24] (143,849) in the year 2009 (MINED, 2010), representing 25% of the population age between 19 to 23 years old[25]; where 16% (22.473) of these belong to technical careers[26]. From all students enrolled in technical careers, ITCA serves 25% (See Graph 3.3-1). ITCA is a public institution that receives subsidy from the Ministry of Education[27], making the costs per career lower under student's side.

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[24] The number of students in higher education is made up from a pedagogical formation course, technicians, technologists, teachers, bachelor degree, engineering, architecture, masters and PhD.

[25] The projected population by DIGESTYC for 2009, based on 2007 population census in El Salvador, in the age range between 19 to 23 years is of 579.518 inhabitants. This population group is usually associated with the technical and academic training. This figure varies by 12.45% when compared with the actual ages of the students, as reported by each institution of higher education (72,133 in age from 19 to 23 years).

[26] The number of students in technical careers represents all those who are register in study programs of two, three and four year, whose degrees include: technician, teacher and technologist.

[27] From the population enrolled in 2009 to the tertiary system, 34% (48.554) are in public educative system; public institutions received subsidy MINED for a total of US$ 64.4 million, where ITCA was given $ 4.5 million , the ITCA's total budget was US $9.5 million (MINED, 2010).

Graph 3.3-1. Enrolment of technical career in 2009

Academy, 5655, 25%

Other institutions; 16818; 75%

Source: Own elaboration, data from Mined (2010)
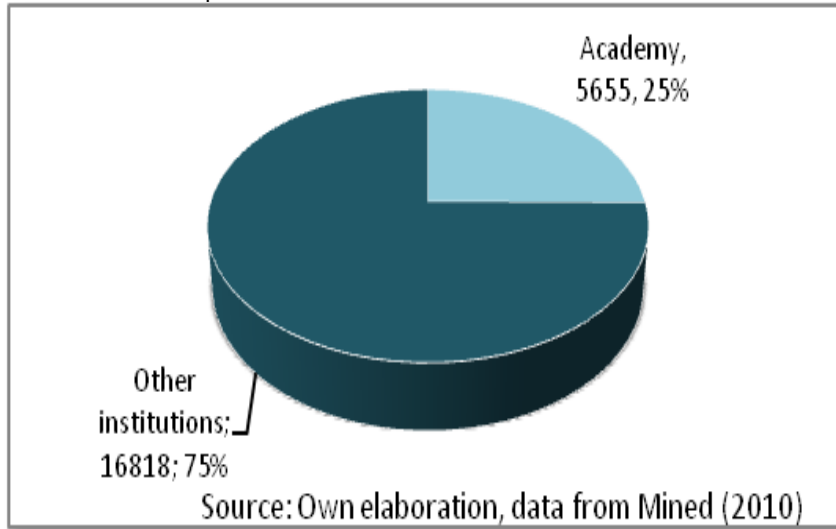
Relation between academy-enterprise

In the study of World Bank (2011) about the qualitative assessment of the education in Applied Science, Engineering and Technology (ASET), the following deficiencies were found relating to training and the workplace:

- **Few links with employers and the labor market**

The participation of employers in the development of ASET programs and the constant updating of the contents from the technological advances and the industry is essential to ensure the professional relevance of graduates and match their skills with labor market needs.

- **Absence of a framework of modular and cooperative programs**

The learning framework modern incorporates learning in the workplace, and the study at the university, to reinforce the theoretical concepts through practical experience world situations real. This also encourages employers to support the training of future graduates of ASET.

- **Assessment of learning is not based on competences acquired**

Currently the standard assessment measures are about what students have learned and what can be done in different dimensions. Beyond the assessment of

knowledge, it is also assessing interpersonal skills, professional ethics, creativity, leadership, communication, teamwork, autonomy, among others.

Based on the foregoing, World Bank has identified the main challenges and policy priorities, in the short and medium term to improve the employment situation of the Salvadoran population. Among other things, World Bank has recommended to implement a comprehensive reform of education system ASET, assessing their relevance for the labor market, modernizing curricula, teaching methods and learning assessment according to international standards and diversify the range of interdisciplinary studies.

On the other hand, the study from OREALC/UNESCO Santiago analyzed curriculum and education policy instruments of countries of Latin America from the perspective of the four pillars of education identified in the Delors Report: learning to know, learning to do, learning to live together and learning to be. The study discovered that "learning to be" and "learning to do" are less developed regionally. It also found that despite the consensus regarding students' role as protagonists in the construction of their learning, the training they receive in schools does not prepare them to develop fundamental skills such as autonomy, emotion management and leadership (UNESCO, 2010b).

Technical and vocational education programs have related with expanding opportunities in the new global economy that can strengthen the transition from school to employment, offer second chances and help combat marginalization. Youth unemployment rates in the region are higher than the global average, with rates among young women, at 19% in 2007, almost two-thirds higher than, those among young men (11.5%) (UNESCO, 2010c).

Professional[28] education (non-formal education[29])

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[28] In El Salvador Professional education is headed by INSAFORP; it is part of non-formal education, that develops skill for labor life, but it is no recognized as higher education.

[29] The tripartite categorization of learning systems made by Combs with Prosser and Ahmed (1973), and cited by Smith (1996) are:

- *Formal education*: the hierarchically structured, chronologically graded 'education system', running from primary school through the university and including, in addition to general academic studies, a variety of specialized programs and institutions for full-time technical and professional training.

- Non-formal education: any organized educational activity outside the established formal system - whether operating separately or as an important feature of some broader activity - that is intended to serve identifiable learning clienteles and learning objectives.

In year 1993, is approved the Professional Training Act by Legislative Decree 554, where the Professional Training Salvadoran Institute (INSAFORP) was created as a public institution with financial and administrative autonomy and legal personality, under whose responsibility is the management and coordination of vocational system for training and qualification of human resources (INSAFORP, 1993).

Also, the law defines vocational training as any action or program, public or private, designed for training in skills and techniques, to provide or increase the knowledge, skills and practices necessary for occupational skills to perform productive work in function of socio-economic development of the country and the dignity of the individual. Its framework does not include formal technical education programs that has authorized by the Ministry of Education.

To fulfill the objectives outlined in the Act since 1996, with support from the German Technical Cooperation Agency GTZ, began the Initial Training Program Enterprises Center. It works with elements of the Dual System, which aim to develop actions systematic and comprehensive training to link technical training with practice and responsive to the demands of the productive sector, in accordance with the needs of the population, to help raise productivity and competitiveness of enterprises (ILO, 2009):

In this modality, the training process is developed with the collaboration of the enterprise (80% of the program), where students done the practices, and with training center in order to developed the theoretical part (20%).

- Informal education: the truly lifelong process whereby every individual acquires attitudes, values, skills and knowledge from daily experience and the educative influences and resources in his or her environment - from family and neighbors, from work and play, from the market place, the library and the mass media.

Other definition used in the Memorandum on Lifelong Learning of European Commission (2003) are:

- Formal learning takes place in education and training institutions, leading to recognized diplomas and qualifications.

- Non-formal learning takes place alongside the mainstream systems of education and training and does not typically lead to formalized certificates. Non-formal learning may be provided in the workplace and through the activities of civil society organizations and groups (such as in youth organizations, trades unions and political parties). It can also be provided through organizations or services that have been set up to complement formal systems (such as arts, music and sports classes or private tutoring to prepare for examinations).

- Informal learning is a natural accompaniment to everyday life. Unlike formal and non-formal learning, informal learning is not necessarily intentional learning, and so may well not be recognized even by individuals themselves as contributing to their knowledge and skills.

This program targets young people between 18 and 25 years, its primary objective is to prepare new workers to perform skilled occupations; the exercise requires manual skill and labor experience. It is acquired at relatively long periods and supplemented with labor practices in business. The courses have last between 6 months and 2 years.

According INSAFORP reports, since the program began to February 2009 was registered about 4 thousand graduates in various non-formal technical careers, as well as 13 training centers and more than 2000 companies involved in the training of young people (INSAFORP, 2009).

Dual system in technical education (formal education) in El Salvador

In the year 1969, was established in El Salvador, Central American Technological Institute (ITCA), in order to develop training in technical careers (ITCA, 1998); years later in 2009 became the Specialized School of Engineering, allowing it to also provide engineering degrees. With an enrolment of 6040 for the year 2009 (ITCA, 2010), is one of the largest specialized schools in the country.

Its educational method is based in the "learn by doing" strategy, which implies that the study plans demand a high percentage of practical knowledge; because of this, students spend most of their time in the laboratories and shops, observing, experimenting, matching theory against application, reassuring their knowledge and strengthening their competencies (ITCA, 2010).

Dual system in El Salvador in higher education started in the year 2006, at ITCA with the cooperation of GTZ[30] and CIM[31]. I was with technical assistance from a German expert. The project began with the development of Mechatronic technical career; it required the planning, design curriculum, academic process and establishment of relations with the employers and the approval of the Ministry of Education.

Based on studies with the employers and the revision of German experience through field visits, interviews with experts and literature review, the first higher education

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[30] Ibidem.

[31] The Centrum für international Migration und Entwicklung (CIM) is the human resources placement organisation for German Development Cooperation. Its mission is to support partners' contributions to their countries' development and the attainment of the goals set jointly by each partner country and the German Federal Ministry for Economic Cooperation and Development (BMZ).

technical career in the modality of dual system, began in 2008 with 40 students in Mechatronic for technical level.

There was technical assistance from German cooperation GTZ, CIM, SIEMENS and FESTO[32]; besides ITCA own investments, for development of study plan, teachers training, and support in the acquisition of equipment. The cooperation instrument used was PPP (Public Private Partnership).

With the first career of Dual system, It was proposed the importance that graduates would have the competences in accordance with the requirements of companies, facing during their formation for solving real problems of working life.

3.4   Mechatronic career: critical analysis of suitable development

Mechatronic definition

As Isermann (2000) wrote in his publication "Mechatronic systems: concepts and applications", there is not a unified definition for it, but, he conclude all definitions agree that Mechatronic is an interdisciplinary field, in which the following disciplines act together (See Illustration 3.4-1):

- Mechanical systems (mechanical elements, machines, precision mechanics);

- Electronic systems (microelectronics, power electronics, sensor and actuator technology);

- Information Technology (theory of systems, automation, software engineering and artificial intelligence).

The word itself is a portmanteau of 'MECHAnics' and 'ElecTRONICS' (Bradley, 1991).

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[32]   FESTO and SIEMENS are German enterprises that supplies manufacturing equipment among others.

Illustration 3.4-1. Mechatronic: Electronics, mechanics & information Technology
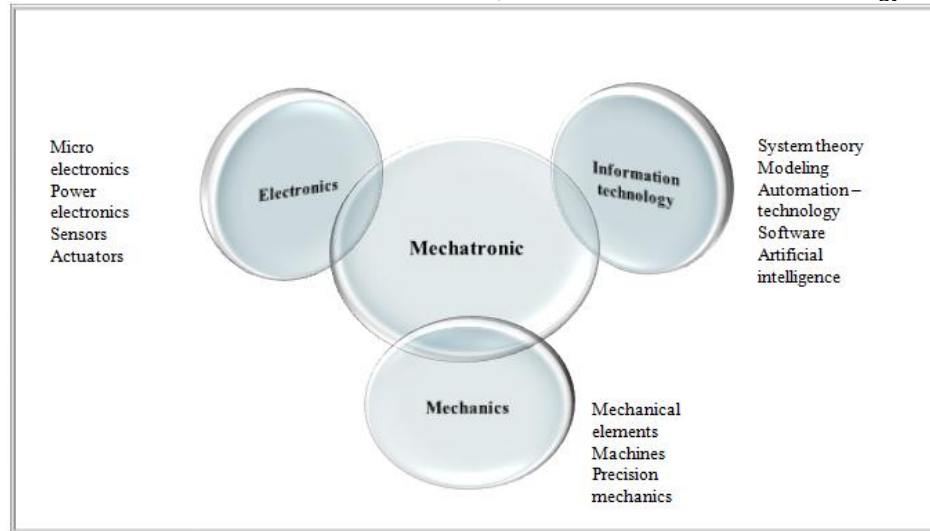
Source: reedited from Isermann, R. (2000)

Mechatronic Career

Mechatronic Technician was implemented in the year 2008, by executive agreement of the Ministry of Education[33], its design was approved with the competence approach and structured in a modular form. This career has implemented by two ways, one in the traditional system and other under dual system. The curriculum is the same as both systems, besides students had the same classes, modules and teachers. For a better understanding of the graphic, In all graphs, color maroon (shades of maroon) is applied for Traditional group and color navy (shades of navy) for Dual group.

The difference between the two curricula is that students registered in the Traditional System, developed in enterprises practices for a period of 1½ months (6 weeks), at the end of his Career (See Illustration 3.4-2). The practice in this case has developed in free form, is a practice not oriented; the enterprise decides what students have to do, and there is not a work binnacle. The differences about the career under dual system have explained further in this chapter.

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[33] All careers that are given to get the technical degree must be registered and approved by the Ministry of Education, as provided in article 43 and 63 of the Act on Higher Education in El Salvador.

Illustration 3.4-2. Traditional system at Mechatronic – Line time
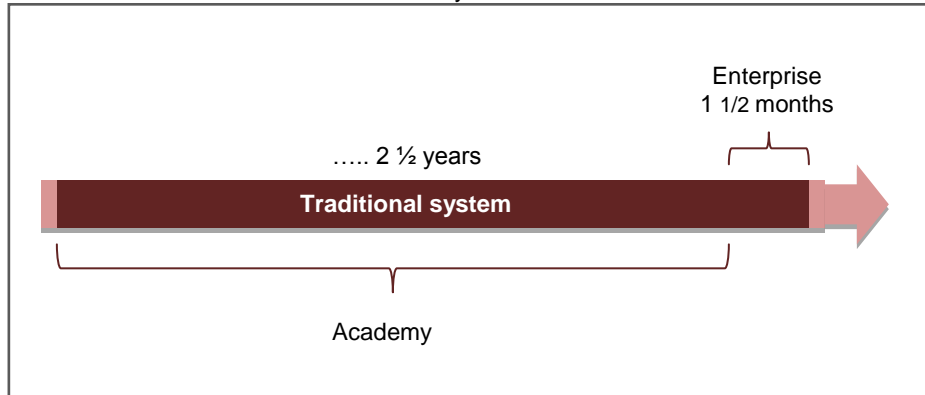
The career Overview

Information about name of the career, entry requirements, title at the end of the studies, credits and others[34], have presented in Table 3.4-1.

Table 3.4-1. Mechatronic career general information

Career name	Technician in Mechatronic
Entry requirements	High school
Title	Technician in Mechatronic
Duration	2 ½ years
Module	39
Credit	240
Year of implementing	2008

Source: Own elaboration, data from DNS for Mechatronic career

Outcome Profile

As defined in the approved curriculum, the Mechatronic Technician shall have the competences to:

- Supervise automated production lines and quality control of inputs.

- Contribute to the training processes and technology within enterprises.

- Monitor and diagnose the state of operation of the various circuits and control devices in automated industrial processes.

- Identify and correct failures in automated machines and industrial processes.

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[34] ITCA (2011a). Guía Estudiantil 2011, Capítulo IX "Descripción de carreras y planes de estudio" [Student Guide 2011, Chapter IX "Description of careers and study plans"].

- Perform mounting and dismounting of electrical, electronic, mechanical, electro pneumatic, electro hydraulic, of machinery and control systems in automated processes.

- Perform preventive and corrective maintenance of machinery and control systems in automated processes.

Field employment

It also states that, graduates could work in enterprises with automated processes such as metal mechanical, food, chemical, textile, among others. They could develop in the following positions: Supervisor of electrical or mechanical maintenance, Supervisor of automated production lines, Contractor, Workshop Supervisor Computer Numerical Control (CNC), Operator trainer of automated equipment, Technical specialist automation equipment or Technical Seller.

Regular Admission Requirements

In the Student Guide[35] presents the admission requirements as set out in the Academic Regulations of the institution, which has defined in Article 4, where applicants for technical or engineering careers must meet the following requirements:

- Have a high school degree's degree or possess an equivalent degree obtained abroad and recognized legally in the country.

- Perform the procedures for admission to the dates set by the Academy.

- Enjoy the conditions of physical and mental health consistent with the requirements of the chosen profession, to enable it to do properly their learning activities without risking its integrity.

- Approve the course of admission with the standards established by the institution.

The course admission develops and evaluates content of Mathematics, Physics, General Culture and Values. It also assesses issues related to discipline, sociability, responsibility, presentation, behavior, leadership and others. The results of the

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[35] ITCA (2011a). Guía Estudiantil 2011, Capítulo II "Requisitos de Admisión" [Student Guide 2011, Chapter II "Admission requirements"], 5 p.

evaluation, as well as the psychological examination and personal interview will determine the pre selection for entry into the career.

Study plan

Into the curriculum, can observe how dual system works, where the study plan has organized by periods and enterprise practice, where each period has 2 month at the Academy and 1 month at the Company. In that way, the curriculum has developed in co responsibility between academy and enterprise. The study plan detail is in the Annex 3. It has 10 periods. The schematic design has presented in Table 3.4-2.

Table 3.4-2. Schematic design of Mechatronic Curriculum

First year				Second year				Third year	
Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Period 7	Period 8	Period 9	Period 10
ENTERPRISE PRACTICE 4 WEEKS	ENTERPRISE PRACTICE 4 WEEKS	ENTERPRISE PRACTICE 4 WEEKS	ENTERPRISE PRACTICE 4 WEEKS	ENTERPRISE PRACTICE 4 WEEKS	ENTERPRISE PRACTICE 4 WEEKS	ENTERPRISE PRACTICE 4 WEEKS	ENTERPRISE PRACTICE 4 WEEKS	ENTERPRISE PRACTICE 4 WEEKS	ENTERPRISE PRACTICE 4 WEEKS

Mechanical competences	Automation competences	Electronic competences	Fundamental areas

The curriculum has designed with 39 modules that cover the development of competences in technical areas, areas of basic education and English, each area has made up by groups of modules. Curriculum covers 64% of technical area (See Table 3.4-3).

Table 3.4-3. Composition of Mechatronic study plan by area

Formation area	Number of modules	% from total
Technical modules	25	64
Basic modules	6	15
English modules	8	21
Total	39	100

The career development runs in 10 periods over the 2 ½ years. The modules required to take are 39 and 10 months of practice, completing 240 credits (See Table 3.4-4). Enterprise practice had related with the knowledge and practice that students have receive at the Academy; this is not an internship, it is shared responsibility in the process of formation.

Table 3.4-4. Mechatronic study plan by periods and modules

Year	Periods (2 months per period)	Number of modules	Credits	Enterprise practice (months)
First year	4	16	96	4
Second year	4	16	96	4
Third year	2	7	48	2*
Total	10	39	240	10
*Last enterprise practice in the third year is for developing an innovation project.				

Source: Own elaboration, data from DNS for Mechatronic career

The structure of the plan per area of expertise has divided into 3 major areas: mechanics, electronics and automation, where 52% has covered with modules that develop competences in the field of automation (See Table 3.4-5). Fundamental areas are related with mathematic, physics, ethics, entrepreneurship and English.

Table 3.4-5. Mechatronic study plan by technical area

Technical	Number of modules	% from total
Mechanics	6	24
Electronics	6	24
Automation	13	52
	25	100

Source: Own elaboration, data from DNS for Mechatronic career

The technical competences that aims to develop during the process of formation are grouped into modules (See Table 3.4-6), and in each competence are defined sub competences (See Annex 4), which are measured with the level of achievement of these goals. The curriculum in modular form has shown in Annex 3.

Table 3.4-6. Mechatronic study plan by competences

Module	Competence
Materials Science	Classify materials by their physical properties.
Electrical Circuits	Arm direct current electrical circuits.
	Assembling three-phase electrical circuits AC.
Technical Drawing	Draw plans of machines
Industrial Power Facilities	Use the tools, accessories and measuring equipment required to perform an electrical installation
Fundamentals of Mechanics	Testing of metallic materials
Electrical Drive Control Systems	Use different electrical machines for industrial applications
	Arming circuit contactor control.
Office	Manage office software
Applied Mechanics	Prepares request for a technical installation.
	Prepares list of parameters of a Mechatronic system.
Industrial Electronics	Use semiconductor devices for electronic power control and fault detection equipment, commercial and industrial application.
Computer Logics	Develop Computational Logic
Manufacturing Processes	Making parts by hand.
	Manufacture of parts to machine tools
Digital Electronics	Use combinational and sequential digital circuits, to develop control systems and digital editing equipment failures.
	Detect and correct faults in systems based on programmable logic devices, microprocessors and microcontrollers
Programming	Develop application programs for the control of electrical and electromechanical devices through the computer.
Computer -AID Design	Using CAD software
Installation and setup of PC and networks	Installing the various components of hardware and software you need a PC to operate.
	Wiring and configuration of a data transmission network.
Hydraulics and Pneumatics	Hydraulic and pneumatic arm.
	Connect hydraulic and pneumatic power
PLC Programming	Develop ladder programs for programmable logic controllers (PLC).
	Apply different types of proximity sensors to generate input signals

Module	Competence
	to PLC.
Automation of hydraulic and pneumatic circuits	Electro and electro-connect circuits.
	Using PLC for hydraulic and pneumatic control circuits.
PLC Systems and Industrial Networks	Use automatic programmable industrial control.
	Install communication protocols for industrial networks.
Robotics and CNC technologies	Using simulation software (Win Unisoft and CADCAM)
	Programming robotic units for industrial processes
Industrial Process Control	Use measurement equipment for different physical variables.
	Apply the different types of sensors and transducers for monitoring of physical variables in the process control industry.
	Use automatic control and regulation of continuous processes in industry.
Integrated Production Systems	Integrate manufacturing modules.
Assembly and calibration Mechatronic	Apply techniques for the assembly of a mechanical system.
Troubleshooting	Test and Troubleshoot for Mechatronic systems
Quality control and cost management	Apply international norms of quality in product development processes.
	List fixed and variable costs of production of a product in an automated system
Safety rules and standards	Implement safety rules and standards in Mechatronic facilities

Source: Own elaboration, data from DNS for Mechatronic career

Technical Mechatronic career – Dual System

Mechatronic Technician under the Dual System has implemented under the same conditions described in the previous topic but with the difference in the enterprise practice. The career should be complete in two and half years, where 20 months have used for theoretical and practical classes at the Academy, and 10 months used for the development of practice at company.

The enterprise role in the process of formation is support to students in their practices into the company facilities, according the Curriculum. These practices have carried out in alternating with theoretical studies, and then students enrolled in this career under the Dual System, attended 2 months at academy and 1 month at enterprise (See Illustration 3.4-3).

Illustration 3.4-3. Dual system at Mechatronic – Line time
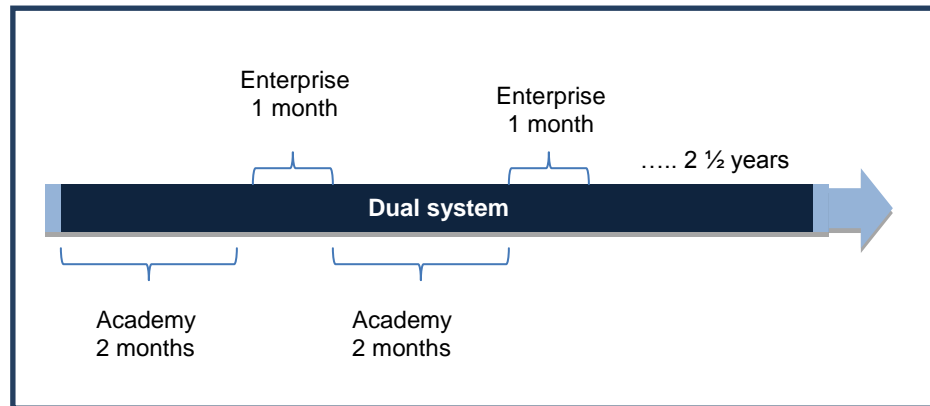
Major players in the process

In the implementation of the careers, there are different actors, depending on the system of study, so, in the traditional system involving students and teachers, while in the Dual System, are also incorporated the tutor and coordinator. The primary roles of these actors are presented below, highlighting the role of tutor and coordinator since they are not common in traditional training processes at Academy:

a. Dual student

Students who have enrolled in the career of Mechatronic under the Dual System have to carry out their practice in the company, for a programmed period of 10 months throughout the process of formation.

Student taking the practice must be registered, and therefore are subject to the rights and duties that belong to them, which are detailed in the Manual of Academic Regulations and are listed in the Student Guide.

b. Teacher

A professional hired by the Academy, which facilitates the formation of students and maintaining relationship with them.

c. Tutor[36]

The tutors are employees of the company, involved in the training of students enrolled in the Dual system. They are professional specialist, generally a manager of

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[36] Schmidt, Klaus. (2009). Taller "Capacitación a Directores y sus profesores para el Sistema Dual" [Workshop "Directors and teachers training for Dual System"]. El Salvador.

any area related with production. The tutors have responsibilities with student, among which are:

- Contribute for education and training of students

- Guarantee practical formation according to curriculum

- Ensure joint work with all staff involved in the company

The tutors have to find the balance between different objectives[37] of enterprise and the student formation, considering: Comply with the issues of the binnacle vs. real and urgent needs of the enterprise; freedom vs. security; give students different task vs. always assign the same; stiffness vs. understanding; and balancing the good and bad in the feedback. In the inter-institutional cooperation agreement between the company and Academy (See Annex 5) sets out the following responsibilities for the tutor:

- Determine prior to the start of practice, activities that the student will develop, which has related to its formation theoretical – practice.

- Establish and define the monthly schedule of activities and places where the practice will develop taking into account the regulations, internal rules, availability of specific areas and needs of the Company.

- Conduct assessments of student performance during the practice, according to parameters and dates defined per Study Centre.

- Provide the results of evaluations and any information relevant to performance and behavioral issues through the designated coordinator.

d. Practice Coordinator

The coordinator is an employee of the academic institution, who is not on a teaching contract but who provides support to learners through direct and regular contact with them. The coordinator has to follow up on the development of enterprise training, is the connection between the enterprise, the academic center and the students, among whose functions are (See Annex 5):

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[37] Lietz; Marco. (2009c). Un año de carrera de Mecatrónica: Experiencias ganadas en el 2008, Capacitación de Tutores del Programa dual de Mecatrónica [A year in Mechatronic Career: Experience earned in 2008, Tutor Training of Dual Mechatronic Program]. Lecture in ITCA. El Salvador, p.27.

- Monitor students in enterprises

- Do the analysis and evaluation about apprenticeship

- Do the performance evaluation and deployment process

- Seek the new spaces for students in the enterprise

- Train tutors

- Do feedback about the process

- Fix for problems of different types; example: binnacle development, working conditions and personal problems

- Organize the business cooperation

- Provide advice to improve the quality of company training

Special admission requirements for Dual System

In order to enroll into the career under the Dual System, the applicant must meet in addition to the requirements stated in the previous sections, with the following: Achieve a space for practice in a company, which has an agreement with the Academy; and sign an apprenticeship contract with this enterprise.

Cooperation agreements for practice

The participation of enterprises in the process of formation requires the implementation of special processes, in order to coordinate the following:

- Relationship Academy – Enterprise

- Relationship Student – Enterprises

- The relation between enterprises

All these relations have formalized by agreements, which are explained follow:

a. Inter-institutional cooperation between the company and Academy

This is an agreement that establish cooperation, between the company and the educational institution, which defines the objectives and scope of this, highlights how the students practices are developed, training of tutors And financial support from the companies to students (See Annex 5).

The main object the agreement is to establish the basis for cooperation, in order to help with the development of the students. Therefore, the students of this Career make their practices and procedures the company through appropriate activities their knowledge, skills and abilities acquired during each study period. The clauses of this agreement set out responsibilities for academic institutions and for enterprises.

For academic institution, there are responsibilities about, monitoring students in the company, assigning a coordinator person, training for tutors, and support for the development of enterprise practices.

In other hand, companies have to participate in process for admission students, provide the equipment necessary for the proper performance of activities in their practices; respect the periods of theoretical study and practical set out in the curriculum, assigning a tutor for each student, and the space to take the training courses for tutors.

b. Agreement between employer and student

Students and companies also acquire commitments, which is formalized through an agreement (See Annex 6), in which is set out company duties and responsibilities of the student. The objectives, schedules, rules and financial support, among others are in this document. In this agreement provides that the Company will receive students for a period of 10 months, giving them the tools and equipment for their practices. During this period, students must develop the binnacle work.

c. Agreement between enterprises

The Cooperation Agreement between companies has the objective the exchange of students in the enterprise practice, when any of the companies do not have the machines and equipment, which are required in the formation process.

This ensures that the training comply with the objectives to be developed in different scheduled practices, and overcoming the shortcomings of technology in the companies. The model of this agreement is in Annex 7.

The binnacle

The binnacle is a tool for handle the student training in the company, like a planned process, results-oriented; and controllable by the student, the tutor and the coordinator. Help tutor to know the contents to develop in different months that the

student is in the enterprise. The binnacle has administered in the company, and it is recorded daily student progress in the training process.

Because the binnacle is an important element to measure the level of competences of students who are in the Dual System, analyze their structure. It has following sections:

- Identification of the student, company, tutor and coordinator

- Control of visit of coordinator

- The curriculum, which identifies the periods of in-company practices

- Tasks to complete by month of Internship

- Evaluation of attitudes

- Format learning activities per week

This instrument can measure the skills and attitude of students through the skills approach in a real working environment. An example of the Binnacle with all its components has shown in Annex 8. The binnacle becomes the student guide and tutor, which records the regular monitoring by the tutor and the coordinator, so, there is clarity on the progress and achievement of competencies in the student, identified in each month the enterprise practice. An example of this section is on Table 3.4-7.

Table 3.4-7. Binnacle - Task control

Objectives:			
• Perform installation, maintenance and administration of computers in mechatronics machines. • Draw mechatronic machines in 2D and 3D.			
Area	**Training profile**	**Competences to be assess**	**Evaluation** Is competent: • Advanced (9.1-10.0) • Intermediate (7.6-9.0) • Basic (6.9-7.5) • Is not competent (0-6.8)
		• Skills • Knowledge • Understanding • Application • Capacity Analysis • Synthesizing Capacity • Ability to judgment	
	Contents/Topics to developed *(It suggested time for learning. It is also recommended combining the content holistically. Example: reading of maintenance manual and real tasks of maintenances, or work only in industrial security)*	**Competence:** Student is able of installing, maintain and generate the administrative conditions for the operation of information technology in mechatronics equipment, considering aspects of data security (theft, back-ups, anti-virus)	**Grades**
Maintenance	**To performs preventive maintenance on computers in mechatronic machines. (2 weeks)** • To generate service data sheet • To performs cleaning hardware • To assemble and test computer • To performs preventive maintenance of the software • To performs cleaning records, defragmentation	Knows the software used in the company including equipment used in mechatronics, and is able to install, maintain and manage it, considering aspects of data security.	

		• To performs scan of virus • Connects to computer network of the plant or company	Knows the hardware used in the company, including equipment used in mechatronics, and is able to install, maintain and manage it.	
			Apply his theoretical knowledge of information technology in company. It is able to assess what extent an enterprise's electronic systems that can network and what external interfaces can generate, considering aspects of data security.	
		Contents/Topics to developed *(It s*uggested time for learning. It is also recommended combining the content holistically, example: reading of maintenance manual and real tasks of maintenances, or work only in industrial security)*	**Competence:** Student is able to design components of simple equipment with CAD / CAM technology, existing within the company and To generate based on processing of these, one simple production, according to the possibilities in the company.	**Grades**
	Maintenance	**Draw a mechatronic parts (1 week)** • Draw diagrams of electrical and electronic control • Draw pneumatic and hydraulic systems • Draw mechanical parts in 2D or 3D • Draw special circuits	Dominates the CAD / CAM software for the 2D or 3D drawing in its area of operation and is able to generate simple production processes based on these, considering aspects of job security	
	Maintenance	**Check the application of environmental standards. * (1 week intensive, integrate each month)** • Check if it complies with the relevant standards for automated production. • Evaluates resources (machinery, raw materials, lubricants, ...) used for production according to ecological criteria and depending on the possibility of replacing it • Present improvement plan about environmental standards compliance.	Analyzes machinery and raw material used in mechatronic systems, according to ecological criteria, and is able to offer more ecological substitutes based on technical descriptions	

Significant task: Performs preventive and corrective maintenance of computers in the mechatronic machines; makes the memory of the work done and analysis of the efficiency of employee resource in mechatronics system including economic and ecological criteria.	**Coordinator grade:**	**Tutor grade:**	**Overall grade:**

Source: reedited from Binnacle for students of Dual system in the Mechatronic career

The tasks in the month of practice, is the main component of the Binnacle, which identify following:

- The objectives of the practice

- The training area

- Competences to be assess

- Evaluation

- Content / topics

- The significant task

- Grades from the tutor, the coordinator and the overall grade

Also, there is an evaluation form for attitudes; this is measured by observing student behavior related to their willingness to do and (Erpenbeck & Rosenstiel, Handbuch Kompetenzmessung [Manual Competence Measurement]., 2007), as well as methodological components about to the organization the student.

The aspects to evaluate are responsibility, initiative, teamwork, willingness to collaborate and apply knowledge, planning, order; respect the safety and the environment; and rational use of resources. An example of this part of the binnacle is in Table 3.4-8, but the complete instrument with all aspect to evaluate is in Annex 8.

Table 3.4-8. Binnacle - Attitude control

	Grade (Only one global grade)	Comments
Respect the company schedules.		
Has initiative		
Performs tasks with responsibility, dedication and high quality results		
Plans and executes tasks in the time assigned		

Source: reedited from Binnacle for students of Dual system in the Mechatronic career

The last topic of the form includes weekly monitoring of the activities (See Table 3.4-9)

Table 3.4-9. Binnacle - Learning week activities

Area	Day	Activities	Hours	Total.
	Monday			
	Tuesday			
	Wednesday			
	Thursday			
	Friday			
	Saturday			
		Total of hours per week		

Source: reedited from Binnacle for students of Dual system in the Mechatronic career

Economic support

The company will provide economic support for students, which is at least US$75.00 per month; this amount has used to pay tuition and other expenses such as transportation. Students in the traditional system, they have no financial support from the company, so that, they bear the costs of their studies, paying an annual amount of $600.00 for tuition[38]. In the year 2012, the economic support from enterprises has been US$125.00 (Annex 24; Key person interview [K4]; December 12th 2011; lines 24-27).

Tutor workshops

The tutors have trained through workshops, in order to learn about the process of planning, implementation and evaluation of student training into practice and facilitate the inclusion of youth in the workplace. The topics covered are importance of the formation dual, the concept of learning competences, the role of the tutor in dual education, the role of coordinator, the Relationship Instructor – Student, the practical curriculum, planning the formation, implementation practice and assessment of practice.

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[38] ITCA (2011a). Guía Estudiantil 2011, Capítulo XVII "Costos de matrículas, cuotas de escolaridad y otros pagos" [Student Guide 2011, Chapter XVII "Tuition costs, school fees and other payments"], 149p.

Proceeding for evaluating competence

The assessment of student learning is a responsibility of teachers, who must use the appropriated assessment tools for the approach of competency[39]. To approve each module is a requirement that students complete the modules, attend at least 80% of the scheduled academic activities, be they theoretical, practical; field activities, company visits, and others; otherwise, the student will fail the module regardless of the final grade in the assessments.

The rating scale of each module is cero (0.0) to ten (10.0), where the minimum grade for approvals is seven (7.0). When a student obtains six point nine (6.9) on a module, the grade will approximate to seven (7.0). In order to relate the concepts of qualitative assessment used in competency-based training with the numerical rating scale; exist the equivalence table (See Table 3.4-10).

Table 3.4-10. Normal evaluation scale

Concept	Grade
O: Outstanding	9.1 - 10.0
E: Excellent	8.1 - 9.0
VG: Very good	7.1 - 8.0
G: Good[40]	6.9 - 7.0
P: Poor	Less than 6.9

Source: reedited from Binnacle for students of Dual system in the Mechatronic career

The evaluation of each module is permanent. There must be a minimum of one test for each learning outcome in each competence defined into the module. In the modules of the specialized areas, the weighting of practical assessments will be at least 60% of the final grade; and 40% for theoretical part.

In the basic modules, the weight of the evaluations will be 50% for practice and 50% for theoretical knowledge of the final grade. In the modules that are entirely theoretical in nature, the average of their evaluations will be 100% of the final grade.

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[39] ITCA (2011a). Guía Estudiantil 2011, Capítulo XVI "Regulaciones Académicas" [Student Guide 2011, Chapter XVI "Academic Regulations"], 140p.

[40] The minimum grade for approvals is 7.0. When a student obtains 6.9 on a module, the grade will approximate to 7.0.

Credit system

The study plan has structured under the system of credits, where it has defined as the unit of measure representing the amount of work the student must meet to achieve the objectives of the curriculum. In this unit of measure integrates the theoretical, practical teaching and other academic activities, including study time and work that the student must perform to achieve the learning objectives of each of the modules of the Curriculum (ITCA, 2007b). The student guide of 2011 in the article 21 and 22, assign a credit for each thirty hours spent by the student, to classes, seminars, forums and so on. It also assigns one hour per each theoretical and practical activities, such as laboratories, workshops or field practices (ITCA, 2011a).

Coefficient of Unit of Merit (GPA)

The GPA has used in the evaluation system in Higher Education, which is used to measure the academic performance of learners. The definition method of calculation, is laid down in Article 7 of the Act on Higher Education (MINED, 2004), which states that the unit of Merit is the final grade for each subject, multiplied by their valuation units. While the Coefficient of Units of Merit is the quotient of the total units of merit earned by the total of credit units of courses taken and passed.

Evaluation of enterprise practice

In this system, students are evaluated within the enterprise practice (See Table 3.4-11). Enterprise practice evaluation scale), as set out in the Binnacle, using the following rating scale:

Table 3.4-11. Enterprise practice evaluation scale

Is Competent	Grade
Advance	9.1 - 10.0
Intermediate	7.6 - 9.0
Basic	6.9 – 7.5
Is not competent	Less than 6.9

Source: reedited from Binnacle for students of Dual system in the Mechatronic career

Moreover, attitudes are measured in the company by observing student behavior, using the grading scale that places it in advanced, intermediate, basic and non-competent (See Table 3.4-8 in page 104).

Chapter 4: Empirical investigation in Mechatronic career

4. Empirical investigation in Mechatronic career

The empirical development of the research is presented in this chapter. It include the methodological approach, that done by qualitative and quantitative method. After, the design is presented including the quasi experimental design, the variables and the treatment. The information about the groups of study like characterization, the initial conditions is explained in the next section. Finally, the data analysis for each hypothesis is presented and its results are developed in the last section; it include competences measurements, students and tutors opinions, and industrialist motivations.

4.1   Methodological approach

The investigation is about results of implementing dual system (new system) for a group of students from Mechatronic career of cohort 2008 -2010, comparing with the result of another group of students in traditional system in the same career and the same cohort.

To reach the aims in this research the scientific methodology to apply were a combination of **quantitative and qualitative method** with questionnaires, interviews and measurements of competences and analyzing time to get a job and the salary (See Illustration 4.1-1).

Illustration 4.1-1. Methodological approach
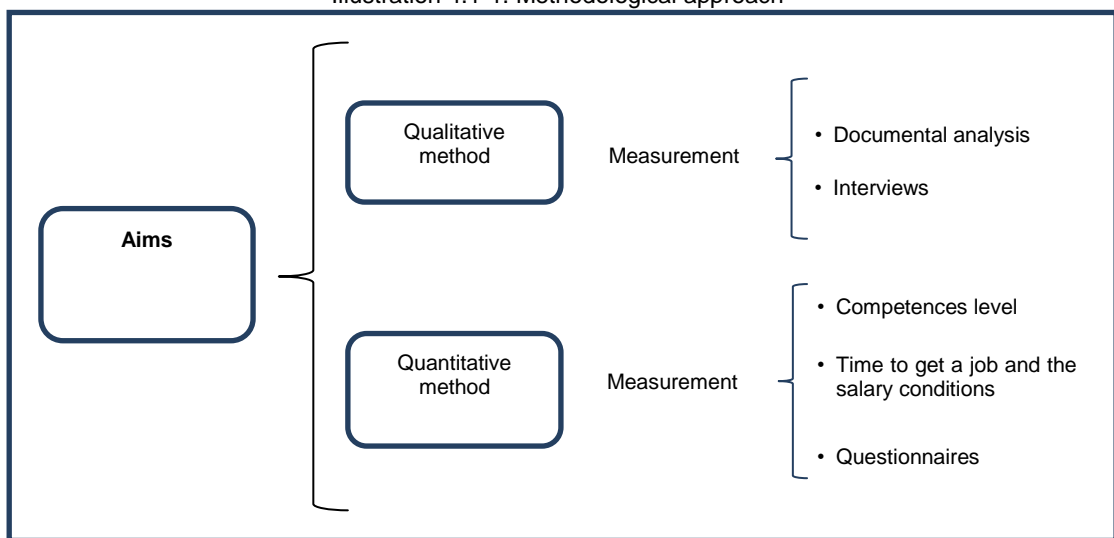
Population in the study

The population of this study were the students of the career of Mechatronic of the Cohort 2008-2010 made up of 56 students, where 39 belonged to the dual system (70%) and 17 to the Traditional System (30%) respectively (See Graph 4.1-1).

Graph 4.1-1. Distribution of population
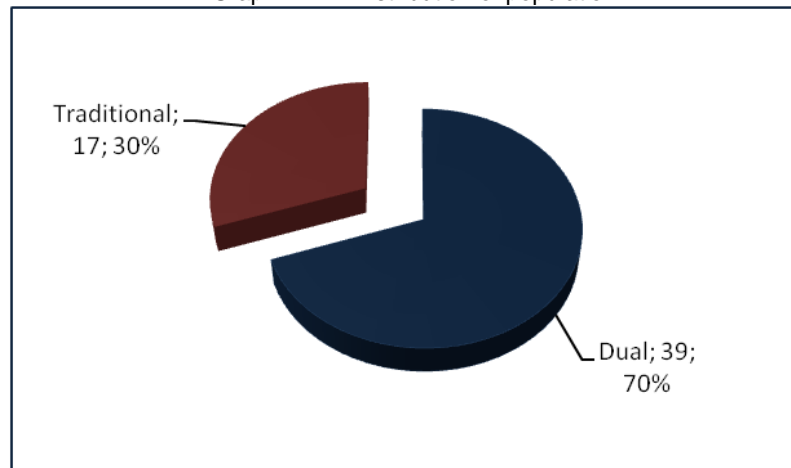
Source: Own elaboration, data from Academic Register Database of the Academy

Hypothesis H1

H1: Students of Cohort 2008 to 2010 that were formed under some elements of the Dual System (new system), have acquired better competences than students in the same cohort that were formed in the traditional system.

For methodological reasons and facilitate the analysis and comprehension of data and results, this hypothesis has been sub-divided, in two sub hypotheses as follow:

Sub hypothesis H1.1

*H1.1: The students from cohort 2008 - 2010 that were formed in the new system (Dual system), **got better competences** than those of the same cohort who were formed in the traditional system.*

The hypothesis about the competencies (H1.1) was been proved evaluating the competences by grades, significant tasks, and watching student's behavior. Besides the opinions about students development were taken from students, tutors and the teachers. Three measurements were collected, one per year, on order to follow the improvement in the student´s competencies and the studies that the German Advisor has done (See Illustration 4.1-2).

Illustration 4.1-2. Methodological approach for Higher Competences H1.1
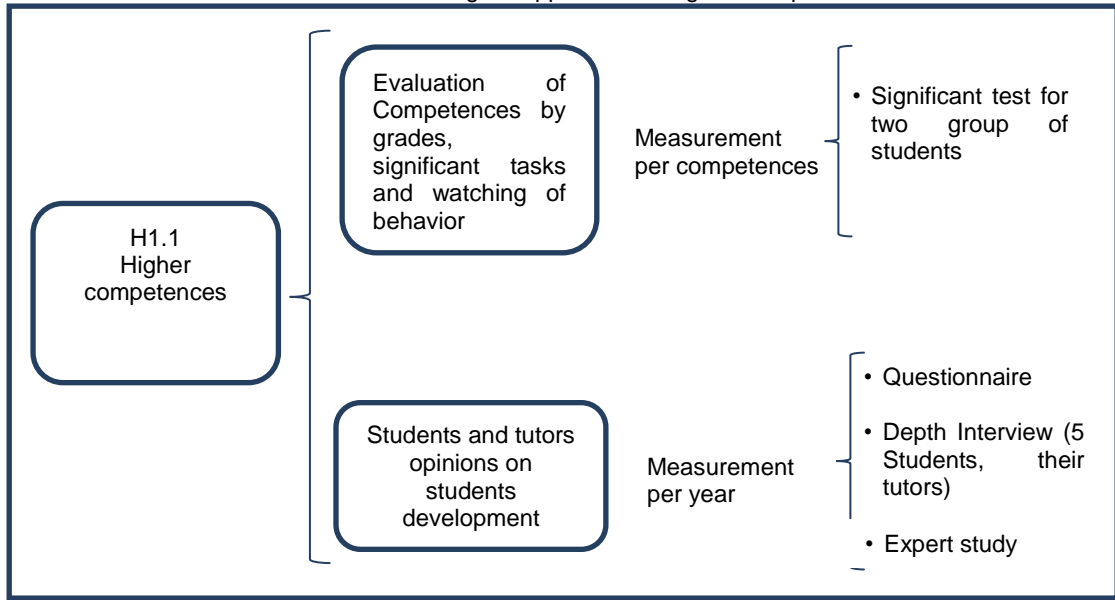
Sub hypothesis H1.2

*H1.2: The students from cohort 2008 - 2010 that were formed in the new system (Dual system), **got job in less time and better salary in the first 6 months** after the graduation, than those of the same cohort who were formed in the traditional system.*

To prove the Sub hypothesis 1.2, the methodological approach applied the statistical technique significant test for the two groups of students (T-student), and the analysis of level of job placement and retention. The source of data was the dates when student got a formal contract and its salary (See Illustration 4.1-3). Two conditions of employability are measured (time to get job and the salary) for this sub hypothesis

Illustration 4.1-3. Methodological approach for sub hypothesis H1.2
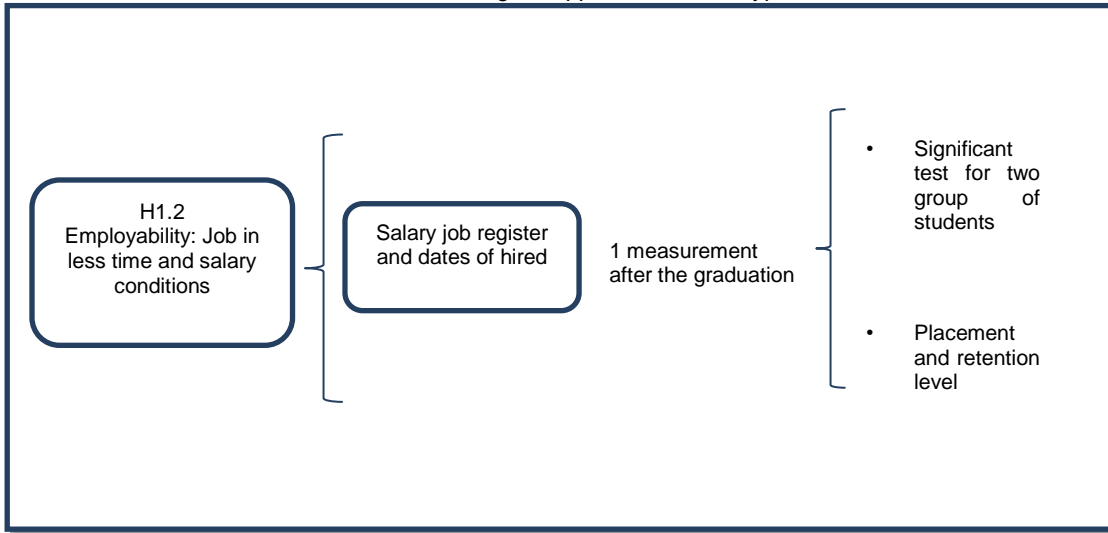
Hypothesis H2

H2: The factors that motivate the industrialists to participate in the dual system are expectation to get people with better competences, to reduce training costs and to take part of student´s formation.

Interviews were the instruments used, in order to get the industrialist opinions about their participation on the student´s formation and reports prepared by the German adviser responsible for the Implementation system to prove the hypothesis 2 (See Illustration 4.1-4).

Illustration 4.1-4. Industrialist motivation H2
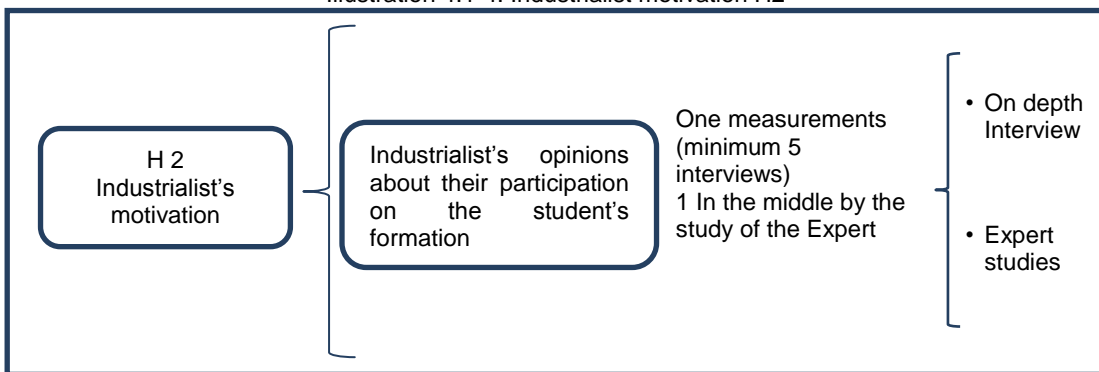
Besides, documental exploration about Dual system, have done in order to know how this system works in other countries and conditions of its implementation in El Salvador. In other hands, interviews were done to people who work in key areas, who can influence in the course of education in the country (See Illustration 4.1-5).

Illustration 4.1-5. Industrialist motivation H2
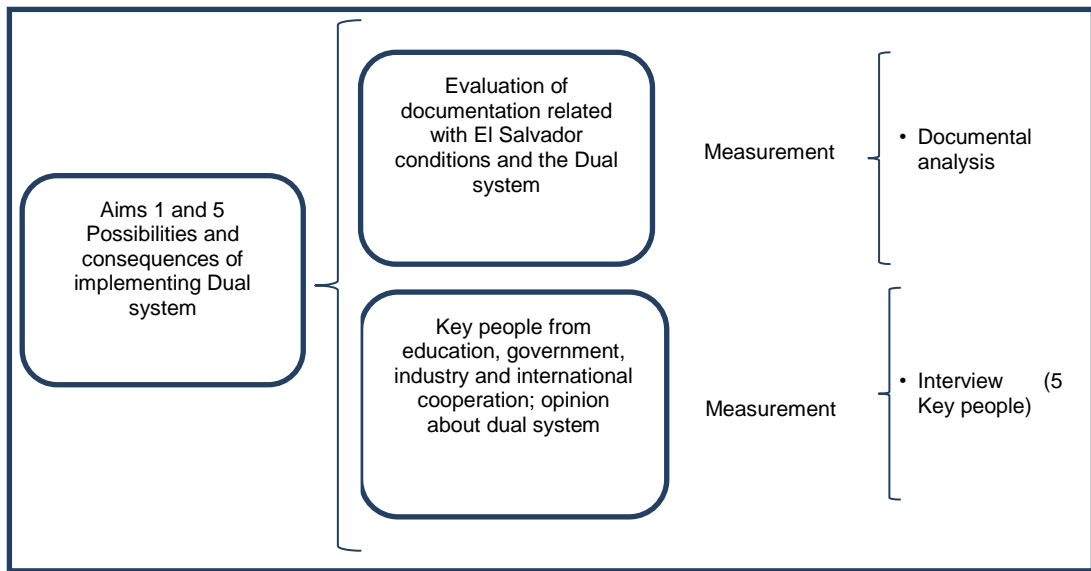
Design

Because the type of investigation and the characteristics on how the groups were conformed, the design applied has been the **Quasi experimental.** In this design the groups were not chosen at random but, through a process of admittance based on grades taken from the admission course and by criterion of acceptances of the companies participating.

Because this situation, it had been necessary to verify that the initial conditions: academic, psychological and aptitudes were not significantly different between both groups. These verification was by (a) the results of the Aptitudes and Learning Test for Secondary Education Graduates (PAES), (b) the course notes for admission, and (c) the results of psychological testing. Each of this analysis is showed further on in this chapter.

- **Experimental Group (EG_Dual)**

This group was formed with 39 students enrolled in dual system.

- **Control Group (CG_trad)**

In this case, the group was formed with 17 students enrolled in traditional system.

Unit of analysis

Students of Mechatronic enrolled in the cohort 2008 – 2010.

Treatment

The enterprise practical that student received in the company is the treatment by the experimental group; this approach allows the Dual Group an alternated formation period of 10 month between the academic institution and the company involved. This was a guided practice, that entails process and elaboration of student's binnacle, as well as records of evaluation, regarding developed competences that include aspects related to attitude.

On the other hand, students from the Traditional Group stayed under a system where formation takes place merely at the academic institution. For this group of students practices occur at the end of their career for a period of one month and a half (6 weeks). It is relevant to note that such practice do not have any evaluation neither a formal supervision from the academic institution.

Intervening Variables

Intervening Variable was the amount of guided practices received by students in the company determinate by the study system. Variables have defined as follow:

- **Independent Variable**

It was the study system, upon which students from each group are formed and it could take two values: Dual system or Traditional system.

- **Dependent Variable**

It was the level of competence acquired by students in the two different study system and the employability conditions. The effect of independent variable, must be observed in this variable.

It was established that the incidence of the study system (independent variable) in the competence level (independents variables), were measured by the knowledge, abilities and attitudes observed in students; and the time to get job and salary; besides the industrialist motivations (See Illustration 4.1-6).

Illustration 4.1-6. Variables of Hypothesis

Cause (independent variable)	Effect (Dependent variable)
Study system • Mechatronic students in Dual system from cohort 2008-2010 • Mechatronic students in Tradicional system from cohort 2008-2010	**Level of competences** • Knowledge • Skills • Attitudes **Employability** • Time to get job • Salary **Industrialist motivations** (only for dual group) **Key people opinion**
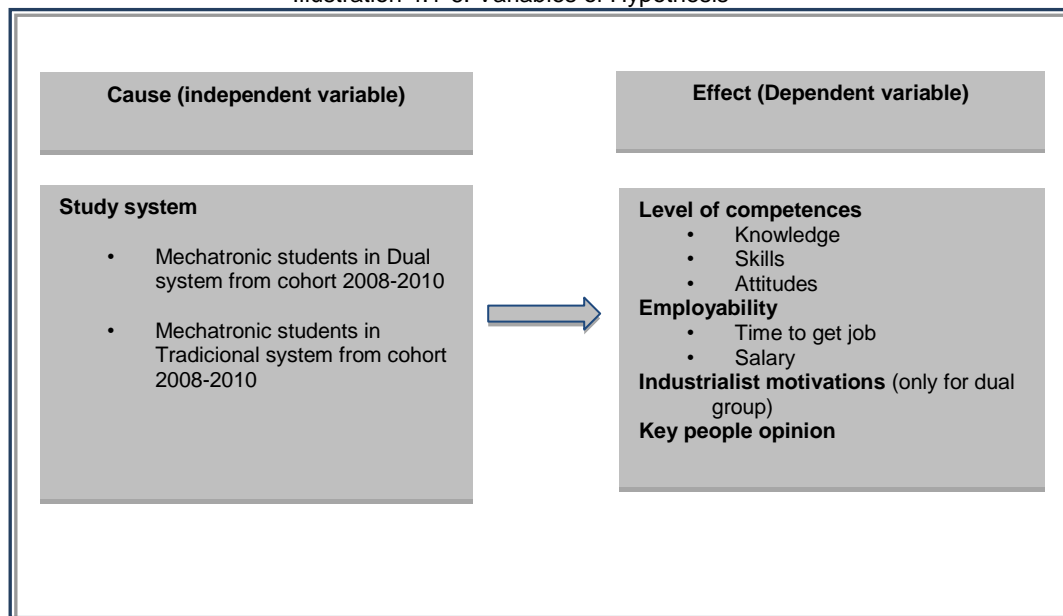
Other intervening actors

During the students' formation process there were other actors whose' perception in relation to the new system implementation that has been considered. In this process were 28 tutors from 22 companies and 9 technical teachers.

4.2   Characterization of population

Student's characterization

For empirical investigation, the students are separated in two groups: dual and traditional group. Both have the same educational plan, the same methodology on module teaching with approach base on competence. The teachers in general are the same. What remarks the difference in both educational systems is that the students under the Dual System combine the formation studies between the academic institution and the company where they are assigned. For this research, the group under investigation are defined as following:

• **Dual Group (Experimental group)**

Dual groups are the students registered in the career of Mechatronic of the cohort 2008 – 2010. These students were under the Dual System (new system).

- **Traditional Group (Control group)**

Traditional group are the students registered in the career of Mechatronic of the cohort 2008 – 2010; these students were under the Traditional System.

Students enrolled

The first cohort for students in the career of Mechatronic began in the year 2008, with 40 students register in the dual system and 20 students register in the traditional system. Within a period of two and a half years there was a variation in the number of students registered because desertion, decease of one student[41] and transfers from the Traditional system to the Dual system (See Table 4.2-1).

Table 4.2-1. Statistics of cohort 2008 - 2011 - Mechatronic career

Students Mechatronic statistics [42]							
System	Year 2008	Desertion and Decease	Transfers[43]	% Desertion	Year 2010	Graduates	% graduates
Dual	40	-3	+2	8	39	31	79
Traditional	20	-1	-2	5	17	11	65
Total	**60**	**-4**			**56**	**42**	**75**

Because two students dropped out their studies from the Dual system in the first semester; the enterprises where they were admitted for the practice, accepted instead of them other two new students. New students were moved from the traditional to the dual system. The main reason for this transfer was to take advantage of the company, in the development of the formation of the student as well as the financial support of the company aimed to their studies. Furthermore, with this action, the Academy was trying to hold the linkage with the enterprise in this

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[41] One student was killed.

[42] ITCA (2007c). Registro de Matrícula 2007 [Enrolment Registry 2007]. El Salvador.

[43] Because two students dropped out their studies from the Dual system in the first semester; the enterprises where they were admitted for the practice, accepted instead of them other two new students. New students were moved from the traditional to the dual system.

first experience implementing the new system of formation in the area of higher education.

Therefore for the year 2010 there were a total of 56 students registered from which 39 students stayed in the dual system and 17 students stayed in the traditional system. The rate of desertion was 8% for Dual and 5% in Traditional, while the general average for other careers was 15%[44].

For all empirical investigation were taken the data related with students registered by the end of 2010.

Age range

In observing the age of the population in the study, it was determinate that students from both systems are within the normal age for these types of studies, where 74.4% (Dual) and 70.6% (Traditional) belongs to the group of youth whose age range from 18 to 21 years. Subsequently, in grouping the first two range of age, the accumulative population reached 82.1% in the Dual system and 94.1% in the Traditional system. In the Table 4.2-2, can observe the details of such distribution by group.

Table 4.2-2. Students range age

Study System			Frequency	% valid	% accumulated
Dual	Valid	Between 18 and 21	29	74.4	74.4
		Between 22 and 25	3	7.7	82.1
		Between 26 and 29	4	10.2	92.3
		30 and up	3	7.7	100.0
		Total	**39**	**100.0**	
Traditional	Valid	Between 18 and 21	12	70.6	70.6
		Between 22 and 25	4	23.5	94.1
		Between 26 and 29	1	5.9	100.0
		Total	**17**	**100.0**	

Educational Precedence

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[44] Schmidt; Klaus (2010a). Evaluación y Asesoría en el proyecto de GTZ – FESTO –ITCA en Mecatrónica [Evaluation and Assessment in GTZ - FESTO-ITCA Mechatronic project.]. El Salvador.

Secondary educational institutions in El Salvador have classified in two mayor types: private schools and public institutes. The difference is that in the former, education has a financial cost, which the student must pay, while the latter the cost of the education is pay by the Salvadoran government. The formation program, for both systems have established by the Ministry of Education of El Salvador (MINED). About quality between public and private schools and institutions, in the Aptitude and Learning Test for Secondary Education Graduates (PAES), test that is provided by Education Ministry, in the year 2007, the average for public institutions were 5.72 and for private schools were 6.34, as is shown in MINED (2008). This fact, suppose better quality education from private schools.

For the specific case of the students of Mechatronic cohort 2008 – 2010, students who prevail came from private schools (64.3%). Most of these students were in Dual system (71.8%). Details about high school precedence of the students are in Table 4.2-3.

Table 4.2-3. Type of high school per group

Study System	Type of School	Frequency	%
Dual	Public	11	28.2
	Private	28	71.8
Traditional	Public	9	52.9
	Private	8	47.1
Total	Public	20	35.7
	Private	36	64.3

Because, this situation, it was necessary to prove if there is any significant difference in PAES, between of Dual and Traditional groups, that could be affected by the precedence school. Results of this test are presented further on.

Prior work experience[45]

Besides, 54 of 56 students (96% of population), students have answered the question: "I have had labor experience (any kind of job) before to start my studies in

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[45] Data were built in SPSS statistics program, where the source of data was the answers in question 25, from the Students Questionnaire, as part of data collection of this research.

Mechatronic", giving as results that 48.1% stated to have a job before initiating their studies. (See Table 4.2-4).

Table 4.2-4. Prior work experience

	Frequency	%
Yes	26	48.1
No	28	51.9
Total	54	100.0

Comparing both groups (dual and traditional), students from traditional (64.7%) had more prior labor experience than dual students (40.5%). (See Graph 4.2-1).

Graph 4.2-1. Prior labor experience by group
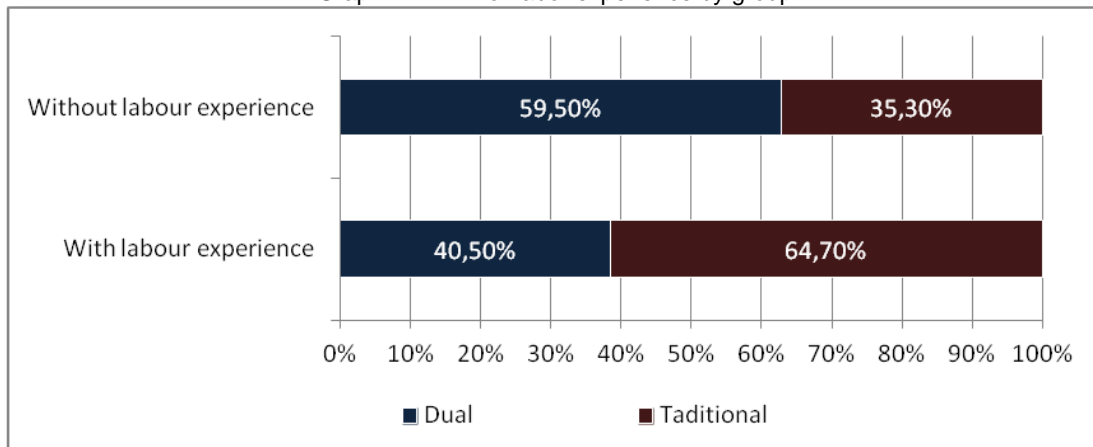
Aptitudes and learning initial conditions

Due to both, the experimental group and control group were not formed by random techniques; if not the main factor for the allocation of students to the Dual Group, was the selection by the representatives of the enterprises participating in the program. This situation led to identify that one of the factors that could affect the validity of the results was the selection of students. Because of this, it was necessary to verify that the initial conditions: academic, psychological and aptitudes were not significantly different between groups.

To determine whether there is any significant difference between both groups were evaluated the results of the PAES, the course notes for admission and the results of psychological testing. Each of this analysis is shown follows:

a. Aptitudes and Learning Test for Secondary Education Graduates (PAES)

When students have completed their studies in high school, they must submit to PAES. This test is provided by MINED, through which the competence of academic development of secondary education students is evaluated. The results are classified in three levels, as it is shown in Table 4.2-5. The national average for PAES in the year 2007 was 5.92 (MINED, 2008).

Table 4.2-5. PAES Level

Level	Score
Basic	0.00 - 3.75
Intermediate	3.76 - 7.50
Advanced	7.51 - 10.00

Students from cohort 2008-2010 in the career of Mechatronic, graduated from secondary school in 2007, they submit to PAES in the same year[46], passing with an average higher than the national standard: 7.56 for Dual students and 6.71 for traditional group. This factor is a good academic indicator for students of this cohort.

With the purpose of identifying whether the results of PAES marked significant differences in both groups (Dual system and Traditional system), the data were submitted to the statistics test T-Student, for independent samples. The complete test is in 0. The hypothesis was:

$$H_0: \mu_{PAES\_Dual} = \mu_{PAES\_Traditional}$$

$$H_1: \mu_{PAES\_Dual} \neq \mu_{PAES\_Traditional}$$

The t test failed to reveal a statistically reliable difference between the mean of PAES, that students of Dual System have ($\mu_{PAES\_Dual} = 7.5688$, s = 1.25092), and students of Traditional system have ($\mu_{PAES\_Traditional} = 6.7154$, s = 1.75064), t(17) = 1.599, p = 0.128, $\alpha = 0.05$.

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[46] Note: not all the students did PAES, because when some of then finished their high school, this test was not exist.

The null hypothesis H_0 was accepted, then there was not significant differences in the **PAES** between the two groups

$$H_0: \mu_{PAES\_Dual} = \mu_{PAES\_Traditional}$$

b. Admission grades

Both groups were submitted for the course of admission, besides to go through a selection process in enterprises. Those who were accepted into the companies came to form the dual group, while the others were admitted in the traditional group.

The mean value obtained for each group, during admission course was for the dual group of 7.4686, and 7.5688 for the traditional. Considering these results, It has determined whether there is significant difference in admission notes between the groups. For this, we applied the statistics test T-student, for independent samples (See in Annex 10 more information about this test), to determine the following hypothesis:

$$H_0: \mu_{course\_admission\_dual} = \mu_{course\_admission\_traditional}$$

$$H_1: \mu_{course\_admission\_dual} \neq \mu_{course\_admission\_traditional}$$

The t test failed to reveal a statistically reliable difference between the mean of Course admission, that students of Dual System have ($\mu_{course\_admission\_Dual} = 7.4686$, s = 1.08671), and students of Traditional system have ($\mu_{course\_admission\_Traditional} = 7.5688$, s = 0.95965), $t(52) = 0.326$, $p = 0.746$, $\alpha = 0.05$.

H_0 was accepted, then there was not significant differences in **course admission** between the two groups, when they started with their studies

$$H_0: \mu_{admission\_course\_dual} = \mu_{admission\_course\_traditional}$$

c. Psychological test

Students in both groups were evaluated with a parametric test, in the areas of personality, values and character in order to know if there was significant difference in psychological aspects that could give advantages to one group from other in the learning process. This was done using **Gordon Personal Profile – Inventory (GPP-I)** and **Gordon´s Survey of Personal Values (SPV)[47]**, in order to establish the level of psychological functioning at the time to start the career (See Annex 11 where is all the data related with this test). Tests were supervised and controlled administration by professional of Psychology[48]. Students were organized in three groups, where group A (19 students) and B (19 students) belonged to Dual System, and group C was students in Traditional System (18 students[49]).

Results in test

- **Gordon Personal Profile – Inventory (GPP-I)**

In relation to the PPG-IPG test, group A (Dual) received a global score of 361 and an average of 19 points per subject, while group B (Dual) received an overall score of 396, giving an average of 21 points, meanwhile the group C, had values of 365 points overall and an average of 20. As can be seen, there is a very slight advantage on the average score of the group B on the other two groups, 2-point advantage in relation to group A and a point with respect to C.

- **Gordon´s Survey of Personal Values (SPV)**

With regard to Survey of Personal Values (SPV), although there are differences in scores by Range, it disappears when comparing the averages of the tests because the three groups had an average score of twelve (12).

In conclusion, by inspection of the results it can say, that there are no differences, in psychological characterization of subjects that form the different groups[50]. This means that when starting the training process the groups are homogeneous.

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[47] Leonard V. Gordon is the author of the tests.

[48] Hada de Escalante and Carlos Mario Pacheco administered tests. They are professionals in Psychology in El Salvador (Escalante & Pacheco, 2008).

[49] In 2008, were 20 students enrolled in traditional group, 18 of them did the psychological test. In 2010, there were only 17 students in this group.

[50] Conclusion for psychological test was made for Hada de Escalante and Carlos Mario Pacheco who are professional in Psychology in El Salvador (Escalante & Pacheco, 2008).

The above is convenient because, any changes in further evaluations will mean that, It is probably the result of educational treatment that have been exposed to each group.

Although, both the experimental groups and control groups were not formed by random techniques; analyzing the initial condition related with PAES, Admission Course and psychological test, it is determined that:

Students in both groups started, with similar conditions related with their knowledge (results in PAES and course of admission), and psychological level.

Enterprises involved

Although there are different variables to classify the size of a company, for purposes of this study will be by the number of employees hired[51], as shown in Table 4.2-6.

Table 4.2-6. Enterprise classification by size in El Salvador

Enterprise classification by number of employees[52]	
Enterprise	Number of employees (Permanent workers with salaries)
Micro	Less than 10 persons
Little	Between 10 and 49 persons
Medium	Between 50 and 99 persons
Large	100 or more persons

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[51] Data based on the classification established by DIGESTYC (2004).

[52] Comparing with the classification by number of employees, that has given in the Commission Recommendation; the main differences are in medium and large enterprises. Commission Recommendation 2003/361/EC have defined micro, small and medium sized enterprises (SMEs) by number of employees (European Commission, 2003a), as follows:
- micro enterprises: with less than 10 persons employed;
- small enterprises: with 10-49 persons employed;
- medium-sized enterprises: with 50-249 persons employed;
- small and medium sized enterprises (SMEs): with 1-249 persons employed;
- large enterprises: with 250 or more persons employed.

Then, companies involved in the Dual System were 22 in the cohort 2008 -2010, majority of the belong to the Medium and Large Enterprise[53], 32% and 59% respectively, accumulating a little over 80% between the two groups (See Graph 4.2-2). The 40 students enrolled in the Dual system were placed in these companies, where sixteen (16) of them worked with more than one student.

Graph 4.2-2. Enterprises distribution by number of employees
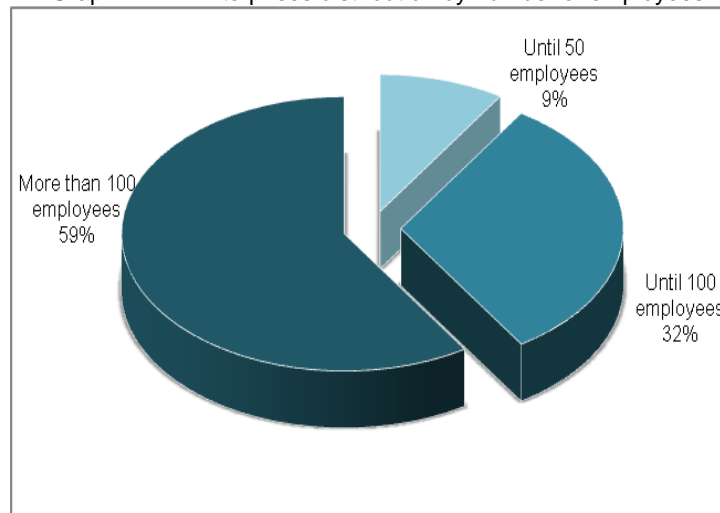
Tutors involved

About tutors, 28 were part of the program, where his role was to facilitate the incorporation of students in the company and take follow up on their training. These tutors are professionals working in the areas of production and maintenance within companies.

To ensure its work with students, tutors received three workshops, where they shared about dual system bases and different experiences in each company (Lietz M., 2009a and 2009b). Besides they learned how to use the instruments to measure the skills developed by students, like the binnacle (Lietz M., 2009b), the assessment tools, meaningful tasks and design and evaluation of projects. The participation of tutors in the workshops was 86%, reflecting the commitment to implement a new program (See Graph 4.2-3). Additionally, they were assisted by coordinators in enterprises (Schmidt, 2008). Besides, tutors experience as a trainer has been determinate, in order to know some previous experience on working with students.

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[53] Data processed from question 34 of Tutor Questionnaire database ("BASE DE DATOS TUTORES 1ra evaluacion para tablas.sav").

Data were collected by Tutor Questionnaire Instrument in question 36 (See Annex 13).

Graph 4.2-3. Tutor Dual System training enrolment
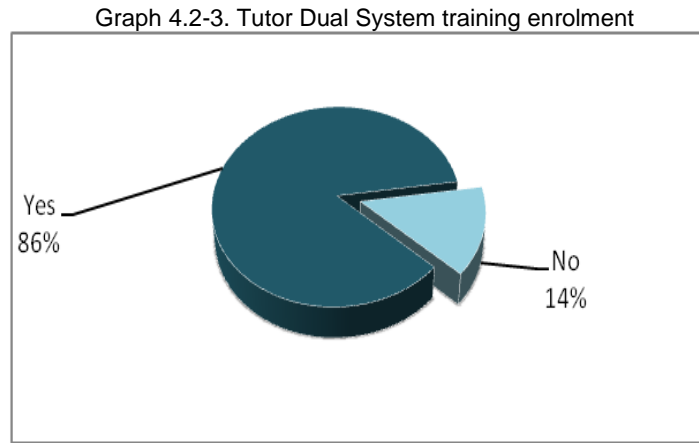
The results of this variable showed that only 28.6% of the tutors have had experience of working in training activities at educational institutions; so for those without such experience, they require more time to understand the processes training in higher education environments. These data are presented in Table 4.2-7.

Table 4.2-7. Tutor experiences as a teacher

		Frequency	Valid percent (%)
Valid	Yes	8	28.6
	No	20	71.4
	Total	28	100.0

Teachers involved[54]

Information about the teacher who were in charge of the mechatronic career cohort 2008-2010, are presented in Annex 25.

Teachers who participated in the formation of students of Mechatronic from cohort 2008-2010 were 23; they taught modules in technical and basic areas. Teachers in the technical area were 39.13% of the population. The basic area has more teachers because the English program, where 7 out of 14 are English teachers (50%), these data are presented in Table 4.2-8.

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[54] Data processed in SPSS from the information presented in Annex 25. The SPSS database is "Teacher.sav".

Table 4.2-8. Teacher per formation area

		Count	Valid percent (%)
Teaching area	Technical	9	39.13
	Basic	14	60.87

With regard the academic level of teachers, 69.57% have university degree including a master degree, and 30.43% are technicians (See Table 4.2-9).

Table 4.2-9. Teacher per academic degree

		Count	Valid percent (%)
Degree	Technician	7	30.43
	Engineer / Bachelor	15	65.22
	Master	1	4.35

Teachers in the technical area, are mostly technician (5 of 7 technicians taught the technical areas). The strength is basic area, where 85.7% are university graduates, including a master degree (See Table 4.2-10).

Table 4.2-10. Academic degree per teaching area

				Count	Valid percent (%)
Teaching area	Technical	Degree	Technician	5	55.6
			Engineer / Bachelor	4	44.4
			Master	0	0.0
					100
	Basic	Degree	Technician	2	14.3
			Engineer / Bachelor	11	78.6
			Master	1	7.1
					100

In this group of teachers is important to note that those of the basic areas, did not have much connection with the implementation of the new system, they generally teach one module in one semester and then no follow-up after. For their part, teachers in the technical area (9) were working in different modules throughout the

training process. About the experience of teachers in the educational field, they were classified into two ranges: (a) Between 1 to 5 years of experience, and (b) Between 6 to 10 years of experience. The information revealed that 65% had from 1 to 5 years of experience (See Graph 4.2-4).

Graph 4.2-4. Teachers experience
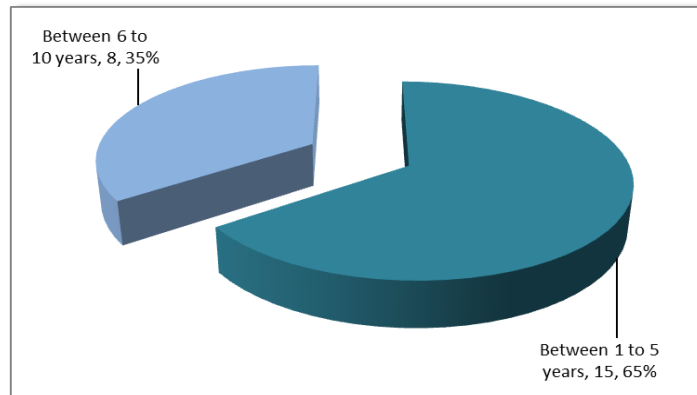
4.3 Higher Competences (H1.1): Results and valuation

*H1.1: The students from cohort 2008 - 2010 that were formed in the new system (Dual system), **got better competences** than those of the same cohort who were formed in the traditional system.*

4.3.1 Competences by grades, significant task and watching of behavior

a. With Coefficient of Unit of Merit (GPA) as a global grade of competences

The GPA has used in the evaluation system in higher education, which is used to measure the academic performance of learners[55]. The following data were the final GPA of students at end of 2010, period when was supposed to finish the career. The analysis is done from considering the studio system, where seeks to determine whether there were significant difference in the results of the GPA among students of the Dual System and the Traditional. The null hypothesis and alternative were:

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[55] The definition method of calculation, is laid down in Article 7 of the Act on Higher Education (MINED, 2004), which states that the unit of Merit is the final grade for each subject, multiplied by their valuation units. While the Coefficient of Units of Merit is the quotient of the total units of merit earned by the total of credit units of courses taken and passed.

$$Ho: \mu_{GPA\_dual} = \mu_{GPA\_traditional}$$

$$H_1: \mu_{GPA\_dual} \neq \mu_{GPA\_traditional}$$

The test has applied for testing differences between means, by the T-Student for independent samples[56]. The mean value obtained for the Study System and other statistical data as the standard deviation and standard error of the mean, is shown below (See Table 4.3.1-1):

Table 4.3.1-1. Statistics for GPA - Hypothesis H1.1

Group Statistics					
	Study System	**N**	**Mean**	**Std. Deviation**	**Std. Error Mean**
GPA	Dual	39	8.274	.4128	.0661
	Traditional	17	8.006	.6329	.1535

Applying the T-Student test, resulting in the following table with the inferential statistics (See Table 4.3.1-2):

Table 4.3.1-2. t-Test for GPA

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
GPA	Equal variances assumed	2.054	.158	1.891	54	.064	.2685	.1420	-.0161	.5531
	Equal variances not assumed			1.606	22.162	.122	.2685	.1671	-.0780	.6149

---

[56] Results from the database "Final Student Profile.sav" processed by the software: Statistical Package for the Social Sciences (SPSS).

The columns labeled "Levene's Test for Equality of Variances", tell it whether an assumption of the t-test has been met. The t-test assumes that the variability of each group is approximately equal. Then, **Levene test**

$$\text{Sig.} = 0.158 > 0.05$$

Because the value (0.158) is greater than α level for the test (.05), then the null hypothesis is accepted where the variability of the two groups is equal, implying that the variances are equal. Then, T-Student for equal variances:

$$\text{Sig. (p)} = 0.064 > 0.05$$

The t test failed to reveal a statistically reliable difference between the mean of GPA, that students of Dual System have (μ_{CUM_Dual} = 8.274, s= 0.4128), and students of Traditional system have ($\mu_{CUM\_Traditional}$= 8.006, s= 0.6329), t(54) = 1.891, p = 0.064, α = 0.05.

> H_0 is accepted, then there is not significant differences between both group related with final grades that were measurement by GPA
>
> Ho: $\mu_{GPA\_dual} = \mu_{GPA\_traditional}$

b. Level of competence

For this research in order to compare how both systems are different from the point of view of competence level, the following classification has been used (See Table 4.3.1-3):

Table 4.3.1-3. Level of competences and grades

Is Competent	Grade
Advance	9.1 - 10.0
Intermediate	7.6 - 9.0
Basic	6.9 – 7.5
Is not competent	Less than 6.8

Analyzing the data by level of competences in the first year of cohort 2008-2010, almost all the student got the intermediate level; 94% for traditional and 97% for dual system, showing a little difference of 3 point up in dual system (See Graph 4.3.1-1).

Graph 4.3.1-1. Level of competence in year 2008
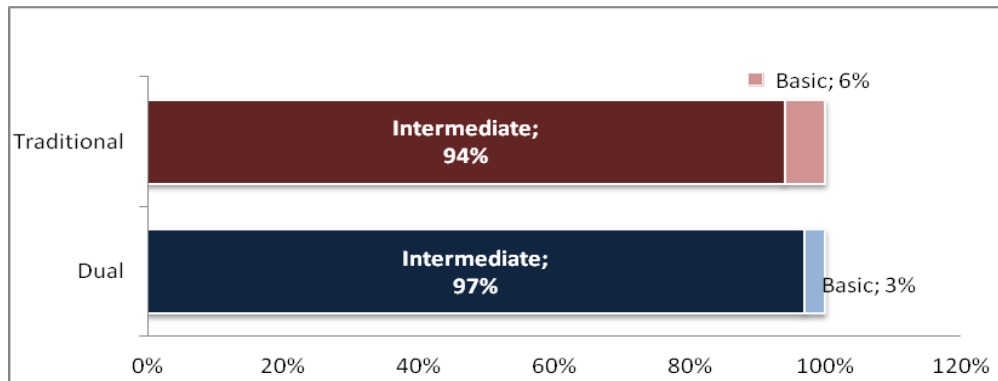
At the end of their studies in the year 2010, the gap grow up with a slight difference of 9 point in favor of in the group of the dual system, because one student got a step down from intermediate to not competent level; 88% for traditional and 97% for dual system, showing a little difference of 9 point up in dual system (See Graph 4.3.1-2).

Graph 4.3.1-2. Level of competences in year 2010
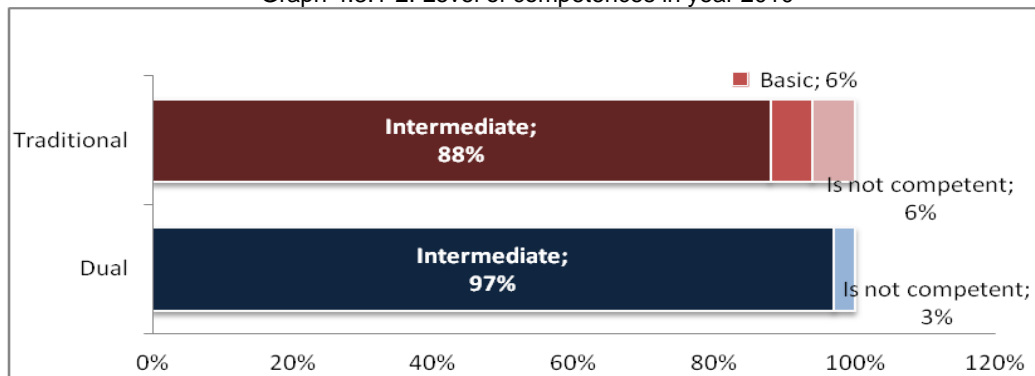
c. **Level of competences according enterprise practice (Only for Dual students)**

The measurement of skills was more complete for students in the dual system, because in addition to the evaluations obtained at the Academy, were evaluated in

the company, using the binnacle[57] as assessment instrument, where were considered: Competences (skills and knowledge), attitudes and the significant task (skills). All these evaluations were part of level of global competences[58] from enterprise.

Assessments made by the tutors reflect better results than those in the academy, in the sense that students have achieved the advanced level of competences (See Graph 4.3.1-3). One of the more valued factors is the student's attitude, while it was developing their training at the company where 49% achieved the advanced level and 46% the intermediate level, which together make up 95% of students achieving at these levels.

Graph 4.3.1-3. Enterprise competences evaluation
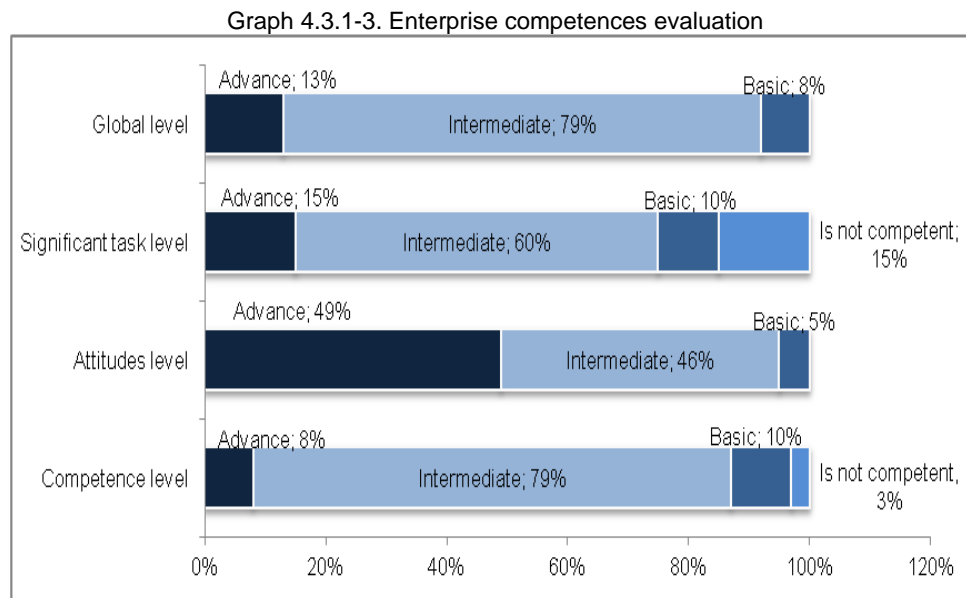
Moreover, the area with the lowest result was for the evaluation to the significant tasks, where they reached the advanced and intermediate levels to 75% of the students.

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[57] The Binnacle instrument is explained in chapter 4.

[58] The global competence grade was calculated considering the 40% of average of competences grades (knowledge and skills), the 30% of average of evaluations related with attitudes and the 30% assigned for significant task (skills).

4.3.2 Students and tutor opinion on student's development

a. Questionnaires

With the purpose to explore students, tutors and teachers opinion about the formation development who was receiving, students under the new system vs. those that were under the traditional system, three questionnaires were designed. In every instrument were established the objectives, the sample, data collected method, time, type of survey, valuation scale, categories, variables, the statement of agreement, and the questionnaire. These were non-parametric test.

Likert scale

A Likert scale was used in most of the questions of the survey in order to know the level of agreement or disagreement with some variables that had influence in the formation process.

Survey design Type

Repeated questionnaires were passed three times between the year 2008 and 2011. This design was in order to observe the opinions of students and tutors thru determinate period of time, identifying how the opinions change in the time. The technique was a Survey and the instrument the Questionnaire.

Applied method

For Liker items, the analysis was with Liker scale; where the additive scale was calculated by the sum of responses on several Liker items, and getting the equivalent point in the scale. Besides, open questions were analyzed (See for Student's result 0 and Tutor's results in 0).

Population and sample

Almost all the students in different systems participated giving their perception and opinion about the formation process; 96% in the first measurement, 88% in second and 91% in the last questionnaire. The same situation was for tutors' participation where 100% did the first measurement, 96% the second and 89% the last questionnaire (See Table 4.3.2-1).

Table 4.3.2-1. Student and tutor sample for questionnaire

No. of measurement	Students			Tutors		
	First question naire	Second question naire	Third question naire	First question naire	Second question naire	Third question naire
Population	56	56	56	28	28	28
Dual system	37	34	35			
Traditional system	17	15	16			
Participant who completed the instrument	54	49	51	28	27	25
% respect population	96	88	91	100	96	89

Validity and Reliability of the scale

Validity

All the questionnaires were validated with professional who work with Mechatronic, one enterprise tutor, one student and expert researchers from the Faculty for Education from Technische Universität Dresden in Germany

Reliability

The reliability of the scale was tested by internal consistency measurement using Cronbach[59] coefficient in order to determinate if answers to the items of the questionnaires were coherent. In every measurement Cronbach Alpha is close to 1 (See Table 4.3.2-2), then the reliability is very acceptable.

Table 4.3.2-2. Cronbach Alpha for questionnaire

	Number of questionnaire	Cronbach Alpha	Number of elements
Students	First opinion	.895	32
	Second opinion	.921	32
	Third opinion	.946	32
Tutor	First opinion	.860	28
	Second opinion	.836	28
	Third opinion	.827	28

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[59] Cronbach Alpha was calculated using SPSS program.

Student questionnaire

The main purpose was to explore Mechatronic student's opinion about the formation development, which were receiving under the new system vs. those that are under the traditional system; having the following objectives:

- To explore students opinion about their formation at Academy

- To identify students opinion about enterprise practice (for students in dual systems)

- To have information about students opinion related to advantages and disadvantages of their study system (dual or traditional)

The complete instrument is in Annex 12, where is described the instruments, scale, population, sample, variables and sub variables. The questionnaire was organized with a range of questions in order to find the student´s perception that was defined in objectives above (See Table 4.3.2-3).

Table 4.3.2-3. Variables and question in Students Questionnaire

Variables	Questions related
	Students
Formation at Academy	Q1 - Q8
Formation at Enterprise	Q9 - Q18
Job opportunities	Q19
Recommend others	Q20
Advantages and disadvantages	Q21-Q23
Precondition	Q24 -Q25

Results

Students opinions were explored by following variables: global perception, the formation at academy, enterprise practice, job opportunities, recommend others, advantages, and disadvantages. Details about student's questionnaire results are in Annex 14.

Comparing student's opinion by variable, with every measurement by system of study, there are changes in the traditional group, that at the beginning of their studies, had more favorable opinion; but this changes to less favorable in the last measurement. In the Graph 4.3.2-1, the red line is the first measurement and the orange belongs to third for traditional students, where is evident the decrease in the favorable opinion. In the same graph, their opinion about recommending the system of study where they were former to others (variable "Recommend others"), there was the major difference between two groups, because students in Dual system maintain their opinion, but students in Traditional systems decrease from a very favorable opinion (4.2) to an unfavorable opinion (2.7),

Graph 4.3.2-1. Student's opinion: all measurements by group of variable
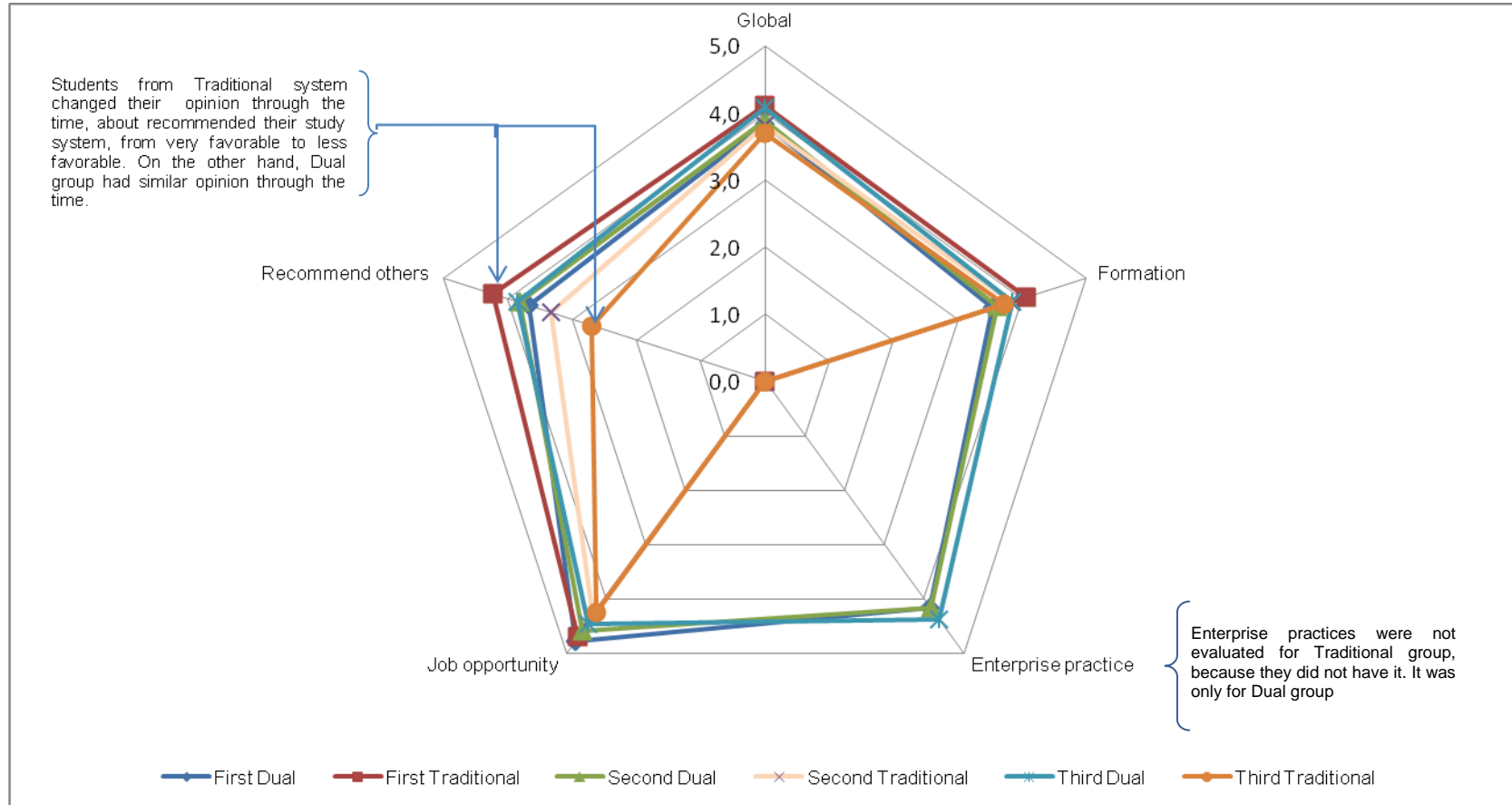
Students from Traditional system changed their opinion through the time, about recommended their study system, from very favorable to less favorable. On the other hand, Dual group had similar opinion through the time.

Enterprise practices were not evaluated for Traditional group, because they did not have it. It was only for Dual group

First Dual   First Traditional   Second Dual   Second Traditional   Third Dual   Third Traditional

Advantages and disadvantages opinions

The purpose of this section was to have information about students opinion related to advantages and disadvantages of their study system (dual or traditional); the information was obtained by "Student Questionnaire", in questions 21 and 22 (See Annex 12), and data was classified and grouped using SPSS software. The results were:

For advantages

Basically, there were five factors that students pointed out about advantages of Dual system: Combine theory and real practice, job opportunity, labor experience, tutor support and teacher support; but they recognized as the most important advantages the "Labor experience" (See Graph 4.3.2-2), opinion that was present in the three measurements.

Graph 4.3.2-2. Dual system: Advantages according student's opinion
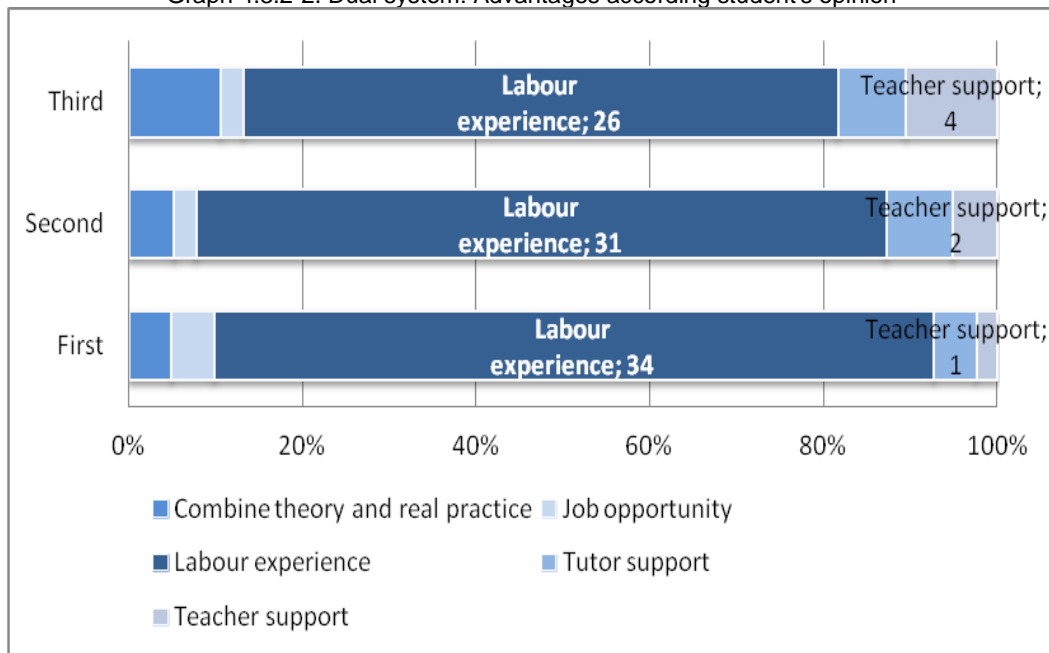
Otherwise traditional group, find out as advantages the teacher support, access to academy resources, more time to do different tasks, the practices at the Academy and do not have compromise with enterprises. As the time of their formation had passed, this group gave more importance to the teacher support, the resources at the academy and the practices (See Graph 4.3.2-3).

Graph 4.3.2-3. Traditional system: Advantages according student's opinion
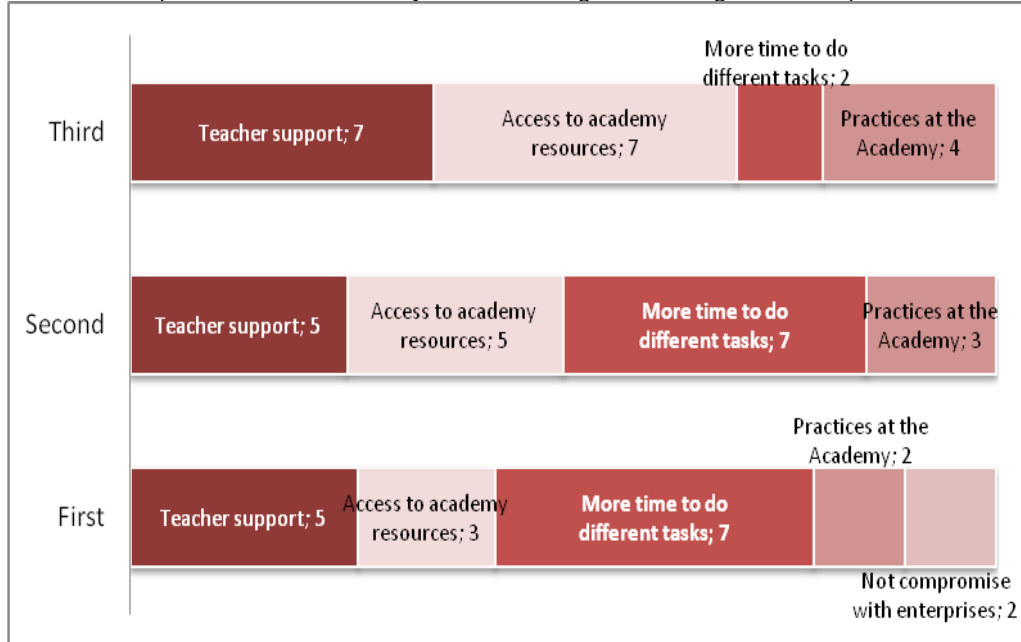
About disadvantages

For Dual group, the most important disadvantages of dual system were lack of coordination at the academy, lack of resources at the Academy, lack of experience of teachers and the situation that the study plan was not completely developed. Otherwise, for Traditional group, the principal disadvantages were lack of coordination, lack of resources at the Academy, lack of experience of teachers, study plan was not completely developed and does not company practice. In both group there were coincidences with these disadvantages: lack of coordination, lack of resources at the Academy and lack of experience of teachers (See Table 4.3.2-4).

Table 4.3.2-4. Disadvantages according student's opinion

Dual system disadvantages according student´s opinion	Traditional system disadvantages according student´s opinion
• Lack of coordination • Study plan is not completely developed • Lack of resource at the Academy • Lack of experience of teachers	• Lack of coordination • Lack of resource at the Academy • Lack of experience of teachers • Not company practice

Tutor questionnaire

The main objective of tutor's questionnaire was to explore Mechatronic tutors' opinion, about the student´s development formation who were in the new system and about the Dual System. The specific goals were:

- To identify tutors opinion about enterprise practice and its incidence in the professional student development

- To evaluate how tutors perceive the students formation at Academy and his incidence in the students enterprise practice

- To determinate tutors opinions about how they see in the future the Dual System in El Salvador and the student opportunities

- To have information about tutors opinion related with advantages or disadvantages of this study system

In Annex 13 is the complete questionnaire, where is described the instruments, scale, population, sample, variables and sub variables. The questionnaire was organized with a range of questions in order to find the tutor´s perception that was defined in objectives above (See Table 4.3.2-5).

Table 4.3.2-5. Variables and question in tutors' questionnaire

Variables	Questions related
	Tutor
Formation at Academy	Q15 – Q21
Practice at Enterprise	Q1 – Q10, Q13- Q14
Job opportunities	Q11 – Q12
Recommend	Q27
Dual system	Q22 – Q26, Q28
Advantages and disadvantages	Q31-Q33
Selection criteria	Q30
Precondition	Q34 –Q37

Results

Tutor's opinions were explored by following variables: global perceptions, formation at academy, enterprise practice, job opportunities, recommend others, about dual system, advantages, and disadvantages. Details about tutor's questionnaire results are in Annex 15.

During the formation process, tutors had maintained their very favorable opinion, about different factors of dual system and students in this method. The biggest scale was for variable "Recommend others", showing that they have good perception and opinion about the new system (See Graph 4.3.2-4).

Graph 4.3.2-4. Tutor's opinions: all measurements by group of variable
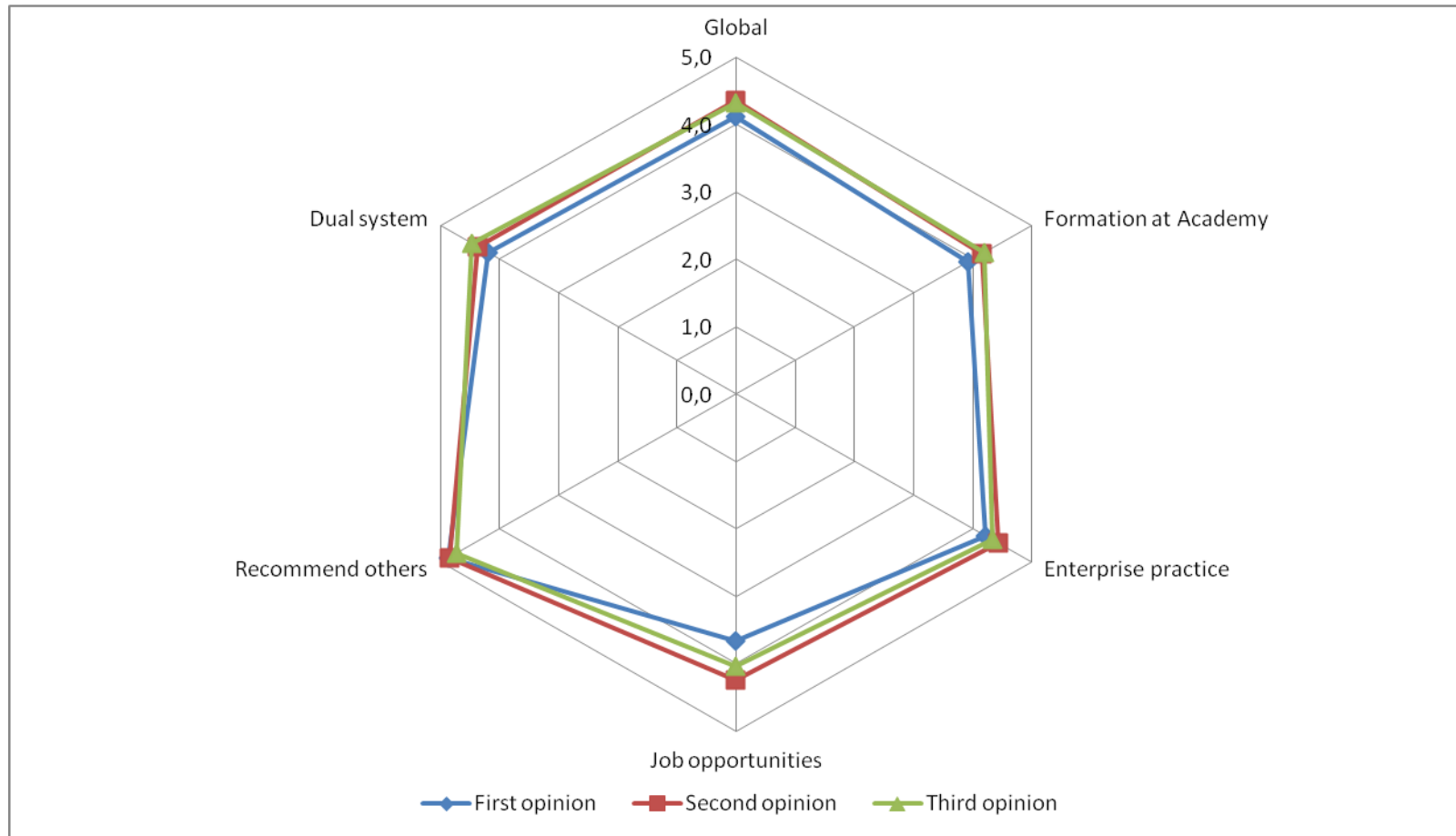
Advantages opinion

Information about advantages and disadvantages under tutor's point of view, were gotten by "Tutor questionnaire" in questions 31 and 32 (See Annex 13). These were open questions that had been classified, getting the follow factors as advantages: Job opportunity, labor experience, less time for enterprise training, prepares future worker, and communication between academy and enterprise. From factors identified, the most pointed out were labor experience of the students in group dual, and the opportunity for enterprises to prepare future workers (See Graph 4.3.2-5).

Graph 4.3.2-5. Advantages according tutor's opinions
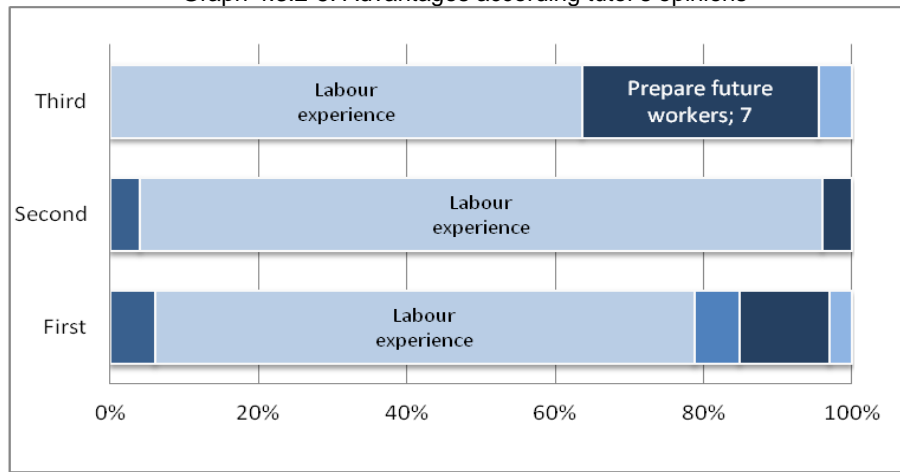
About disadvantages

Some disadvantages were identified by tutors, like lack of coordination; lack of resources; binnacle is not completely developed; student has not compromised to work in the company; lack of enterprise support and incentives for enterprises. Common opinions with students about disadvantages are lack of coordination and lack of resources (See Table 4.3.2-6).

Table 4.3.2-6. Advantages & disadvantages according tutor´s opinion

Dual system advantages according tutor´s opinion	Dual system disadvantages according tutor´s opinion
• Job opportunity • Labor experience • Prepare future workers • Less time for enterprise training • Communication between academy and enterprise	• Lack of coordination • Binnacle is not completely developed • Lack of resource at the Enterprise • Students have not compromised to work in the company • Lack of enterprise support

b. Interviews

The interviews were done with the purpose to explore students and tutors opinion about the formation development who was receiving students under the new system. In every instrument were established the objectives, the sample, data collected method, time, type of interview, categories, variables, the statement of agreement, and the interview protocol (See the instruments for student and tutor interviews in 0 and Tutor's interview in Annex 18).

Students and their tutors were selected by random method, where 5 from 39 were the sample[60]. Because, confidentiality the information this study is presented identifying the students and tutors, with code [S#] and [T#] respectively, example Student[1] or Tutor[1]. The transcriptions for each interview are as follow: (a) student interview´s transcripts in Annex 21, and (b) tutor interview´s transcripts in the Annex 22. The interviews have recorded in digital format. The analysis was made using the Qualitative Content Method (Mayring, 2000).

Student interview

The students´ interviews were developed in order to have their opinion about the formation development that they have received under the new system. The specific objectives were:

- To know if they work in the area that was formed

- Explore the experience being formed in the Dual system

- Identify difficulties in the development of their studies

- Explore about the evaluation of the competences that they have had

- Explore how their studies, have influenced in better job opportunities

- Know their opinion about the dual system expansion

Five interviews were developed with students from dual system, by semi structured interviews, with open questions. Categories explored were (a) Work in the area of formation (b) experience in the system, (c) limitations, (d) evaluation method, (e) job

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[60]   Data were selected using SPSS.

opportunities, and (f) measures to expand the system. The questions for the interview were classified by categories as are presented in the Table 4.3.2-7.

Table 4.3.2-7. Questions for Student Interview by category

Category	Related objective	Variable	Item #	Question
Work in the area where was formed	To know if they work in area that were formed	Job related with the formation area	Q1	What is your position in the company? Is your job related to the area in which you have been trained?
Experience in the system	Explore the experience being formed in the system.	Experience in general and the formation process	Q2	How has been your experience studying in the Dual System? How do you evaluate formation process?
Limitations	Identify difficult in the development of their studies	Limitations dual system development	Q3	What do you consider are the factors that could limit the development of Dual system?
Evaluation method	Explore the point of view of the students about the evaluation of the competences that they has had.	Evaluation of competence	Q4	How has the system of evaluation in the academy, for measurement the achievement of competence? How has it been in the company? What have been the differences?
Job opportunities	Explore how their studies, has influence in better job opportunities.	Employability	Q5	How the company practices, has allowed better job opportunities for the students?
Measures to expand the system	Know the point of view of the students about the dual system expansion.	Measures to expand	Q6	What should be the measures to be implemented in order to expand coverage of Dual System: in the Academy, Enterprise, Industry, Government and International cooperation?

The interviews were made in Spanish (The recording of the interviews are in the CD attached), and the transcriptions were in English (Annex 21). The analysis of the interviews by categories is in the table below (See Table 4.3.2-8). In this table are the references to the number of interview and the lines where is the information.

Table 4.3.2-8. Student Interview. Analysis by categories

Student's answer by categories		
Interview	**Category of analysis**	**Opinions**
Student [S1]	**Work in the area where was formed - Q1**	Job in the area of formation in quality maintenance (Annex 21; Student Interview [S1]; July, 08th 2011; lines 14-15).
Student [S1]	**Experience in the system - Q2**	At the enterprise, things are more complex, but the knowledge learned at the Academy has been useful. It is necessary that Academy taught closer to the enterprise needs. At the enterprise have learned, and discovered new knowledge. (Annex 21; Student Interview [S1]; July, 08th 2011; lines 18-21,28-29, 44-47, 143-144).
Student [S1]	**Limitations – Q3**	There was difficult to complete the study plan, the modules. Sometime teacher help more other students. (Annex 21; Student Interview [S1]; July, 08th 2011; line 69-74, 117-118).
Student [S1]	**Evaluation method – Q4**	The system was work. They had advantages comparing with students from traditional system. They developed the social competences, like help each other; work in team, the knowledge, technical skills. All was according learning outcomes. (Annex 21; Student Interview [S1]; July, 08th 2011; lines 31, 55-57, 62-64, 95-96, 98, 120-121, 140-141).
Student [S1]	**Job opportunities - Q5**	The enterprises give them a good opportunity with the time and economic support. With the practice at the enterprise, have the chance to adapt to other job. (Annex 21; Student Interview [S1]; July, 08th 2011; lines 68,145-146, 172 - 174).

Student's answer by categories		
Interview	**Category of analysis**	**Opinions**
Student [S1]	Measures to expand the system - Q6	Work more with enterprise needs, always in contact with them. Having good control of the teachers, the subjects, the administration. Expand the economic support from companies to students. (Annex 21, Student Interview [S1]; July, 08th 2011; lines 21-24, 150-151, 161 -165, 174-176).
Student [S2]	Work in the area where was formed - Q1	Yes. Job in the area of machine maintenance. (Annex 21; Student Interview [S2]; July, 23th 2011; lines 19).
Student [S2]	Experience in the system - Q2	It is a good system, and he preferred this system than the traditional. Good way to make the formation process with the practice in real world. To know the labor environment. Time was not enough to complete the theoretical part. They have to work in teams in order to complete the task. Enterprise practice facilitates the incorporation into the company. To have economic support from enterprise was a good motivation. Learned from real problems, working in a team in order to solve them. This system gives advantages for the industry and for students. (Annex 21; Student Interview [S2]; July, 23th 2011; lines 28-29; 43-44, 48-49, 55-58, 79-82, 90-92, 113-116, 168-169).
Student [S2]	Limitations – Q3	Time to complete all the topics, it was not enough for research. Enterprises have benefit with the students; they have to trust in students; with better salary conditions. Some teachers need to be updated with their knowledge. Limitation with access to the equipment. (Annex 21; Student Interview [S2]; July, 23th 2011; lines 30-34,65, 70-71, 205 – 211, 213-214).

Student's answer by categories		
Interview	**Category of analysis**	**Opinions**
Student [S2]	Evaluation method – Q4	Promotes work in teams for evaluations. (Annex 21; Student Interview [S2]; July, 23th 2011; lines 55 -58).
Student [S2]	Job opportunities - Q5	Enterprise practice facilitates the incorporation into the company. This formation has gave him opportunity to have better salary. (Annex 21; Student Interview [S2]; July, 23th 2011; lines 79-82, 126-131, 192).
Student [S2]	Measures to expand the system - Q6	Enterprises should give a lot of importance to this system because give benefits for them. Students have to be motivated with the dual system. (Annex 21; Student Interview [S2]; July, 23th 2011; lines 143-144, 152-155).
Student [S3]	Work in the area where was formed - Q1	Yes. His work position is electric department manager. (Annex 21; Student Interview [S3]; July, 14th 2011; lines 13-14).
Student [S3]	Experience in the system - Q2	With the career upgrade the knowledge. It was a good decision to study in this system because it is profitable, with the enterprise practice. Because it was the first experience, system need to be improve, example the evaluations. (Annex 21; Student Interview [S3]; July, 14th 2011; lines 19-22, 28-34, 45-46).
Student [S3]	Limitations – Q3	The career has a lot of work to do. The program was not completed in 100% (Annex 21; Student Interview [S3]; July, 14th 2011; lines 195-199, 321-324).
Student [S3]	Evaluation method – Q4	The evaluations were by test, labs and significant task. They evaluate the competences, about how students put in practice the knowledge and help other to use the knowledge.

Student's answer by categories		
Interview	**Category of analysis**	**Opinions**
		At the enterprise the following was very close like 80 or 90%. At the enterprise was the binnacle, with this they planned the work for the practice, with good feedback about learning outcomes and attitudes. It was not clear the way that Academy evaluates attitudes. Evaluations at Academy were before to go to the enterprise, it means that the competences after enterprise practice were not evaluated. (Annex 21; Student Interview [S3]; July, 14th 2011; lines 100, 104-107, 111 – 112, 143-145, 149-151, 162-165, 170-171, 174-175, 330-338).
Student [S3]	Job opportunities - Q5	Students have good jobs; acquiring responsibilities with more compromise for the enterprise. (Annex 21; Student Interview [S3]; July, 14th 2011; lines 206-208).
Student [S3]	Measures to expand the system - Q6	Enterprises have to support people with not good economic conditions; open more spaces for students in the enterprises; the government has to support more students and project for foreign investment and more employment; more labs from the international cooperation. (Annex 21; Student Interview [S3]; July, 14th 2011; lines 275-277; 287-292,297).
Student [S4]	Work in the area where was formed - Q1	Yes. Customer support technician. (Annex 21; Student Interview [S4]; July, 26th 2011; lines 13-15).
Student [S4]	Experience in the system - Q2	It was a good experience, with new knowledge. It was hard at the beginning, solving problem at the enterprise; But has learned more, and to work with others. Now they have more experience and know how to resolve customer issues.

Student's answer by categories		
Interview	**Category of analysis**	**Opinions**
		(Annex 21; Student Interview [S4]; July, 26th 2011; lines 18-20, 24-26, 30-33, 116-117).
Student [S4]	Limitations – Q3	There was more work, then more time studying and working;, and without vacations. The study plan was not always complete. (Annex 21; Student Interview [S4]; July, 26th 2011; lines 40-43, 72-74).
Student [S4]	Evaluation method – Q4	Test, labs, solving problems; with responsibilities evaluation, and with the binnacle. Attitudes were evaluates with the binnacle. (Annex 21; Student Interview [S4]; July, 26th 2011; lines 49-51, 54-57, 61-62,64,68-69).
Student [S4]	Job opportunities - Q5	They have jobs with good conditions (good salaries). (Annex 21; Student Interview [S4]; July, 26th 2011; lines 83- 84, 87).
Student [S4]	Measures to expand the system - Q6	More space for students in the enterprise. It is necessary to review the study plan, if it has too much things to teach, it is overload. Teachers more qualified with more experience about real work. Scholarships and labs from government. (Annex 21; Student Interview [S4]; July, 26th 2011; lines 92-93, 97- 100, 107-108).
Student [S5]	Work in the area where was formed - Q1	Yes. Maintenance technician. (Annex 21; Student Interview [S4]; July, 30th 2011; lines 13-16).
Student [S5]	Experience in the system - Q2	Tutors help with the process; at the beginning with a lot of pressure, solving real problems. Now can do the task by himself and help others. To be always busy at the Academy and enterprise without vacations

Student's answer by categories		
Interview	**Category of analysis**	**Opinions**
		was better at the end. Now have learned more.
		(Annex 21; Student Interview [S5]; July, 30th 2011; lines 23- 26; 30-34, 40-43, 49-51, 95-97).
Student [S5]	Limitations – Q3	Difficult at the beginning of the process because of adaptation.
		Do not complete the binnacle. The program was overload.
		Other difficult with the technology in the enterprise
		(Annex 21; Student Interview [S5]; July, 30th 2011; lines 37, 64-65, 81-82)
Student [S5]	Evaluation method – Q4	The evaluations were with test, laboratories and projects (significant task). The binnacle at enterprise
		Evaluation of attitudes.
		(Annex 21; Student Interview [S5]; July, 30th 2011; lines 53-55, 59-62, 71-74).
Student [S5]	Job opportunities - Q5	The advantages going to the enterprises. To have job after the studies.
		(Annex 21; Student Interview [S5]; July, 30th 2011; lines 42-43, 49 – 52, 86-88).
Student [S5]	Measures to expand the system - Q6	More space in the enterprises.
		The career has to be according needs of enterprises.
		(Annex 21; Student Interview [S5]; July, 30th 2011; lines 91-92, 101-102, 104-105).

(Source: Own elaboration, data from transcriptions of Student's interviews. See Annex 21)

Results by Category

The summary of student's interview by category is presented as follow. This information is related with the opinions by category presented in the Table 4.3.2-8, page 145.

- **Work in the area of formation**

All the students that were interviewed had an employment related with their area of formation.

- **Experience in the system**

Important facts pointed out by students about their experience in the system are related with the satisfaction with knowledge learned at the Academy and how it has been useful. It was considered a good way to make the formation process with the practice in real world. Enterprise practice facilitates the incorporation into the company. At the enterprise have learned, and discovered new knowledge, solving real problems, working in teams and learning from others, developing social competences. The economic support from enterprise was a good motivation and it is necessary to continue with this effort. This experience has included the evaluation in areas that according students have to be improved.

Thru the students opinions it could discover the dimension of competencies mentioned by Erpenbeck and Von Rosenstiel (2003) about (a) personal competences,(b) activity and implementation-oriented competencies, (c) Technical and methodological competences, and (d) social and communicative competences[61].

- **Limitations**

Because it was the first experience, system need to be improve, example the evaluations method, the communication between Academy and enterprise, the overload of the curriculum. Some difficult with the technology at the enterprise; some of them did not have all the equipment, but they finish the practice in other enterprise just for some practices[62]. According students, It is necessary that enterprises thrust in them and give more space for enterprise practice and to improve the salary conditions.

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[61] More information about this classification of competencies is in the chapter 2.

[62] Agreement between enterprises was the instrument in order to solve this problem. See the format in Annex 7.

- **Evaluation method**

Dual system has a good evaluation from students related with the competences that has been evaluated. The evaluations were by test, labs and significant task at the Academy. According to students, they evaluate the competences developed about how they put in practice the knowledge and help other to use the knowledge.

At the enterprise was the binnacle, with this they planned the work for the practice, with good feedback about learning outcomes and attitudes. It was not clear for students the way that Academy evaluates attitudes. Evaluations at Academy were before to go to the enterprise, it means that the competences after enterprise practice were not evaluated.

- **Job opportunities**

Students recognize the job opportunities that they have had because the Dual system and its enterprise practice.

- **Measures to expand the system**

Important facts have been recommended to ensure the expansion of the system, like to design and developed careers or programs according the needs of enterprise; improve the administration, the teacher competences where demonstrate that have real experience from labor world. In other hand, they pointed out the need that enterprise support more students and government promotes scholarships and laboratories in order to allow other students to have access to this kind of system.

Conclusion

In general, with the interviews to students, It has been confirmed that there are a good opinion about Dual system. Related with the process there are favorable opinions, even though they recommended to review the study plan, because most of them think that is too much, and they do not finish with all the curricula. About the evaluation, the aspect that has to be considered is that evaluation at the Academy is before to go to the enterprises; meaning that the Academy, do not evaluate what has happened after the enterprise practice. Regarding to job opportunity, all of them have accepted that with Dual system they had the opportunity to get a job in less time. About expanding the Dual system, they believe that it has to be taking in consideration the enterprise needs, with support of the government, and motivating the students for the new system.

Tutor´s interview

The general goal was to explore tutors' opinion about dual system: process, evaluation and opportunities. The specific objectives were:

- To know the experience being tutor in the Dual system

- To identify factors that constraint the development of the Dual system

- To explore about the evaluation process

- To explore how Dual system has influenced in better job opportunities

- To know their opinions about which measures should be implemented to expand of Dual System

Five interviews were developed with tutors from dual system, by semi structured interviews, with open questions. Categories explored were (a) Experience in the system, (b) limitations, (c) evaluation method, (d) job opportunities, and (e) measures to expand the system. The questions for the interview were classified by categories as are presented in the Table 4.3.2-9.

Table 4.3.2-9. Questions for Tutor Interview by category

Category	Related objective	Variable	Item #	Questions
Experience in the system	To know the experience being tutor in the Dual system	Experience in general and the formation process	Q1.	How has been your experience participating in the Dual System? How do you evaluate formation process?
Limitations	To identify factors that limits the development of the Dual system.	Limitations dual system development	Q2.	What do you consider are the factors that could limit the development of Dual system?
Evaluation method	To explore about the evaluation process	Evaluation of competence	Q3.	How has been the system of evaluation, for measurement of competence in the company for students?

Category	Related objective	Variable	Item #	Questions
Job opportunities	To explore how Dual system has influenced in better job opportunities.	Employability	Q4.	How the company practice, has allowed better job opportunities for the students?
Measures to expand the system	To know their opinions about which measures should be implemented to expand of Dual System.	Measures to expand	Q5.	What should be the measures to be implemented in order to expand coverage of Dual System: in the Academy, Enterprise, Industry, Government and International cooperation?

The interviews were made in Spanish (The recording of the interviews are in the CD attached), and the transcriptions were in English (Annex 22). The analysis of the interviews by categories is in the table below (See Table 4.3.2-10). In this table are the references to the number of interview and the lines where is the information.

Table 4.3.2-10. Tutor´s interview. Analysis by categories.

Interview	Category of analysis	Opinions
Tutor [T1]	Experience in the system - Q1	Good experience, because the Academy prepared the process (training, binnacle, procedures, and so on); students work with real situations; can deal with and analyze and solve problems. They have learned thru the time. They could face, analyze and resolve the problems. They acquire experience. At the time of graduation dual group has better competences. Trained according needs of the company. (Annex 22; Tutor Interview [T1]; July, 22[h] 2011; lines12-13, 29-33, 39-44,52,61-62, 129-131, 145-147)
Tutor [T1]	Limitations – Q2	Take time to have experience at work; it is necessary to review the time of the career, it is too much knowledge. Did not complete the binnacle because time or topics do not apply. The high school formation could affect. The program of study is overloaded. (Annex 22; Tutor Interview [T1]; July, 22[h] 2011; lines 21-23, 74-77, 85-86, 139-140)
Tutor [T1]	Evaluation method – Q3	Evaluations by exams at the Academy. In the traditional group there were more time for evaluations. With Dual group the experience was different, with less time for studying, with more pressure. Besides Dual group have the experience to apply all the knowledge and skills. The binnacle means a lot of work. (Annex 22; Tutor Interview [T1]; July, 22[h] 2011; lines 95-96, 101-104, 107-110)
Tutor [T1]	Job opportunities – Q4	They are formed according enterprise needs; it is the advantages for job opportunities. (Annex 22; Tutor Interview [T1],July, 22[h] 2011,lines 145-150)
Tutor [T1]	Measures to expand the system – Q5	More space from companies for students. Better communication to the enterprises, showing them benefits of Dual system. From government support for students and incentives for enterprises. (Annex 22; Tutor Interview [T1]; July, 22[h] 2011; lines 157-158, 162-165, 173-177)

Interview	Category of analysis	Opinions
Tutor [T2]	Experience in the system - Q1	A complete process of formation. They were motivated applying the knowledge in enterprise practice, with many applications They work with responsibility, character and discipline. They were maturing during the process. With the system have the opportunity to have people well prepared to be hired after. (Annex 22; Tutor Interview [T2]; July, 11th 2011; lines 12-13, 76-77, 82-83, 111-114, 123-126)
Tutor [T2]	Limitations – Q2	To finish with the binnacle it was not possible because company did not have the machines. The production are the priority. (Annex 22; Tutor Interview [T2]; July, 11th 2011; lines 19-22,27-28, 38-40, 93-94)
Tutor [T2]	Evaluation method – Q3	It is necessary to review the evaluation method, sometime they evaluates only theoretical knowledge (Annex 22; Tutor Interview [T2]; July, 11th 2011; lines 48-52)
Tutor [T2]	Job opportunities – Q4	The opportunities were for the student with more dispositions and ability. There are opportunities for technicians in technological areas (Annex 22; Tutor Interview [T2]; July, 11th 2011; 142-146; 165-172)
Tutor [T2]	Measures to expand the system – Q5	The enterprise can participate like a social responsibility; the government has to work with incentives and students support. Networking with enterprises. A lot of communications about benefits of the system and agreements with Industrialist and commerce chambers. Have connection with industry for curricula design. Training for enterprises. It could be successful, one because the employer knows from first hand their employee and how they are going to behave, does it in a slow form and develops the attitudes, and the responsibilities that they want from the new employee. The promotion must be have.

Interview	Category of analysis	Opinions
		Study plan according enterprise needs. (Annex 22; Tutor Interview [T2]; July, 11th 2011; lines 182-185, 191-194, 227-230, 235, 253-256, 264-268)
Tutor [T3]	Experience in the system - Q1	With this system are forming the people for the next generation at enterprise. They learn how to deal with problems and find solution in the production line. It is a gradual process. (Annex 22; Tutor Interview [T3]; July, 6th 2011; lines 14-17)
Tutor [T3]	Limitations – Q2	It is necessary more feedback from teachers and coordinators. It is necessary the will, and commitment by enterprises. (Annex 22; Tutor Interview [T3]; July, 6th 2011; lines 29-34, 74-75)
	Evaluation method – Q3	At the Academy, they did the theoretical evaluations, but they not evaluate how students resolve real problems; this is a strength for Dual system, but it is not evaluated. The binnacle was useful. (Annex 22; Tutor Interview [T3]; July, 6th 2011; lines 47-51, 55-58, 65-68)
Tutor [T3]	Job opportunities – Q4	For more job opportunities, there are areas such as leadership, self-esteem, entrepreneurship, that has to be teach (Annex 22; Tutor Interview [T3]; July, 6th 2011; lines 117-119)
Tutor [T3]	Measures to expand the system – Q5	Communicate the benefits for the enterprises and students; enterprise are where they win. With career that enterprise needs. Government has to work in the incentives. (Annex 22; Tutor Interview [T3]; July, 6th 2011; lines 78-80, 97-98
Tutor [T4]	Experience in the system - Q1	It has been a new way to form the technicians; It was a new experience for our enterprise, and the tutors. Tutors have learned . For students were a good real labor experience and to have contact with other persons in the company; they have combine the theory and the practice. They learned how to comply with the

Interview	Category of analysis	Opinions
		rules and how to work with others.
		They solved real problems.
		(Annex 22; Tutor Interview [T4]; July, 27th 2011; lines 12-15, 18-21, 25-28, 31-34 , 43-44, 83-85)
Tutor [T4]	Limitations – Q2	The economic situation of the enterprises in El Salvador;
		The aperture of the enterprise to receive more students and support them.
		Binnacle was not completed because other priorities at work
		(Annex 22; Tutor Interview [T4]; July, 27th 2011; lines 36-39, 56-58, 79-80)
Tutor [T4]	Evaluation method – Q3	The evaluations were at the end of every month.
		The binnacle help to put in order the work with the student, but It was not finished.
		The students receive feedback about their behavior.
		At the Academy they presented exams and projects.
		(Annex 22; Tutor Interview [T4]; July, 27th 2011; lines 50-54, 61-64, 71-73)
Tutor [T4]	Job opportunities – Q4	In this system they have the chance to learn about the enterprise and do practice and work with real problems
		(Annex 22; Tutor Interview [T4]; July, 27th 2011; lines 76-80)
Tutor [T4]	Measures to expand the system – Q5	It is important to have careers that enterprise's needs. And communicate to the enterprises the benefits and difficult of this system. The government could give incentives to the enterprises and scholarships for students. Support like social responsibility.
		(Annex 22; Tutor Interview [T4]; July, 27th 2011; lines 94-95, 100-104, 108-113)
Tutor [T5]	Experience in the system - Q1	The enterprise has programs like a social responsibility, where support students from different careers, but Dual system were different because the formation process was developed in cooperation enterprise and Academy.

Interview	Category of analysis	Opinions
		It was new but we know the experience from Germany. (Annex 22; Tutor Interview [T5]; July, 14th 2011; lines 12-14, 19-22, 32-34)
Tutor [T5	Limitations – Q2	The time that tutor need to attend students and to do the work, all the responsibilities for the enterprises. The space in the enterprises for the students. (Annex 22; Tutor Interview [T5]; July, 14th 2011; lines 38-39, 47-48)
Tutor [T5	Evaluation method – Q3	At the Academy it was by exams, labs and projects. The binnacle was the instrument to do the evaluations. It has a lot of activities that cannot be finish. There was evaluation about the attitudes of the student; it was in a meeting between the tutor and the students, and make reflection about how to improve according the enterprise values and rules (Annex 22; Tutor Interview [T5]; July, 14th 2011; lines 53-56, 61-64, 68-70, 72-73)
Tutor [T5	Job opportunities – Q4	From 2 students,1 got a job at the enterprise. The other find a better job in other enterprise. They had job opportunities because the good formation, the career and the real life experience (Annex 22; Tutor Interview [T5]; July, 14th 2011; lines 50-51, 77-81)
Tutor [T5	Measures to expand the system – Q5	It could be good to implement Dual system in other careers. Incentives from government for companies. Communication about benefits. Enterprises have to know how it works and the benefits. More career but that enterprises needs (Annex 22; Tutor Interview [T5]; July, 14th 2011; lines 87-88, 95-97, 99)

(Source: Own elaboration, data from transcriptions of Tutor's interviews. See Annex 22)

Results by Category

The summary of student's interview by category is presented as follow. This information is related with the opinions by category presented in the Table 4.3.2-10, page 155.

- **Experience in the system**

There are coincidences between tutor and student opinions about this category. Tutor have expressed that this has been a good experience, because the Academy prepared the process (training, binnacle, procedures, and so on); students work with real situations; can deal with and analyze and solve problems. They could face, analyze and resolve the problems. They acquire experience. At the time of graduation dual group has better competences. Students were encouraged to do the enterprise practice with responsibility, attending rules into the company. They were maturing during the process. In the other hand, It was a learning process for tutors too.

- **Limitations**

According tutors, work with Dual system need time to develop the experience at work, and the curriculum was overload affecting the complete development of the Binnacle; sometimes it was affected because their duties in the enterprises where productions are the priority; besides, for some practices the enterprise did not have the required equipment. Other fact is the lack of feedback from teachers and coordinators, where is necessary more communication between them and the tutors.

It is necessary the commitment by enterprises with more support and spaces for students; most of the time this commitment is affected because the poor performance of the Salvadoran economy that affects productivity and employment levels.

- **Evaluation method**

Tutors explain that evaluations were by exams, labs and project at the Academy. At the enterprise the evaluation for technical skills and attitudes were in the Binnacle; the evaluations were at the end of every month, and students receive feedback about their behavior, making reflection about how to improve according the enterprise values and rules.

According tutors, the evaluation for students in dual system were more realistic than those who were in traditional system. Dual group has less time for studying, with more pressure; but with the experience to apply all the knowledge and skills, developing better level of competencies. It is necessary to review the evaluation method, sometime they evaluates only theoretical knowledge but they not evaluate how students resolve real problems; this is a strength for Dual system; besides the evaluations were before the enterprise practice, meaning that they do not considered how the student reinforce their competencies level at enterprise.

- **Job opportunities**

Tutor pointed out that Dual system is an advantages for job opportunities, because students are formed according enterprise needs, with real life experience; having chance to learn about the enterprise and do practice and work with real problems. The opportunities were for the student with more dispositions and ability. In other hand, it is important to consider that there are opportunities for technicians in technological areas.

- **Measures to expand the system**

About measure to expand the system, tutor recommend to implement careers that enterprise's needs, and communicate to the enterprises the benefits and difficult of this system. The government could give incentives to the enterprises and scholarships for students.

It is necessary to have connection with enterprise in Dual system. Employer knows from first hand their employee, and how they are going to behave, they know about their responsibilities and attitudes or disposition. Enterprise has to open more space from companies to students.

Conclusion

In the tutor´s interviews, they have expressed their favorable opinion about the formation process, because the labor experience of the students, the development of the responsibilities and the opportunity to have people that they know for being hired. According their opinion student have worked with real problems and have learn to do the solution applying their theoretical knowledge and abilities, with good disposition.

About constraint, they have pointed out the necessity to review the career related with the duration and the contents and the binnacle. Besides, It means to work with commitment of more enterprises. It is clear for them that with Dual system there are better job opportunities to the students. An important action of the process is the feedback from tutors to students related with their attitudes, responsibilities, and their incorporation to the enterprise.

Finally, their opinion about the deployment of the system, the recommendation is to communicate the benefits and difficult of work with the system inside the enterprise, for example the time of the tutor, the economic support from the enterprise, and so on. For government, they have recommended to work in incentives for enterprises and scholarships for enterprises. Tutors are clear that the Academy must supply careers that enterprise's needs, in order to have spaces for practice into the company.

4.4   Job in less time and better salary (H1.2)

Returning to the understanding of competences according OEDC, where, "Key competences represent a transferable, multifunctional package of knowledge, skills and attitudes that all individuals need for personal fulfillment and development, inclusion and employment. These should have been developed by the end of compulsory school or training, and should act as a foundation for further learning as part of Lifelong Learning"[63], it is important evaluate the employability as a result of the formation process of the new study system. Then the empirical research included, to prove, if students in Dual system (the new system), have had better opportunities of employment than students in traditional system. The measurements were by time to be hired and the salary level. The sub hypothesis to test was:

> *H1.2: The students from cohort 2008 - 2010 that were formed in the new system (Dual system),* **got job in less time in the first 6 months** *after the graduation and* **better salary condition***, than those of the same cohort who were formed in the traditional system.*

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[63]   European Commission (2003b). Implementation of "Education and Training 2010" work program, Working group on Basic skills, entrepreneurship and foreign languages.

The population of the cohort 2008 - 2010 was 56 students, from which the 75% finished their studies as the study plan demanded. In Dual system from 39 students, 31 (79% of dual population) were graduated on time, meanwhile in traditional, from 17, 11 students (65% from traditional population) finish on time (See Graph 4.4-1).

Graph 4.4-1. Mechatronic cohort 2008 -2010- Graduates
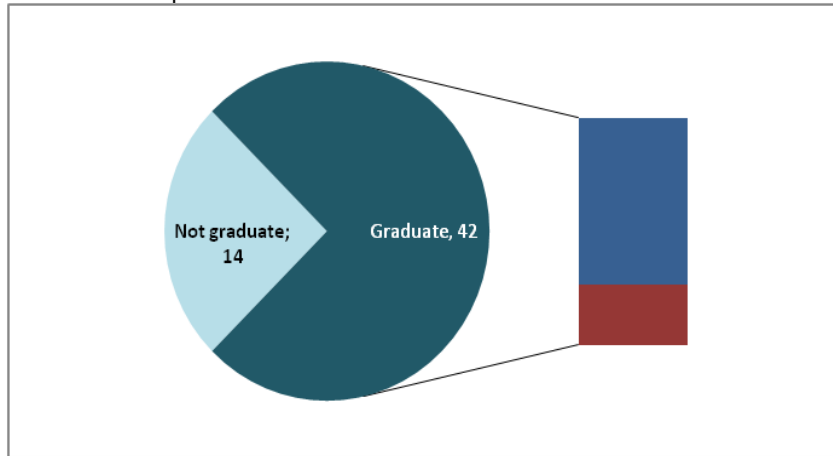
The foregoing mean, that dual system has better performance than traditional, in terms of academic efficiency as measured by the time it takes to complete the studies. Considering the graduation the end of the studies, this was the started point to measure the time that took the student to be employed by an enterprise and its correspondent salary (See 0 for more details about these data calculation).

It is important to clarify that, in addition to the graduates, some of the undergraduates, were employed, so for purposes of this investigation are considered both.

a. Job in less time

Taking into consideration graduate and not graduate on time students, six months after the graduation, 85% of dual group got a job, while in traditional group only 53% had employment (See Graph 4.4-2).

Graph 4.4-2. Mechatronic cohort 2008 – 2010 - Level of employability
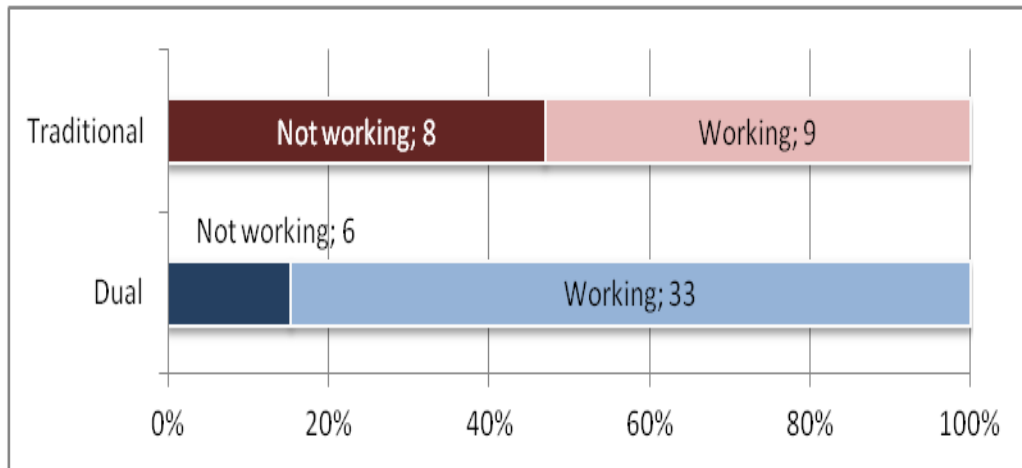
Analyzing inside the data, most of the graduates' students and some not graduate, with an employ in the first month after graduation: 67% for Dual system, and 41% for Traditional. In case of Dual group, the **Level of Retained** was 41%; meaning the proportion of persons who got a job immediately that they have finished their studies, which were hired in the same enterprise where practice was done. After six month, the gap into the two groups in relation to the time to get a job grow up, where dual group's employability was 85%, while traditional had 53% (See Table 4.4-1).

Table 4.4-1. Mechatronic cohort 2008 – 2010 - Time to get a job

Time to get Job since graduation (Include graduate and not graduate on time students)				
Time	**Study System**			
	Dual		**Traditional**	
	Count	**The cumulative percentage**	**Count**	**The cumulative percentage**
Immediately after graduation	16	41%	0	0%
One month after	10	67%	7	41%
Two months after	1	69%	0	41%
Three months after	**1**	**72%**	**1**	**47%**
Four months after	0	72%	0	47%
Five months after	1	74%	1	53%
Six months after	4	85%	0	53%
Without job	**6**	**100%**	**8**	**100%**
Total	**39**		**17**	

The Level of retained (41%) was close with the expectation to be hired that the students have (54%) (See Graph 4.4-3).

Graph 4.4-3. Expectative to be hire by students
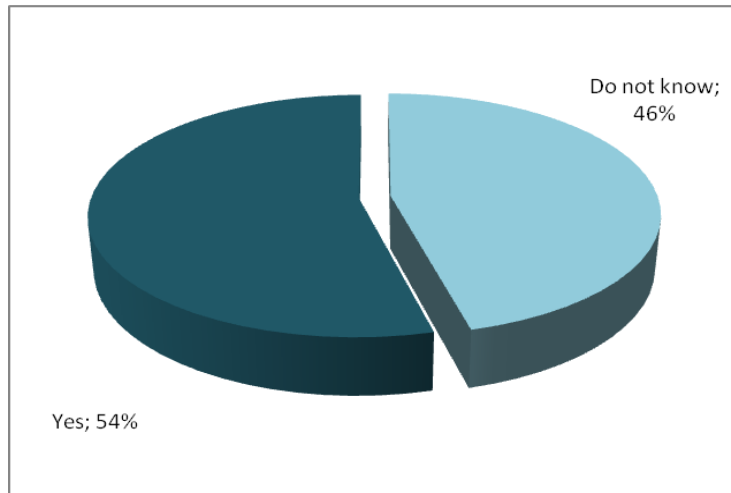
In conclusion:

*According the **job placement and the level of retention**, the students from cohort 2008 - 2010 that were formed in the new system (Dual system), got job in less time in the first 6 months after the graduation, than those of the same cohort who were formed in the traditional system.*

b. Better salary

In the sub hypothesis H1.2, one of the factors to prove is the salary conditions for students from cohort 2008 – 2010 who had been employed. The hypothesis declaration is as follow:

*H1.2: The students from cohort 2008 - 2010 that were formed in the new system (Dual system), **got job in less time in the first 6 months** after their graduation and **better salary condition**, than those of the same cohort who were formed in the traditional system.*

Where,

$$H_0: \mu_{Salary\_dual} = \mu_{Salary\_traditional}$$

$$H_1: \mu_{Salary\_dual} \neq \mu_{Salary\_traditional}$$

The test is applied for testing differences between means, by the T-Student for independent samples[64]. The mean value obtained for the Study System and other statistical data as the standard deviation and standard error of the mean, is shown below (See Table 4.4-2):

Table 4.4-2. Statistics of Mechatronic student salary from cohort 2008 - 2010

Group Statistics					
	Study System	N	Mean	Std. Deviation	Std. error Mean
Salary	Dual[65]	32	476.31	158.00	27.93
	Traditional	9	357.78	115.30	38.43

Applying the T-Student test, resulting in the following table with the inferential statistics (See Table 4.4-3):

Table 4.4-3. t-Test for Salary

Independent Samples Test									
	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	Sig.	T	df	Sig.	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
					(2-tailed)			Lower	Upper

---

64 Results from the database "Final Student Profile.sav" processed by the software: Statistical Package for the Social Sciences (SPSS).

65 Even though, 33 persons were working, only 32 were processed, because one of the data was not available because the technician was out of the country.

Independent Samples Test									
Salary	Equal variances assumed	1.102	.300	2.091	39	.043	118.5347	56.6858	3.8768	233.1926
	Equal variances not assumed			2.495	17.427	.023	118.5347	47.5114	18.4815	218.5879

The columns labeled "Levene's Test for Equality of Variances", tell it whether an assumption of the t-test has been met. The t-test assumes that the variability of each group is approximately equal. Then **Levene test:**

$$Sig. = 0.300 > 0.05$$

Because the value (0.300) is greater than α level for the test (.05), then the null hypothesis is accepted where the variability of the two groups is equal, **implying that the variances are equal**. Then, **T-Student for equal variances:**

$$Sig. (p) = 0.043 < 0.05$$

The t test for independent sample reveal a statistically reliable difference between the mean of salary, that students of Dual System have ($\mu_{Salary\_Dual} = 476.31$, $s = 158.00$), and students of Traditional system have ($\mu_{Salary\_Traditional} = 357.78$, $s = 115.30$), $t(39) = 2.091$, $p = 0.043$, $\alpha = 0.05$.

In conclusion:

H_0 is rejected, then there is a significant differences between both group related with the salary, where dual group **($\mu_{Salary_Dual} = $ US\$476.31)**, has gotten better salary than traditional group **($\mu_{Salary_Traditional} = $ US\$357.78)**.

$$Ho: \mu_{Salary\_dual} \neq \mu_{Salary\_traditional}$$

It is also important as a reference point that minimum wage for industry since May 2011 is US\$210.30 in El Salvador (Ministerio de Trabajo y Previsión Social, 2011). Moreover, the average salary of all technical graduates at the same time of

Mechatronic groups, in this educational institution for the year 2010 was US$379.62, and the percentage of job placement of 73.56%[66].

The foregoing, shows that the Dual group's students, had better results at the job placement Percentage (85%) relative to the job placement rate of graduates of all technical careers of the Academy (73.56%); in wage levels also exceeded the overall average for all technical graduates in the year 2010 (See Graph 4.4-4).

Graph 4.4-4. Average salary
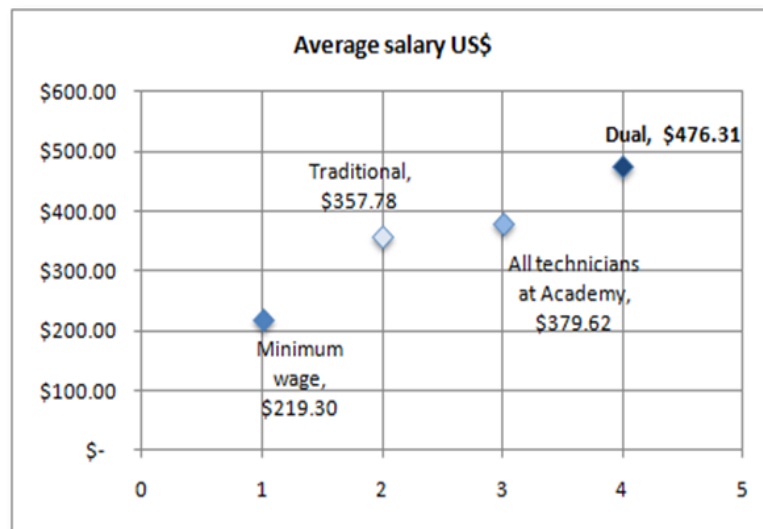
4.5   **Industrialist motivation (H.2)**

Enterprise participation is critical in Dual system, because one of the most important elements is to expose students to real labor life, then it was an important aim of this study to determine the factors that motivates the industrialists to participate in the students' formation by this system; with this purpose the investigation started with the follow hypothesis:

H2: The factors that motivate the industrialists to participate in the dual system are expectation to get people with better competences, to reduce training costs and to take part of student´s formation.

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[66]   The job placement rate and the average salary, was calculated in the first 6 months after the graduation, and the data was in the Annual Report for the year 2010; it included the graduated from all technical careers.Annual Report of ITCA (ITCA, 2011b).

To reach this aims the scientific methodology to apply was a **qualitative method** by interviews to industrialist and reports prepared by the German Adviser responsible for the Implementation of the Dual system in Mechatronic career.

Interviews for industrialist were designed in order to explore which are the factors that motivated them to be part of Dual system. Besides, with the objective to explore more extensively such as entrepreneurs see the implementation of the system, these others complementary variables were considered in the interviews: limitations for implementing the system, measures to expand it and the actions in the formation process to increase employability (In Annex 19 there is the instrument for Industrial Interview). The goals of the interviews were:

- To identify factors that motivate to industrialist to be part of Dual system

- To explore the factors that limits the development of the Dual system

- To know the point of view of employer that measures should be implemented to expand coverage of Dual System

- Identifying, the actions that employers think are important to improve the level of employability of young people from the educational process

Interviews

The number of enterprises started with the cohort 2008 – 2010 of Mechatronic in Dual system were 22, but for this aim, six person (27%) who were involved in the decision of participate on the system were interviewed, one per company. Enterprise were selected by random method, where 6 (27%) from 22 companies conformed the sample[67]. Because confidentiality, the information in this study is presented identifying the enterprise by number, type of investment, number of employees and size (See Table 4.5-1)

Table 4.5-1. Enterprises which were interviewed

Number	Enterprise	Investment	Number of employees	Size
1	Enterprise 1	Other country investment with programs like dual system	More than 100 employees	Large

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[67] Data were selected using SPSS program from enterprise database and saved into Sample_Enterprise_interview database

2	Enterprise 2	Other country investment with programs like dual system	More than 100 employees	Large
3	Enterprise 3	Other country investment with programs like dual system	More than 100 employees	Large
4	Enterprise 5	German investment	Until 100 employees	Large
5	Enterprise 6	Salvadoran investment	Until 100 employees	Large
6	Enterprise 7	Salvadoran investment	More than 100 employees	Large

Interviews were developed with Decision Maker people from enterprises working with dual system, by semi structured interviews, with open questions. Categories explored were (a) motivations to be in Dual system (b) Factor that limit Dual system, (c) measures to be implemented, and (d) actions to improve employability.

The questions for the interview were classified by categories as are presented in the Table 4.5-2.

Table 4.5-2. Questions for Decision Maker Interview by category

Category	Related objective	Variable	Item #	Question
Motivations to be in Dual system	To identify factors that motivate to industrialist to be part of Dual system	Factors of motivation	Q1.	Under your point of view, which are the factors that motivated you to participate in Dual system? From the list below, select the 3 most important factors to participate in Dual system ____ Lower production costs ____ Reduce hiring costs ____ Reduce training costs ____ Reduce the risk of hiring wrong people ____ Having people with better competences according to the needs of the company ____ Participate in the formation process ____ Support to improve youth employability ___ Promote work experience in youth ____Improve the Academy's relationship with the Company ___ Other: _____

Category	Related objective	Variable	Item #	Question
Factor that Limit Dual system	To explore the factors that limit the development of the Dual	Limitations	Q2.	What do you consider are the factors that could limit the development of Dual system? From the list below, select the 3 most important factors that could limit the development of Dual system ___ Coordination between Academia and the company ___ Costs to keep students in practice ___ Lack of resources in the company ___ Lack of resources in the academy ___ Lack of student interest ___ Other: _____
Measures to expand the system	To know from the point of view of employer that measures should be implemented to expand coverage of Dual System	Measures to expand	Q3.	What should be the measures to be implemented in order to expand coverage of Dual System: in the Academy, Enterprise, Industry, Government and International cooperation?
Actions to increase employability	Identifying, the actions that employers think are important to improve the level of employability of young people from the educational process	Employability	Q4.	Which are the most important actions to improve the level of employability of young people from the educational process?

The interviews were made in Spanish (The recording of the interviews are in the CD attached), and the transcriptions were in English (Annex 23). The analysis was made using the Qualitative Content Method (Mayring, 2000). Besides, in this analysis has been applied the concept map technique, with the purpose to organize the ideas in logic way, and to have a better visual comprehension of the results.

The analysis of the interviews by categories is in the table below (See Table 4.5-3). In this table are the references to the number of interview and the lines where is the information.

Table 4.5-3. Decision Maker Interview. Analysis by categories

Interview	Category of analysis	Opinion
Decision Maker [D1]	Motivations to be in Dual system	Motivation was because the innovation in the new career in El Salvador, that combine three different areas (mechanical, electronics and informatics), with dual system. People from the production line were studying in Germany. Dual system has benefits for students because they have the opportunity to developed labor experience. For the country it a good option to have well prepare youth for the work life. The program has been successful because they have good results in the productions. Students have been incorporated in maintenance production equipment and now they have implemented some measurement that has meant less time of the equipment out work. He thinks that they will accept any kind of program under the condition that it must to improve the performance in the company. The program do not reduce training cost because there are a long period of time that the student is not at the company, but optimized the investment training, because in the medium term it produce better positive results. The program was the opportunity to train the employees, who further will contribute to improve the productivity and to rise quality standards into the factory. (Annex 23; Decision Maker Interview [D1]; July, 27th 2011; lines 14, 21-22, 23, 31-32, 46-47, 52-53, 57, 64-65, 68-69, 76, 79-80).

Interview	Category of analysis	Opinion
Decision Maker [D1]	Factors that limit Dual system	Managing scarcity, the mental scarcity from managers, who see only the focus of money at the time, they do not see beyond their company. Trying to do the system like an imposition (Annex 23; Decision maker Interview [D1]; July, 27th 2011; lines 85-86, 145-146)
Decision Maker [D1]	Measures to expand the system	Communicate the program to Salvadorian Industrial Association and show them the benefits. It has to be developed only with enterprises. It is necessary more agreements with companies. Besides Government could help with scholarships (Annex 23; Decision maker Interview [D1]; July, 27th 2011; lines 14- 106, 112-115, 124-127, 148, 153-154, 179-181).
Decision Maker [D1]	Actions to increase employability	El Salvador needs workers, most of the people emigrate. People have to be qualified with professional level. (Annex 23; Decision Maker Interview [D1]]; July, 27th 2011; lines 187-188, 201-203, 205-208).
Decision Maker [D2]	Motivations to be in Dual system	The training of the personnel according to the proper activities of the company, guaranteeing an adequate participation in the discipline. (Annex 23; Decision maker Interview [D2]; July, 11th 2011; lines 15-17).
Decision Maker [D2]	Factors that limit Dual system	The economic situation, is a part of the difficult from the companies because, not having

Interview	Category of analysis	Opinion
		so many positions to offer.
		The costs of maintaining a student. Lack of resources, sometimes, some attitudes with the people, with the students, lack of resources from the company.
		(Annex 23; Decision maker Interview [D2]; July, 11th 2011; lines 20-21, 24-25).
Decision Maker [D2]	Measures to expand the system	There should be, tax incentives. The formation has to strengthen responsibility attitudes, schedule fulfillment.
		(Annex 23; Decision maker Interview [D2]; July, 11th 2011; lines 30-32, 46-49).
Decision Maker [D2]	Actions to increase employability	Students could have besides good qualifications, they must have good responsibility attitudes, schedule fulfillment, even hygiene standards.
		(Annex 23; Decision maker Interview [D2]; July, 11th 2011; lines 46-50).
Decision Maker [D3]	Motivations to be in Dual system	The factor that motivated her to be part of Dual system was the previous knowledge about this kind of formation. She was formed in a similar program in other country, then she and all the students of that generation got the benefits of the system having in short time the opportunity to work; so believes that system works.
		Decrease the risk to hire wrong people, because they have been working for almost 3 years, and they know the student behavior, attitudes and technical capacity.
		Reduce the training cost, because do not have to pay salary during the formation process, and the student support the production. With new employees have to pay

Interview	Category of analysis	Opinion
		salary, training and they do not produce at the beginning.

Also having people that have better competences, according to the necessities of the company.

Now the Company continues receiving more students from the Dual system program, because for them is the opportunity to have people with better competences according the company needs, due to they learn about process and the equipment into the line production

(Annex 23; Decision maker Interview [D3]; July, 11th 2011; lines 16-19, 26-27, 36-37, 40-41, 43). |
| Decision Maker [D3] | Factors that limit Dual system | The company continues in the program because they believe in the benefits, even though the students, who were supported in the first cohort, do not work with them because they had better job opportunities in other companies. They hope to have in the future, better economic conditions in order to retain these types of employees.

(Annex 23; Decision maker Interview [D3]; July, 11th 2011; lines 45-47, 50-52). |
| Decision Maker [D3] | Measures to expand the system | To have a good feedback they have to be checking and they do it, the boys are constantly learning, in the workplace.

For Company, means to assign a person in charge to be the tutor of that person, and communicate with them, and assure that that tutor spends time, but you can assign them. |

Interview	Category of analysis	Opinion
		Communicate the systems with its benefits.
		(Annex 23; Decision maker Interview [D3]; July, 11th 2011; lines 63-64, 81-83, 91-94).
Decision Maker [D3]	Actions to increase employability	Students are inserted quicker into a job, because they almost go with a secure job.
		With agreements with companies and assure that the young person I going to get a job, if not, what is the point of preparing them, if they are going to be sitting unemployed.
		Students have to know how to behave inside of a company, but that almost comes from the personality of each of them.
		(Annex 23; Decision maker Interview [D3]; July, 11th 2011; lines 98-99, 116-118, 127-128, 131-133).
Decision Maker [D4]	Motivations to be in Dual system	Previous knowledge about Dual system because they have German roots and they decided from the beginning to start with two technicians.
		To have well-trained people with what enterprise need.
		To believe in the system
		In traditional system they do not have labor experience.
		In the dual formation they bring a lot of experience, in reality the dual, It is an excellent opportunity for students, to train, to someone that haves all the theory knowledge that they acquire in the normal technician, they acquire the labor experience of work environment

Interview	Category of analysis	Opinion
		(Annex 23; Decision maker Interview [D4]; July, 11th 2011; lines 14-15, 19-20, 37-39, 63-66, 78-81, 101-104, 121-122).
Decision Maker [D4]	Factors that limit Dual system	The shrinkage labor market that limit the spaces for students at enterprises.
		It requires a high commitment from the institution, that is doing it, a high commitment from the company.
		Enterprise has to have a structure to in the system, for example a production departments, or maintenance department; it means something related with the study program.
		the limitations for technicians, in employment, is the excess of university graduates, there is simply to many graduates of engineering, of bachelors, year by year, that with the need of a job and everything.
		(Annex 23; Decision maker Interview [D4]; July, 11th 2011; lines 29-31, 126-127, 143-144, 149-153, 185-187).
Decision Maker [D4]	Measures to expand the system	Communicate the advantages, disadvantages of the system.
		Train has to be according demands of the company, developing labor experience, that means less risk to hire inappropriate people for the company.
		Industrial associations has to be in the system.
		Government could support giving training, with policies for the right development
		(Annex 23; Decision maker Interview [D4]; July, 11th 2011; lines 95-97, 162-164, 167-

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Interview	Category of analysis	Opinion
		169, 172-173, 175-178).
Decision Maker [D4]	Actions to increase employability	To encourage students to do the best in the companies; they have to show their knowledge from Dual system (Annex 23; Decision maker Interview [D4]; July, 11th 2011; lines 214-217).
Decision Maker [D5]	Motivations to be in Dual system	The system gives the opportunity of taking on new youth to the company, according the needs you have. That students know how to solve the real problems that we show. This is part of our company culture. Among the main factors involved are the people who have to have the technical skills, they know how to do things and solve real problems. This is also part of corporate social responsibility. Such systems are already known by investors, because it applies in their countries. Reduces the risks of hiring the wrong people, and also reduces cost of training. (Annex 23; Decision maker Interview [D5]; July, 22th 2011; lines 14-15, 17-20, 22-24, 27-28,35-38).
Decision Maker [D5]	Factors that limit Dual system	The decision from the authorities of the company to support the system. It is necessary to work in careers that are actually needed in the industry and formed how they are needed. Limited resources, the lack of communication with coordinator and teachers, with

Interview	Category of analysis	Opinion
		people from enterprise. (Annex 23; Decision maker Interview [D5]; July, 22th 2011; lines 40-41, 46-47, 52-53, 55-56).
Decision Maker [D5]	Measures to expand the system	It is necessary to work in careers that are actually needed in the industry and formed how they are needed. Government could support with scholarship and promotes the system. It is necessary technical assistance from German cooperation. (Annex 23; Decision maker Interview [D5]; July, 22th 2011; lines 46-47, 69-70, 72-75, 82-83, 92-95)
Decision Maker [D5]	Actions to increase employability	There are many problems of employment, especially for the difficult economic situation of companies, now everything is limited and restricted, there is much competition, and crime has affected. It is important values of people, respect and responsibility. But this should also be resolved with counter crime that now exists. It is necessary to continue the efforts to educate young people and companies should support. (Annex 23; Decision maker Interview [D5]; July, 22th 2011; lines 98-100, 104-107).
Decision Maker [D6]	Motivations to be in Dual	The formation of the staff according to the proper activities of the company,

Interview	Category of analysis	Opinion
	system	guaranteeing, an adequate participation in the discipline, work focus, work mechanic and respect of the internal regulations of the company. one of the factors is to minimize costs and that they actually help with production. the cost can become an investment when the right people is hired. (Annex 23; Decision maker Interview [D5]; July, 25th 2011; lines 14-16, 20-21, 31-32)
Decision Maker [D6]	Factors that limit Dual system	The economic situation of companies affect the number of student's places for enterprise practice. This generates maintenance costs of students who may not always be supported by companies. (Annex 23; Decision maker Interview [D5]; July, 25th 2011; lines 27-30).
Decision Maker [D6]	Measures to expand the system	Tax incentives from government. (Annex 23; Decision maker Interview [D5]; July, 25th 2011; lines 38, 63-66).
Decision Maker [D6]	Actions to increase employability	To form students according to the real environment of the company. To give feedback to the students, because sometimes they might have better grades, but if they don't have good qualities of responsibility, of schedule follow, even hygiene regulations, that fails. (Annex 23; Decision maker Interview [D5]; July, 25th 2011; lines 56-59).

(Source: Own elaboration, data from transcriptions of Decision Maker's interviews. See Annex 23)

Results by Category

The summary of Decision Maker's interview by category is presented as follow. This information is related with the opinions by category presented in the **Table 4.5-3**, page 172.

- **Motivations to be in Dual System**

The main aim of the interview was exploring, which were the factors that motivated them to participate in Dual system, because they participation is critical in Dual system. Using interviews were identified if factors that motivate the industrialists (Decision Makers) to participate in the dual system are expectation to get people with better competences, to reduce training costs and to take part of student´s formation[68].

Representing the hypotheses in a concept map[69], the illustration shows the three factors that were considered early in the dual program, which might have influenced the motivation of industrialists to be part of this system (See Illustration 4.5-1)

Illustration 4.5-1. Industrialists' motivation factor – Hypothesis

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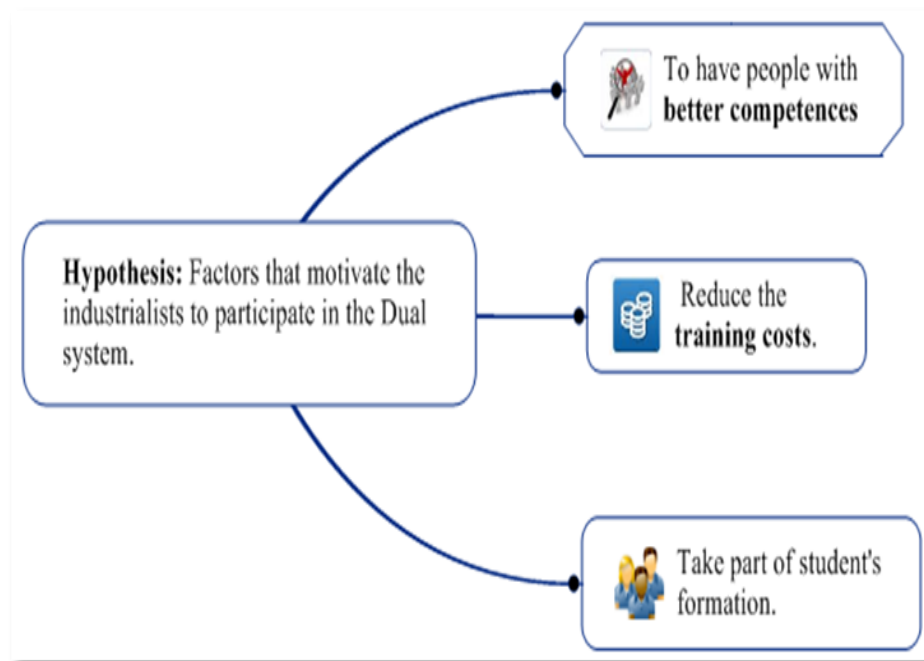
[68] See Hypothesis 2.

[69] In this part of the analysis was made using the concept map technique, with the purpose to organize the ideas in logic way, and to have a better visual comprehension of the results.

Representing the information about motivations to be in Dual system, that is showed in presented in the Table 4.5-3, page 172, with a concept map classified by enterprise[70], is easier to see the motivation of each one, and some coincidences among them. This map is in Illustration 4.5-2.

Illustration 4.5-2. Motivations of industrialist to be in Dual system by enterprise
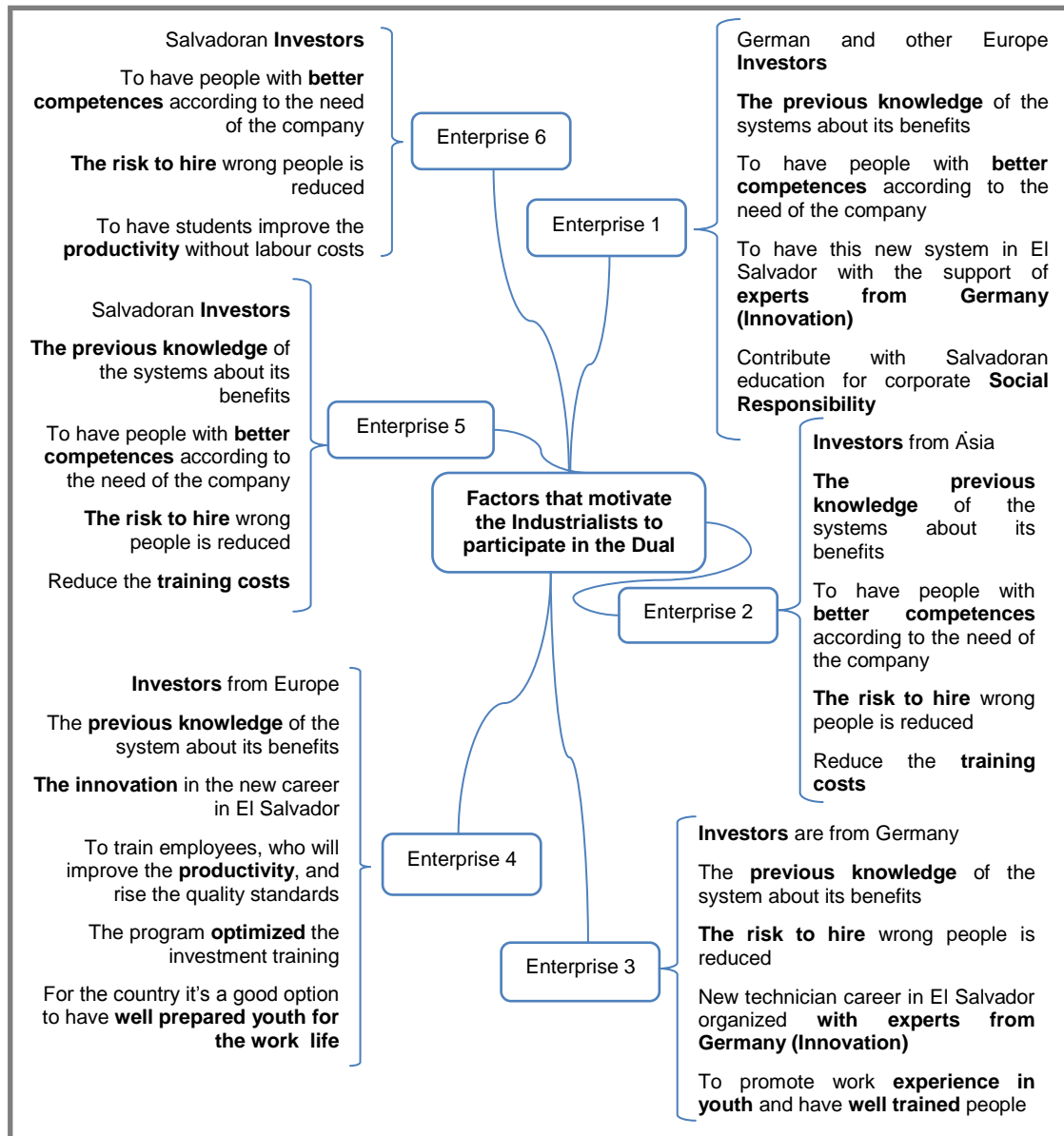
In interviews suitable matches were found, related to the motivations for participating in the Dual System. This coincidences has been classified in Table 4.5-4.

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[70] Every Interview was made in different enterprise.

Table 4.5-4. Decision Maker's motivation to be in Dual system

Motivation	Frequency of opinions	Comments about the motivation
Previous knowledge about Dual system	5	• People from the production line were studying in Germany. • The factor that motivated to be part of Dual system was the previous knowledge about this kind of formation because the Production Manager was formed in a similar program in other country. • Previous knowledge about Dual system because they have German roots and they decided from the beginning to start with two technicians. • Such systems are already known by investors, because it applies in their countries.
Contribute with Salvadoran education for corporate social responsibility	3	• This is also part of corporate social responsibility • Dual system has benefits for students because they have the opportunity to developed labor experience. For the country it a good option to have well prepare youth for the work life. • That students know how to solve the real problems that we show. This is part of our company culture.
People with better competences according the needs of the company	4	• Also having people that have better competences, according to the necessities of the company. • It is the opportunity to have people with better competences according the company needs, due to they learn about process and the equipment into the line production. • The training of the personnel according to the proper activities of the company, guaranteeing an adequate participation in the discipline. • To have well-trained people with what enterprise need. • The formation of the staff according to the proper activities of the company, guaranteeing, an adequate participation in the discipline, work focus, work mechanic and respect of the internal regulations of the company. • The system gives the opportunity of taking on new youth to the company, according the needs you have.

The risk to hire wrong people is reduced	4	• Decrease the risk to hire wrong people, because they have been working for almost 3 years, and they know the student behavior, attitudes and technical capacity. • Reduces the risks of hiring the wrong people, and • The cost can become an investment when the right people is hired. •
Reduce the training cost. Optimized the investment training	4	• Reduce the training cost, because do not have to pay salary during the formation process. • The program do not reduce training cost because there are a long period of time that the student is not at the company, but optimized the investment training, because in the medium term it produce better positive results. • Also reduces cost of training. • one of the factors is to minimize costs and that they actually help with production,
To have students helping to improve the productivity without labor costs. To train the employees, who will improve the productivity and rise quality standards	2	• The program has been successful because they have good results in the productions. Students have been incorporated in maintenance production equipment and now they have implemented some measurement that has meant less time of the equipment out work. • They will accept any kind of program under the condition that it must to improve the performance in the company. • The program was the opportunity to train the employees, who further will contribute to improve the productivity and to rise quality standards into the factory. • Students support the production. With new employees have to pay salary, training and they do not produce at the beginning.
To have this new system with the support of experts from Germany (Innovation)	3	• New career in El Salvador, that combine three different areas (mechanical, electronics and informatics), with dual system.

According to the interviews, to the Decision Makers the motivations were: (a) the previous knowledge of the system about its benefits; (b) Contribute with Salvadoran education for corporate social responsibility; (c) to have people with better competences according the needs of the company; (d) the risk to hire wrong people is reduced; (e) reduce the training cost and optimized the investment training; (f) to have students helping to improve the productivity without labor cost; and to train the employees, who will improve the productivity and rise quality standards; and (g) to have the new system with support of experts from Germany (Innovation).

Representing these motivation in a concept map (See Illustration 4.5-3), it easier to shows which factors have influenced the motivation of industrialists (Decision Makers) to be part of this Dual system for students from cohort 2008-2010. In the concept map the nomenclature of #/6, means the number of opinions that were coincident; for example 2/6 means that two interviewees have similar opinion, six were the total of interviews.

Illustration 4.5-3. Motivation of Decision Makers to be part of Dual system
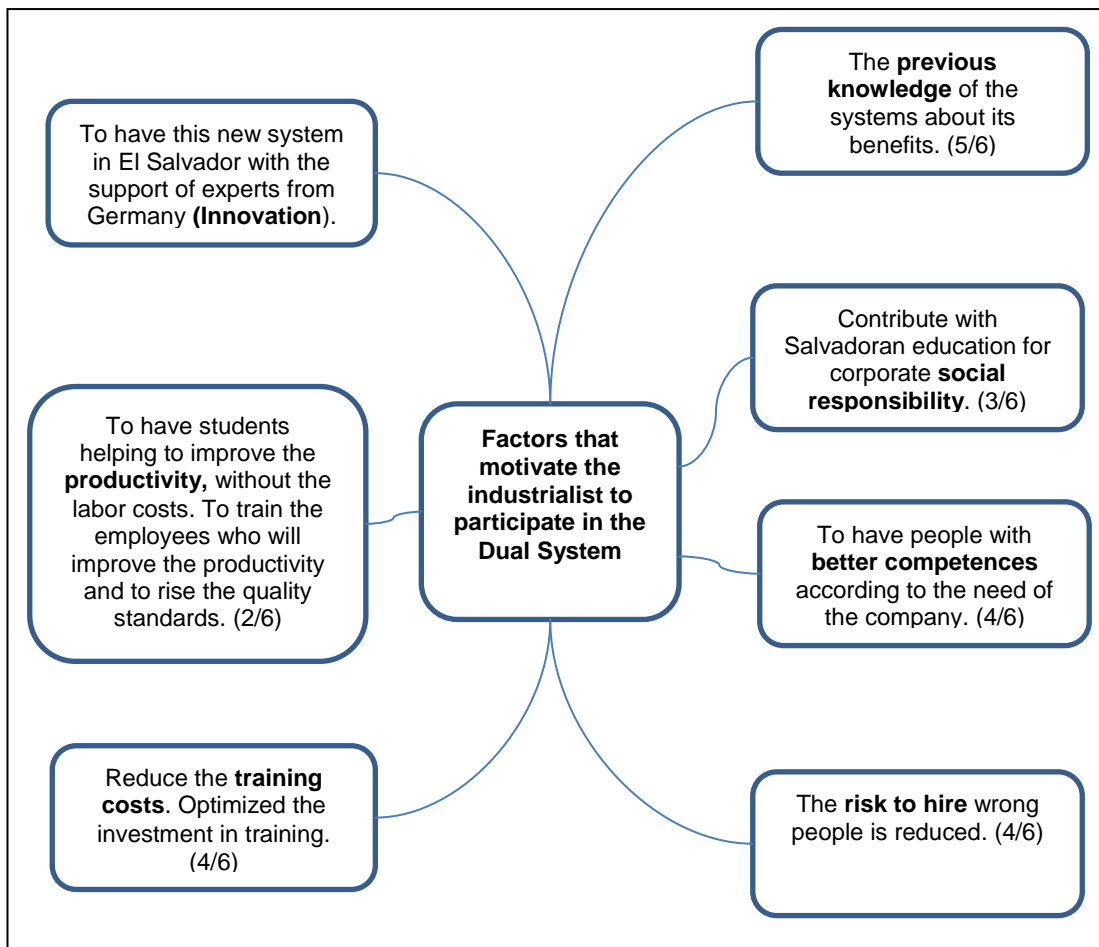
The previous knowledge of the system about its benefits

Results pointed out, that when the program started, the motivation to be part of the student´s formation in Dual system, were the previous knowledge[71] of this (5 of 6 interviews). Decision maker knew about Dual system because enterprise have German investment, or investments from countries where exists programs similar to dual system; in case of enterprises with Salvadoran investment, there are some people who know about dual system, because they were formed under its.

According the interviews, the foregoing, allowed them to know how the system works and to be clear about the benefits of incorporate well trained young people, in order to prepare the new generation for the sustainability of the company in the long term, and to improve the productivity.

Because that finding, all the enterprises were classified by type of investment, considering if it is from El Salvador, Germany, or other countries; where results shows that 68% of the companies that were participating are from countries which Dual system is applied in some educational programs (See Graph 4.5-1).

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Graph 4.5-1. Type of capital investment

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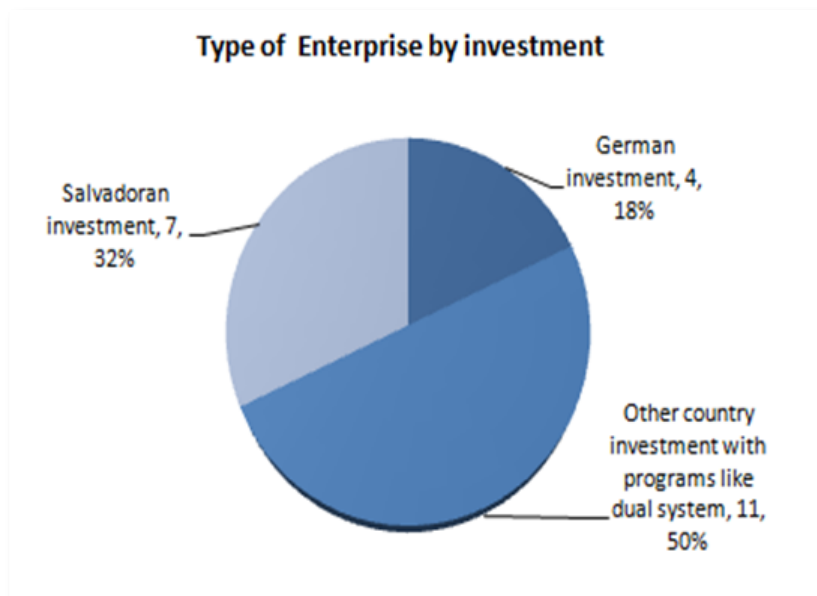
71   According First Interview of Employers.

Contribute with Salvadoran education for corporate social responsibility

Other factor that was present in some enterprises was the corporate social responsibility, where it is included to contribute with Salvadoran education, giving spaces to students for making practices into the company. They believe that enterprise practices allow more job opportunity, and in this way they can contribute for employability of youth.

Dual system has benefits for students because they have the opportunity to developed labor experience. For the country it a good option to have well prepare youth for the work life.

It is interesting, that in one of the company that was interviewed, continues in the program because they believe in the benefits, even though the students, who were supported in the first cohort, do not work with them because they had better job opportunities in other companies. They hope to have in the future, better economic conditions in order to retain these kinds of employees (Annex 23; Decision maker Interview [D3]; July, 11th 2011; lines 45-47, 50-52).

To have people with better competences according the need of the company

All the interviewees believe that the group of the Dual system has better competences. They believe that the system works, and gives the opportunity to hire technicians with labor experience according their needs, that were formed practicing in the real enterprise world with real situations under the pressure to give good results. These students, have developed technical skills with the production's equipment, have known the process, the rules, the philosophy and have strengthened their social and interpersonal competences.

Important information is that from 6 enterprises, 5 still continue working with the program, giving space for new students. In one of the company there is not new students because at the moment of the interview the Company has not more jobs to hire them. According their point of view, to have more students is to prepare employees to   competition (Other companies), but when they grow up in their operation, then will accept more students. Even though, this year they have taken the decision about do not participate into the program, they still believe that Dual system works.

The risk to hire wrong people is reduced

Decrease the risk to hire wrong people is other motivation, because they have been working for almost 3 years, and they know, how the student's behavior is, their attitudes and their technical capacity. The students are integrated into the Company in a natural way. The enterprise decision makers have been interacting with the students, and then when they have to take the decision to hire, they have more elements to know if the students are appropriated for the company. On the other hand, the new technicians, have had the experience with the company, and have element to decide if this is the company where they want to work.

Reduce the training cost and optimized the investment training

Some of the interviewees expressed that the Dual system reduce the training costs because students have had the experience for 2 ½ years knowing the enterprise, their process, the culture and having interactions with others; so, at the moment of hiring they do not need the initial training.

Besides, the company do not have to pay salary during the formation's process, and the student support the production in many cases. With new employees, the company has to pay salary, training and they do not produce at the beginning.

In other point of view, the program do not reduce training cost, because there are a long period of time that the students are not at the company, but optimized the investment training, because in the medium term it produce better positive results.

To have students helping to improve the productivity without labor cost; and to train the employees, who will improve the productivity and rise quality standards

During the formation process, for some enterprises is the opportunity to have in the production process some students, who will improve the productivity, without labor costs. Besides, the program is the opportunity to have trained employees, who further will contribute to improve the productivity and to rise quality standards into the factory, when they finished the studies. The program has been successful because they have good results in the productions. Students are well prepared to resolve problems into the companies.

The enterprise will accept any kind of program under the condition that it must to improve the performance in the company.

To have this new system with the support of experts from Germany (Innovation)

Other motivation for some of them (3/6) was the innovation in the new technical career in El Salvador, that combine three different areas (mechanical, electronics and informatics), which is necessary for enterprise productivity. It was meant, employees with more complete technical competences.

Besides, this career was implemented with dual system; it was organized with German cooperation with experts from Germany. It has been a well-organized program and a process handled with responsibility.

- **Factors that limit Dual system**

According Decision Makers, factors that could limit the development of Dual system are the shrinkage labor market that limit the spaces for students at enterprises. Besides, the limitations for technicians, in employment, is the excess of university graduates, there is simply to many graduates of engineering, of bachelors, year by year, that with the need of a job. Hence, it is necessary to work in careers that are actually needed in the industry and formed how they are needed.

Besides, it requires a high commitment from the institution, that is doing it, and a high commitment from the company, where both have to be prepared with the resource related with the study program.

- **Measures to expand the system**

The expansion of the Dual system has to be developed with enterprises, hence it is necessary to communicate the program to industrial associations the advantages and disadvantages of the system. Industrial associations have to be in the system.

It is necessary to work in careers that are actually needed in the industry and formed how they are needed. Train has to be according demands of the company, developing labor experience, that means less risk to hire inappropriate people for the company. The formation has to strengthen responsibility attitudes, schedule fulfillment.

Government could support promoting the system, promoting training and collaboration for technical assistance from German cooperation, with policies for the

right development of the system, with scholarships for students and tax incentives for the enterprises.

- **Actions to increase employability**

There are many problems of employment, especially for the difficult economic situation of companies, now everything is limited and restricted, there is much competition, and crime has affected. It is important values of people, respect and responsibility. But this should also be resolved with counter crime that now exists.

It is necessary to continue with the efforts to educate young people and companies should support.

To prepare students according to the real environment of the company. People have to be qualified with professional level, and besides good qualifications, they must have good responsibility attitudes, schedule fulfillment, even hygiene standards. To encourage students to do the best in the companies; they have to show their knowledge from Dual system. In other hand, Decision Makers recommend to have more agreements with companies and assure that young person will get a job.

Expert evaluation in the middle of the career

During the formation process of the cohort 2008 – 2010, the German Expert Advisor did 13 interviews(Schmidt, 2010a) in the first months of 2010 to the decision makers into the enterprises which were participating in Dual system; some results of expert evaluation, related with this research are considering follow:

The general evaluation of industrialist about Dual system had very favorable opinion, with an average of 8.92, minimum evaluation 8 and maximum was 10, from the scale of one for the worst opinion to ten for the best opinion (See Graph 4.5-2).

Graph 4.5-2. Industrialist general evaluation of Dual system

Enterprise evaluation of Dual system
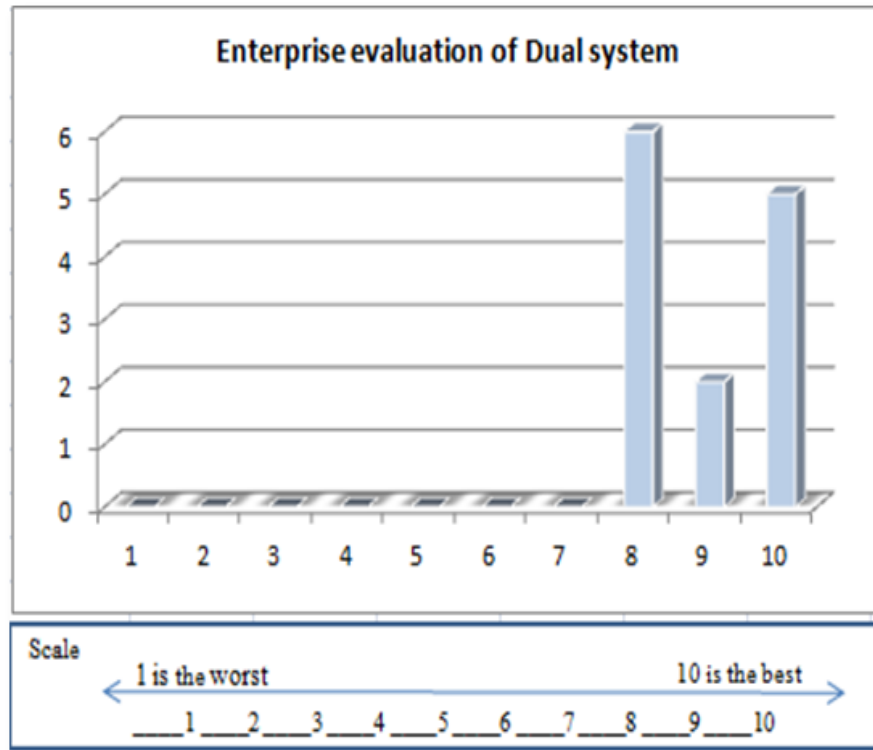
The reason that fundaments these evaluations were: (a) It is a good system with well-defined process where the combination between theory and practice allows better performance of the students because they reinforce their knowledge, become more creative, getting labor experience and resolving real problems; (b) for the enterprise is the opportunity, to hire the best students because the results are positives; and (c) it will be an option to improve the technical formation in El Salvador.

Even though the benefits, the program has to be improve in the curricula, coordination, and the students tracking.

Other factors that were evaluated are: (a) The student performance in the enterprise, (b) performance of the coordinator, (c) the formation at the academy, (d) the curriculum, and (e) the alternation between enterprise and the academy. All factors have very favorable opinions with scale more than seven. The factor with less evaluation was the alternation between enterprise and academy, because they recommend that students should be more time at enterprise, suggesting 50% at the academy and 50% in the enterprise (See Table 4.5-5).

Table 4.5-5. Level of satisfaction of Industrialist about Dual system

Industrialist: Level of satisfaction			
Area	Minimum	Average	Maximum
Student performance in the Enterprise	3	8	9
Performance Coordinator	7	9.15	10
Formation in the academy	4	8.46	10
The curriculum	0	8	10
The alternance Enterprise - Academy	4	7.54	10

Scale

1 is the worst   10 is the best

       1   2   3   4   5   6   7   8   9   10

Industrialists identified advantages of the system mainly in the security way to hire people because they know the students and their capabilities, knowledge, skill and adaption to the enterprise rules and values; besides, there was not a labor compromise by enterprises while students are studying; and the career covers different disciplines: mechanic, electronics and informatics.

Most of industrialist do not identified disadvantages (7/13), but some of them pointed put the need of expand the years of the career and time for practice (50% for practice); and the implementation in other disciplines.

Conclusions about hypothesis 2

In conclusion, the hypothesis H2, could not be falsified about 2 factors that motivate the industrialist to participate in the Dual system: (a) to get people with better competences, and (b) to reduce training cost. About the motivation of taking part of student's formation, the hypothesis could be falsified.

Result of this hypothesis test was:

The factors that motivate the industrialist to participate in the Dual system were:

(a)   the previous knowledge of the system about its benefits;

(b)   contribute with Salvadoran education for corporate social responsibility;

(c)   to have people with better competences according the needs of the company;

(d)   the risk to hire wrong people is reduced;

(e)   reduce the training cost and optimized the investment training;

(f)   to have students helping to improve the productivity without labor cost; and to train the employees, who will improve the productivity and rise quality standards; and

(g)   to have the new system with support of experts from Germany (Innovation).

4.6   Opinion of Key People

In this section is considered the opinion of Key people from education, government, industry and international cooperation. The general empirical results of this research were shared with five persons who have experience en educations and employability in El Salvador, because they work or have been working in relevant educational programs for professional and technical education. The purpose of sharing this information was to explore how Dual system could be expand in el Salvador from a macro vision, like a national strategic for technical education.

The methodology to apply to analyze the interview the qualitative method; categories explored from key persons were about (a) Condition for Dual system, (b) Areas for Dual system, and (c) Measures to expand Dual system. The questions of these interviews were classified by categories as are presented in the Table 4.6-1.

Because It was a semi structured interview, questions were varying, but keeping the focus on key categories. During the interviews, interviewees pointed out some advantages of Dual systems that have been included in the analysis.

Table 4.6-1. Questions for Key Person's Interview by category

Category	Related objective	Variable	Item #	Question
Conditions for Dual system	To identify conditions to implement Dual system	Conditions	Q1.	What conditions would you consider should be given for the Dual system to be viable?
Areas for Dual system	To explore other areas where Dual system could be implemented	Areas	Q2.	What are the areas you identify could develop in the Dual system?
Advantages of Dual system	This appear category appears during the interviews	Advantages		In the semi structured interview was not considered.
Measures to expand the system	To have recommendation in order to expand Dual system	Measures to expand	Q3.	What recommendation would you do to an adequate enlargement of the Dual system?

The interviews were made in Spanish (The recording of the interviews are in the CD attached), and the transcriptions were in English (See Annex 24). The analysis was made using the Qualitative Content Method (Mayring, 2000). The analysis of the interviews by categories is in the table below (See Table 4.6-2). In this table are the references to the number of interview and the lines where is the information.

Table 4.6-2. Analysis of the interview for Key people

Interview	Category of analysis	Opinion
Key person [K1]	Conditions for Dual system	An enterprise is going to open a productive space only if they are going to win; academic offer should be designed that answer a very specific productivity process that's what is important for the entrepreneur, if you don't have that, is not possible to implement the system; human resource that increments productivity. (Annex 24; Key person Interview [K1]; December, 14th 2011; lines 57-63).
Key person [K1]	Areas for Dual system	Areas of training in little specialization of technical people, one should find an offer that meets the no such gap in food, the whole chain, from purchasing materials, process control, control results, certifications, standards and all that kind of stuff, that kind of thing is what the company wants both foods, as in textiles, laboratories, pharmaceutical chemistry. (Annex 24; Key person Interview [K1]; December, 14th 2011; lines 67-71)
Key person [K1]	Advantages of Dual system	Employers have an opportunity to have someone and evaluate them before hiring. The problem is that academic institutions are forming young people coming out and cannot find a job because they have never set foot in a production area and this is the advantage of a dual approach in technical careers, I do not think that

Interview	Category of analysis	Opinion
		can be done in all of them, in technical you can do it.
		Dual system is better than an internship. It is to secure a contract between an institute of higher education with a company or group of companies, where we agree that minimum competencies are those that I want to be formed.
		Internships are not structured, It is a space for practice, dual education is something else, is a curriculum designed to be implemented in a shared way between academy and company.
		(Annex 24; Key person Interview [K1]; December, 14th 2011; lines 76-79, 98-101, 134-137, 159-163)
Key person [K1]	Measures to expand Dual system	It is easier to start in technical careers, because for an entrepreneur is much more simper to see practical things than operating. Now it has been a little experience, but in order to expand it is necessary Dual system like a state policy is necessary to ensure the work together between Ministry of Finance and Ministry of Education. The formation for Human resource required for production and innovation needs government. Design the career according enterprise needs. Enterprises will support if this increase their productivity. Teachers need to have production experience.
		(Annex 24; Key person Interview [K1]; December, 14th 2011; lines 104-105, 126-130,

Interview	Category of analysis	Opinion
		170-171, 173-177, 187-189, 214)
Key person [K2]	Conditions for Dual system	Greater involvement of the company; It is necessary from companies to have confidence, in educational institutions. The company for various reasons have not trusted in educational institutions and a bit like has been closed. (Annex 24; Key person Interview [K2]; November, 9th 2011; lines185-188)
Key person [K2]	Areas for Dual system	In specific sectors like commercial areas like customs management, energy, water, sugar and coffee industry, textile industry, mechatronics, automation and control systems. It could be in technical level (Annex 24; Key person Interview [K2]; November, 9th 2011; lines 111-118, 171-177)
Key person [K2]	Advantages of Dual system	The system works in function to that develops very specific competences that suit it very focally to the company where they go, from that point of view I think the system has advantages**.** (Annex 24; Key person Interview [K2]; November, 9th 2011; lines 73-75)
Key person [K2]	Measures to expand Dual system	It is too new, It is an interesting system, I think it gives better results than the traditional, but It should be extended, the sample is still very small to draw conclusions as well as to be definitive. It is necessary to extend and continue testing the experience. (Annex 24; Key person Interview [K2]; November, 9th 2011; lines 104-107, 228-231,

Interview	Category of analysis	Opinion
		262-268)
Key person [K3]	Conditions for Dual system	It is necessary better economic conditions for enterprises. The economic situations of the enterprise affect the employability. the teacher has to go out of the classroom, and have a relation with the companies, because is not possible that a person is giving theory and does not know how a company works. (Annex 24; Key person Interview [K3]; December, 9th 2011; lines107-108, 134-137)
Key person [K3]	Areas for Dual system	(Annex 24; Key person Interview [K3]; December, 9th 2011; lines)
Key person [K3]	Advantages of Dual system	The combination of theory with practice is a good thing for young people when they are graduates. Dual system is the opportunity to have better technicians, with better salaries, and companies with better production. (Annex 24; Key person Interview [K3]; December, 9th 2011; lines 117-119, 268-269)
Key person [K3]	Measures to expand Dual system	It has to be supported by Ministry of Education in this innovative system in El Salvador. It must be done, with change in the laws. The best way to implement this, It is that the academy has to communicate with

Interview	Category of analysis	Opinion
		employers to agree on how they will support, how they will do and how many students are going to take and the State has to recognize the efforts of companies giving some incentives to make the program a success.
		International cooperation could help with experts people not only in technology, but in the development for industry.
		(Annex 24; Key person Interview [K3]; December, 9th 2011; lines 149-151, 157-160, 186-189, 227-230)
Key person [K4]	Actual conditions for Dual system	The dual system in Germany is a triangulation between the company and the student, and the university; there is an agreement that each party has do for the practical curriculum.
		They have to pay one hundred twenty-five U.S. dollars each month, to the student, which means the student receives this context twenty-five dollars and the Academy receives a hundred dollars each month from the company.
		Without benefits companies do not participate, entrepreneurs Germans and Salvadorans are the same, they need a benefit for participation in the dual system.
		(Annex 24; Key person Interview [K4]; December, 12th 2011; lines 14-17, 24-27, 68-69)
Key person [K4]	Current areas in Dual system	Until the year of 2011, there was three careers in the dual system, that is

Interview	Category of analysis	Opinion
		mechatronic, custom logistics and electronic, and preparing a new career, in CNC mechanics numerical computation control. (Annex 24; Key person Interview [K4]; December, 12th 2011; lines 83-86)
Key person [K4]	Advantages of Dual system	In relation with traditional careers, students in traditional courses, they take practices six weeks, in the dual system ten months, then it is very clear that in ten months advantage is quite large, for the student, for the Academy and for the company. Benefits in this dual methodology have the students, business people, the Academy and also the Salvadoran society. There are the benefits for students who are following, primarily students receive experiences, good practices and theory, but of course these are ten months into his career at the company. It is the first time in this country that they receive a renewal for its work currently are one hundred twenty-five dollars per month, they get job security for the company. There are fewer desertions in relation with traditional careers, and at the end there are have good results, seventy-one percent of these, students in the dual system, receive directly after study, an offer to work in the company, in relation to the traditional that are about fifty-five percent.

Interview	Category of analysis	Opinion
		(Annex 24; Key person Interview [K4]; December, 12th 2011; lines 33-36, 38-45, 58-61)
Key person [K4]	Current expansion of Dual system	Until the year of 2011, there were one hundred and ten companies that participate in the dual system; and one hundred and ninety six students; and one hundred and fifty one tutors qualified.
		(Annex 24; Key person Interview [K4]; December, 12th 2011; lines 86-89)
Key person [K5]	Advantages of Dual system	Results are very attractive. The advantage is that in the practice enterprise meet them and finally, there is an internship program. Companies are participating because they think they can find a person who can work with them or not.
		Dual system has the advantage of having a relationship with the company
		These students were contributing to the productivity of the company 10 months then the company is gaining in training and productivity.
		Dual system has had a great immediate impact in hiring and the average salary after 6 months.
		(Annex 24; Key person Interview [K5]; December, 16th 2011; lines 89, 100-106, 147-148, 150-155, 168-170)

(Source: Own elaboration, data from transcriptions of Key person's interviews. See Annex 24)

Results by Category

The summary of Key Person's interview by category is presented as follow. This information is related with the opinions by category presented in Table 4.6-2, page 195.

- **Conditions for Dual system**

An enterprise is going to open a productive space only if they are going to win; academic offer should be designed that answer a very specific productivity process that's what is important for the companies, without this condition, is not possible to implement the system. The system has to assure the human resource that increments productivity. They need benefit to participate in Dual system. Besides, economic conditions for enterprises have to improve because the economic situations of the enterprise affect the employability.

It is necessary from companies to have confidence, in educational institutions. The company for various reasons have not trusted in educational institutions and a bit like has been closed. Actually, the dual system in Germany is a triangulation between the company and the student, and the university; there is an agreement that each party has do for the practical curriculum.

In the other hand, teachers have to go out of the classroom, and have a relation with the companies, because is not possible that a person is giving theory and does not know how a company works.

- **Areas for Dual system**

According these experts, Dual system could be developed in areas of training in little specialization of technical people, in process of production for foods, textiles, pharmaceutical, chemistry.

In specific sectors like commercial areas like customs management, energy, water, sugar and coffee industry, textile industry, mechatronics, automation and control systems. It could be in technical level

Until the year of 2011, there were three careers in the dual system, that is mechatronic, custom logistics and electronic, and preparing a new career, in CNC mechanics numerical computation control.

- **Measures to expand Dual system**

Since 2008 to 2011, there were one hundred and ten companies that participate in the dual system; and one hundred and ninety six students; and one hundred and fifty one tutors qualified.

Now it has been a little experience, but in order to expand it is necessary, Dual system like a state policy. It is necessary to ensure the work together between Ministry of Finance and Ministry of Education. It is too new, it gives better results than the traditional, but should be extended, the sample is still very small to draw conclusions as well as to be definitive. It is necessary to extend and continue testing the experience.

Design the career according enterprise needs. Enterprises will support if this increase their productivity. Teachers need to have production experience. It could be is easier to start in technical careers, because for enterprises is better to see practical things.

The best way to implement Dual system is that the academy has to communicate with employers to agree on how they will support, how they will do and how many students are going to take, and the State has to recognize the efforts of companies giving some incentives to make the program a success. International cooperation could help with experts people not only in technology, but in the development for industry.

- **Advantages of Dual system**

Despite, advantages were not part of the objectives of the interviews, interviewees, observed them. Their appreciations were as follow:
The problem is that academic institutions are forming young people coming out and cannot find a job because they have never set foot in a production area and this is the advantage of a dual approach in technical careers.

Dual system is better than an internship. It is to secure a contract between an institute of higher education with a company or group of companies, where we agree that minimum competencies are those that I want to be formed. Internships are not structured, It is a space for practice, dual education is something else, is a

curriculum designed to be implemented in a shared way between academy and company.

The system works in function to that develops very specific competences that suit it very focally to the company where they go, from that point of view I think the system has advantages. The combination of theory with practice is a good thing for young people when they are graduates.

In relation with traditional careers, students in traditional courses, they take practices six weeks, in the dual system ten months, and then it is very clear that in ten months advantage is quite large, for the student, for the Academy and for the company.

Benefits in this dual methodology have the students, business people, the Academy and also the Salvadoran society. There are the benefits for students who are following, primarily students receive experiences, good practices and theory, but of course these are ten months into his career at the company. It is the first time in this country that they receive a renewal for its work currently are one hundred twenty-five dollars per month, they get job security for the company.

Results are very attractive. The advantage is that in the practice enterprise meet them and finally ,there is an internship program. Companies are participating because they think they can find a person who can work with them or not. Employers have an opportunity to have someone and evaluate them before hiring.

Dual system has the advantage of having a relationship with the company and has had a great immediate impact in hiring and the average salary after 6 months. Dual system is the opportunity to have better technicians, with better salaries, and companies with better production.

4.7   Expansion of Dual system

Dual system in technical education started in 2008 with Mechatronic career; three years after, Logistics and Custom has been implemented (in the year 2010) and Industrial Electronics (in 2011); besides, for the year 2012 has been planned to begin with Computer Numerical Control. (Schmidt K., key person interview, December 12th 2011, Lines 93-101).

The system has been expanded so fast, only in Mechatronic it has grown (See Graph 4.7-1), more than four times in number of students (497%), tutor (464%) and enterprise (500%). The 70% of the enterprises, which started in the first cohort (2008 – 2010), continue working with Dual system with new cohorts (Schmidt, 2010b). Foregoing, reflects the level of acceptance of the model by the main actors; influencing the confidence of German international cooperation and industry, also resulting cooperation projects and technical assistance by GIZ and German industry[72], to strengthen the internal capabilities of the Academy to improve the system development.

Graph 4.7-1. Growth of the Dual system
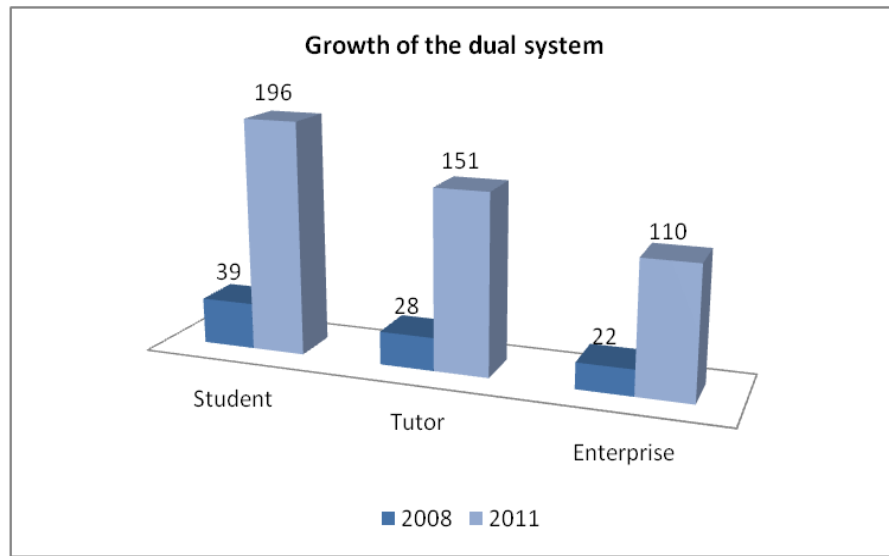
In relation to the total of students enrolled in Dual system, 3% with respect to 6040 students registered in 2009[73] at the Academy, it is still a challenge that could be a national strategy.

4.8 Summary

Finally, in the Table 4.8-1, the Summary results of hypotheses is presented, where is included the hypotheses, results and conclusions.

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[72] In the period of 2008 – 2012 (projected), there have been project of cooperation in technical assistances, equipment and training with GIZ, CIM and German enterprises, using twice the Public – Private Partnership (PPP).

[73] The last data available in the web page is for 2009. 6040 students were enrolled in technical careers at the Academy in study.

Table 4.8-1. Summary results of hypotheses

Hypothesis	Results	Conclusion
Hypothesis 1 (H1): Students of Cohort 2008 to 2010 that were formed under some elements of the Dual System (new system), have acquired better competences than students in the same cohort that were formed in the traditional system.		
H1.1: The students from cohort 2008 - 2010 that were formed in the new system (Dual system), **got better competences** than those of the same cohort who were formed in the traditional system.	**Better competences** The t test failed to reveal a statistically reliable difference between the mean of GPA, that students of Dual System have ($\mu_{GPA\_Dual} = 8.274$, s= 0.4128), and students of Traditional system have ($\mu_{GPA\_Traditional} = 8.006$, s= 0.6329), t(54) = 1.891, p = 0.064, α = 0.05.	H_0 is accepted, then **there is not significant differences** between both group related with final grades that were measurement by GPA Ho: $\mu_{GPA\_dual} = \mu_{GPA\_traditional}$
H1.2: The students from cohort 2008 - 2010 that were formed in the new system (Dual system), **got job in less time and better salary** in the first 6 months after the graduation, than those of the same cohort who were formed in the traditional system.	**Time to get job** In case of Dual group, the **Level of Retained** was 41%; meaning the proportion of persons who got a job immediately they have finished their studies. After six month, the gap into the two groups in relation to the time to get a job grow up, where dual group's employability was 85%, while traditional had 53% **Better salary** The t test for independent sample reveal a statistically reliable difference between the mean of salary, that students of Dual System have ($\mu Salary\_Dual = 476.31$, s= 158.00), and students of Traditional system have ($\mu Salary\_Traditional= 357.78$, s= 115.30), t(39) = 2.091, p = 0.043, α = 0.05.	According the **job placement and the level of retention**, the students from cohort 2008 - 2010 that were formed in the new system (Dual system), **got job in less time** in the first 6 months after the graduation, than those of the same cohort who were formed in the traditional system H_0 is rejected, then **there is a significant differences** between both group related with the salary, where dual group ($\mu_{Salary\_Dual} = US\$476.31$), has gotten better salary than traditional group ($\mu_{Salary\_Traditional} = US\$357.78$). Ho: $\mu_{Salary\_dual} \neq \mu_{Salary\_traditional}$

Hypothesis	Results	Conclusion
Hypothesis 2 (H2): The factors that motivate the industrialists to participate in the dual system are expectation to get people with better competences, to reduce training costs and to take part of student´s formation.		
		The **factors that motivate the industrialists** to participate in the dual system are: a) The previous knowledge about the system; b) to have people with better competences according the needs of the company; c) to reduce the risk to hire wrong people; d) to reduce or optimize the training costs, e) the innovation of a new career that enterprise needs; f) for corporate social responsibility; and g) to improve the productivity and quality

(Source: Own elaboration, from the results of this research)

Chapter 5: Consequences for using Dual system

5. Consequences for using Dual system

Possibilities of Dual system under El Salvador conditions for improving quality in vocational technical and HE, institutions that could steer the implementation and networking cooperation are presented in this chapter.

5.1   Possibilities of Dual system under El Salvador conditions

In contrast to Germany, in El Salvador, the implementation of the Dual system on the higher education has been without government intervention and the Chambers of Commerce and Industry. It has been developed through agreements on direct cooperation between the academy and the company and with technical assistance from the German International Cooperation, with economic support from the enterprises (See Table 5.1-1).

Table 5.1-1. Similarities and differences: Dual system (Germany, El Salvador)

Principal elements of Dual system	In Germany	In El Salvador
Connection between theory and practice	Yes	Yes
Learning sites: academies and companies	Yes	Yes
Financial support by enterprises	Yes	Yes
State coordinate frame regulations for training in companies and academies	Yes	No
Final examination by chambers	Yes	No

Even though the differences, the results of the implementation of Dual System in the Technician career of Mechatronic, means extensive possibilities to improve technical training (in addition to training in HE) according to the needs of the productive sector for improving productivity. Dual system could support for raising the level of training human resources, focusing on economic growth and social improvement that affects in a positive way the life's quality of people. Based on the findings and conditions of El Salvador, identifies the following potential of extending Dual System, which are set out in section below.

- **Possibility for improving Quality the Vocational, Technical Education and Higher Education**

A recent study developed for USG and GOES (2011) by Constraints Analysis (CA)[74], in the framework of the Partnership for Growth (PFG), indicated that the issues limiting El Salvador's productivity in tradable[75] are factors of productivity -physical capital (infrastructure), human capital, and financial capital- and the institutional environment in which tradable firms operate.

About human capital, the PFG[76] analysis revealed serious shortcomings in human capital development in El Salvador. The GOES believes that investment in human capital and innovation is necessary in order to develop an array of tradable featuring a strong technological component consistent with international demand. Moreover, the private sector has repeatedly asserted that the workers' skills sets do not match the labor expectations of the business sector. In this PGF there is a goal that has the aim to improve the quality of the education system in order to create a more highly qualified and technologically skilled labor force in order to help ensure that education of the labor supply matches labor market demand (USG & GOES, 2011).

Dual system gives the possibility to bridge this gap in vocational training, technical education and higher education. As has been explained before, to form competences of students that prepared them to the labor life is the main objective of the German dual system. This system develop the cooperation between the schools (or academies) and the enterprises like a two complementary places for the students learning.

The development of this system in higher secondary education could be concrete form and highly productive to expand technical education in the Latin American region and improve the availability of skilled labor needed in the short and medium term (Carlson, 2002, p. 18). In other hand, Schmidt (Annex 24, Key person Interview [K4], December

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[74] The Constraints Analysis (CA) indicated that the issues limiting El Salvador's productivity in tradable are factors of productivity -physical capital (infrastructure), human capital, and financial capital- and the institutional environment in which tradable firms operate (USG & GOES, 2011).

[75] Tradable are those goods and services which are or can be traded internationally and whose prices are set on world markets (USG & GOES, 2011).

[76] The Partnership for Growth (PFG) is a relationship that strengthens this GOES -driven process with the goal of steering it towards an historical era of investment and broad- based economic growth. In this way, the PFG is a critical contribution to strengthening the process and creating a valuable opportunity for Salvadoran development (USG & GOES, 2011).

12th 2011, lines 55-58) has referred to Dual system as a good challenge, good change and good possibility to develop competences on the students: technical, professional and social competences.

The strengthening of Academia-Enterprise relationship in this system, and the joint participation in the formation process, requires from the Academy to maintain a continue review of its formation programs to ensure they are pertinent to the needs of the enterprises and demand-driven of the industry. The Dual system works in those careers where the potential exists for recruitment of students into the industry.

It also requires greater involvement by teachers in the processes of management and production of the company, since the alternation of the students between academia and the company, it is demanding more domains of knowledge, technologies and techniques applied in industry. It could be implemented by internships in enterprises for teachers or hiring them from enterprises. In this part, Cromeyer (Annex 24, Key person Interview [K3], December 9th 2011, lines 134 -137) and Barraza (Annex 24, Key person Interview [K1], December 14th 2011, lines 214) pointed out the needs about teacher experiences with enterprises and in real labor situations.

Moreover the formation based on competence approach in the dual system, requires in depth review of assessment systems that linkage the skills developed during formation in the company, where the student must demonstrate proficiency in full and comprehensive knowledge, their skills, but above all their willingness to solve problems in complex and unexpected situations.

Dual system gives the possibility to improve the perception of the stakeholder about the quality of the education in El Salvador. The available studies from Following commission for the National Plan 2021, AMCHAM, USAID, GIZ and the interviews with key people, from the educational and enterprise sector have in common the opinion that, ,it is necessary to have better quality education in high school, vocational, technical and higher education. It will allow to make a real connection with the needs of the industry for well prepare people for the employment.

A direct consequence of implementation of the Dual system is a strong change in the range of careers that institutions of higher education provide to young people, offering careers oriented to the labor demand of the enterprises. Actually, in El Salvador there are too many careers oriented to the student demands, where there are not enough job opportunities. Barraza (Annex 24, Key person Interview [K1], December 14th 2011,

lines 208-211) has pointed out that the challenges for Academy is to understand the productive topic, and in the case of technicians it is necessary to have strong connection with the productive sector.

The possibilities for better job conditions for youth

This strengthening relation in the process of formation between students and the enterprise has an impact on the employability of the young who study these technical careers. This could become a viable alternative for El Salvador, where the rates of youth unemployment could decrease, since the company integrated in the educational process. Besides, It helps a better professional preparation of the students and develops in them labor experience. This type of formation can be an alternative in the short-term (2 ½ years), which may decrease the big social and economic problems that currently has El Salvador with the youth.

In Germany, the unemployment for graduated in Dual system has decrease and the retaining trainees was 57%, giving the opportunities to the enterprises to observe the individual trainee's performance for a longer period, before to decide to hire them (BMBF, 2007).

Similar situation has been in El Salvador in Mechatronic, the retention level was 41%, and after the graduations 85% got a Job in the first 6 months; besides, they got better salary conditions compared with students that were in the traditional system of the same promotion. This situation has been affected because, since they were for 10 month into the enterprises, they had better opportunities in order to make visible their competences to the decision makers for the hiring.

For the Salvadoran enterprise decision makers, the system is the opportunity to hire technicians with labor experiences, which were developed in the real enterprise world. As they have pointed out, the Dual system allows having people with better competences according the needs of the company. Students have understood the process, but more important they are involved in the company culture.

For decision maker the Dual system in Mechatronic has given then the opportunity to know the potential workers as a students, observing their attitudes, behaviors and technical skills; decreasing the risk to hire wrong people.

On the side of the young, the experience at the enterprise working with real situations, testing their competences that they have developed at the academy and throughout

their life, it is a real advantage for their job opportunities. About this, the research's results about student's opinions pointed out the labor experiences as the most important advantages of the dual system. In general, students have a good perception of the quality of their formation process at the Academy and into the enterprise.

Key people who were interviewed felt that dual system could support the improvement of the education for youth, giving them better competences, and as consequences better job opportunities, improving their living conditions. According Cromeyer (Annex 24, Key person Interview [K3], December 9th 2011, lines 70-73, 76-77) the Dual system was implemented in technician area with the aims of have enterprises support for students and to have better employability conditions for students. Dual system was a good choice because the combination between theory and practice.

In the other hand, Brunn (Annex 24,,Key person Interview [K5], December 12th 2011, lines 147-148, 150-154) has observed on the result advantages to have the connections with the enterprise for students, and the advantages have better trained people and to support the productivity.

In the new programs, that the Government currently being promoted to improve employment among young people as "My first job[77]", could include support for the extension of the Dual system assuring the impact of the program.

- **Possibility for supporting the competitiveness and productivity for the industry**

For companies, the development of this system in El Salvador means, that the education programs at the Academy are relevant to the needs of industry. It has the effect of counting the appropriate personnel to the enterprise needs. It allows enterprises to improve their levels of productivity and competitiveness, how has been pointed out by USG and GOES (2011) in the Constraints Analysis about limiting El Salvador's productivity in tradable.

In so far, Dual system will be implemented in other careers, according the demand of enterprises, with their actually needs and for the emergent economy going ahead to

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[77] It will for young people with low education or high school primary. The program called "My First Job" was announced in the framework of the XVII Inter-American Conference of Ministers of Labor (IACML) of the OAS, by the Minister of Labor and Social Security of El Salvador, which has the main initiative involving the private sector to employ young people in exchange for tax incentives (IACML, 2011)

the future needs; it will be a possibility for improving the productivity and will support the competitiveness of the industry.

As have been pointed by Barraza (Annex 24, Key person Interview [K1], December 14th 2011, lines 57-63) and Schmidt (Annex 24, Key person Interview [K43], December 12th 2011, lines 68-69), the industrialist will open a space for students in Dual system, if and only if they are going to win. The academic offer must answer specific issues of productivity, if this need is cover then it will be feasible the Dual system. Dual system could be easier if exist a sectorial policy where is the productivity, starting with technical careers, because it has practical components. It has to be flexible to the enterprise's needs.

In Germany students in Dual system makes a significant contribution to their company's regular production and services (Wenzelmann, Schönfeld, Pfeifer, & Dionisius, 2009). According to the most of the decision maker from enterprises that participate in this research, Dual system reduce the training costs for the new employees and give them well trained people with labor experience who has the capacity to work in real situation under the pressure to give good results. Besides, Dual system reduces the risk of hire wrong people. They believe that the system warranty the student's adaption to the rules, work focus and philosophy of the company. In a gradual way, students are incorporated to the production line, helping to increase the production. Through the time, have been expressed the interviewees, people formed in this system will support to rise quality standards in the productions line.

Besides, well prepared people are an attractive for national and international new investments, and it could be a support the foreign direct investment besides other actions. In the recently study of UNCTAD & CEPAL (2011) pointed out that El Salvador in one of the countries of Central America with less FDI with an average of US$70, meanwhile Panamá and Costa Rica had an average of US$346 respectively.

- **The opportunity for improve the competences for people in LLL**

Even though the research was for a group of students in one career of technical education, Dual system give the possibilities for improve the competences for people in Lifelong Learning, in order that they have better job conditions.

As has been pointed out before, the Report Learning: The Treasure Within (1996) reiterated the essential role that learning throughout life plays for both society and

individuals, equipping them to cope with the evolving requirements of the labor market and the changing timeframes and rhythms of individual existence.

Taking into account the decisive influence of the world markets and the ways in which the world of work had changed, the report reflected a rights-based, humanistic, transformative approach to learning. It underlined the need to foster skills and attitudes that would enable people to overcome their religious and cultural differences and coexist peacefully, while at the same time linking learning to shared human, moral and ethical values.

Special programs applying some elements of Dual systems, could be a possibility for those people that are in or out the labor force, but need to improve their competences in order to have better job opportunities.

- **Possibility to improve the competitiveness index**

As has been referred before, according the Global Competitiveness Index of WEF (2010), El Salvador's competiveness is in decline. In the last ten years has decreased from the position 58 to 91 in a sample of 142 countries. The WEF listed the lack of a qualified workforce as one of the greatest barriers to attracting businesses to El Salvador.

The UNCTAD & CEPAL (2011) policy review report emphasizes that Education is a critical factor in the development of competences and skill for a trained and productive labor force, and pointed out that this key element of technological and innovative development is one of the principal weaknesses of El Salvador.

Access to employment is a continual challenge in El Salvador, a country where citizens face a high level of underemployment and where many can only find work in the informal sector. Many disenchanted youth look to immigration or illicit activities for economic opportunities. A skilled workforce will not only improve the economic stability of the country, but will also impact the overall social wellbeing and health of its citizens.

There are some programs like Improving Access to Employment from USAID that support the training and skill development necessary to increase El Salvador's competitiveness in the global market. This Program works with employers and institutions dedicated to workforce training and curriculum specialists to develop industry standards regarding the skills and competencies needed by private industry, supporting the design of specialized programs that meet identified needs. The Program

seeks to strengthen vocational training institutions through the development of competency-based programs that meet the certification standards of international and national organizations (USAID, 2011). In many case this program works with short internship for the trained people.

Dual system is a possibility like an strategy to have less unemployment and underemployment with better skilled people more connected with the enterprises with a systematic plan of formation that include the formation at the academy and at the enterprise.

The challenges of change the situation of a lack of a qualified workforce could be faced by the implementation of dual system in programs for technical, vocational, higher education, but also in Lifelong learning programs, allowing a better position into the competitiveness index related with the education and trained people.

5.2   Institutions which could steer the dual system implementation

This first experience in technical higher education have been steered by an academic institution with the support of the German cooperation by the technical assistance, training and supporting invest in some workshops.

Even though the program has good results, its deployments to other career and other institutions has to be assure by national institutions that have to work in order to warranty the quality of the programs and careers. Then Ministry of Education has to have an important role in the deployment of the Dual system, assuring the instruments for the quality in every component of this system of study, facilitate the technical support by agreements between international cooperation, the higher education's institutes and the enterprises. Besides has to support the development of the infrastructure and the process for accreditation or certification the quality of this program. Other important action is to communicate the positive result of the Dual system to the stakeholders; besides, how this could help to improve the productivity for enterprises and developed better life conditions for students.

Other government institutions related is the Ministry of Economy have to be involved facilitating the information about industry needs in relation to the skills and competences for people. In other hand, they have to support actions about incentives, and the cooperation agreements between industry and the academy among other important activities that could improve the technical and higher education that contributes to the

economy and social development of the country. On the other hand, Ministry of Labor and Social Security has to work the framework of this kind of relation between students and enterprises in order to warranty a healthy process for all, including the opportunity to work with this system in public and autonomous institutions.

Expanding the Dual system at national level, requires to be displayed as a policy of State, which must make sure joint actions among Ministry of Finance, MINED and MINEC, to ensure the training of human resources required for production (Annex 24, Barraza, Key person Interview [K1], December 9th 2011,lines 126-130). Some actions according Tutors and Decision Makers Interviews are the incentives and it was pointed out by Cromeyer (Annex 24, Key person Interview [K3],July, 14[h] 2011,lines 186-189).

Higher education institutes have to steer the process for the program design, the development of the curricula, the quality in the process of teaching and training, the teacher qualifications and the technological infrastructure assuring the quality in this system.

Enterprises have to steer the process of facilitation the space for students, the tutors and the facilities for the process of formation inside the enterprise. Chambers of Commerce, Industry and other Services has to lead the side of assure that the education system is forming the people that really will be integrated in the productive process and has to be a good connections between enterprises, government and higher education institutes,.

5.3   Networking cooperation

Until now, the relation with the enterprises has been by agreements between Academy and companies, without any intervention of the government. It has been just a networking cooperation between these two stakeholders.

In a systematic deployment of Dual system, it is necessary to build networking cooperation with all the stakeholder that warranty a fluid process, good communications, and high quality results.

It needs further support the development of the dual system. It is necessary to work on strengthening cooperative relations with organizations such as Ministry of Education, Chambers of Commerce and Industry, as well as government institutions related to the economy (Ministry of Economy) and the labor (Ministry of Labor and Social Security);

enterprises, chamber of commerce, industry and services; technical institutions and universities (See Illustration 5.3-1).

Considering El Salvador's conditions, other important actors are the international cooperation for the technical and economic support in the middle term (about 10 years) of the deployment of the system.

Illustration 5.3-1. Institutions networking cooperation
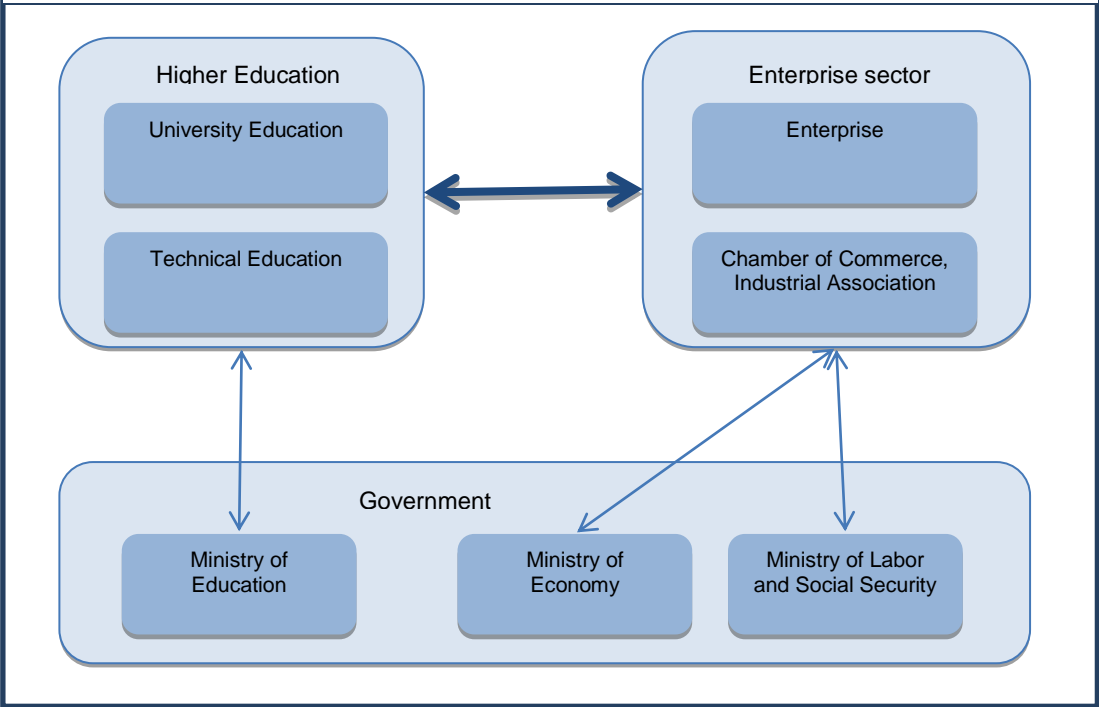
Chapter 6: Conclusion and view for further investigations

6. Conclusion and view for further investigation

In the first section of this chapter, the conclusions are presented in order to give the answer to the main questions of this research, and using the results of the hypotheses tests and the extra information about the development of Dual system, related with the aims. Since this point, in the second section there are identified some further investigations that considered important in order to strengthen the results of this research or consider other topics that were not addressed in this investigation.

6.1 Conclusions

As has been identified by World Bank (2011), the main challenges and policy priorities in the short and medium term to improve the employment situation of the Salvadoran population, where among other things, recommended implementing a comprehensive reform of education system ASET. Besides is necessary to assess their relevance for the labor market, modernizing curricula, teaching methods and learning assessment according to international standards and diversify the range of interdisciplinary studies.

According the results for empirical and theoretical part, Dual system could be a strategic to attend part of the challenges of the employability situation for youth and to improve the technical educational system. This main conclusion is developed as follows, by the association to the aims of the research, giving answer for eleven scientific questions, grouped in five aims.

- **Influences to rise employability under using of better combination of theory and practice in studies**

The aim was to analyze influences to rise employability under using of better combination of theory and practice in studies - possibilities of dual experiences from Germany for El Salvador`s conditions. Related with the aim, the research was conducted in order to find the answers to these scientific questions: (a) which is the consequences for employability of using a combination of theory and practice in studies? and (b) Which are the possibilities of dual experiences from Germany to El Salvador's conditions?

The answers to these questions are based in the documental and the results of the investigation.

The consequences for employability of using a combination of theory and practice in studies

The strong connection of Dual system with theory and practice at the enterprise gives the possibilities for improving the employability. The Dual group of this investigation has 41% were hired in the same enterprise where they done the practice, 85% got a job in the first 6 months meanwhile in the Traditional group 53% got a job in the same time. The average salary was higher for Dual group (US$476.31) compared with the salary that got the traditional group (US$357.78). Enterprises and students have recognized the labor experience of the students in Dual systems as the most advantage of Dual system.

For the Salvadoran enterprise decision makers, the system is the opportunity to hire technicians with labor experiences, which were developed in the real enterprise world.

On the side of the young, the experience at the enterprise working with real situations, testing their competences that they have developed at the academy and throughout their life, it is a real advantages for their job opportunities.

This strengthening relation in the process of formation, between students and enterprise could have an impact on the employability of the young who study under Dual system.

The possibilities of dual experiences from Germany to El Salvador's conditions

Even though the conditions of Germany in the economic and social are different with El Salvador, dual experience from Germany to El Salvador is a possibility to improve the technical education in El Salvador. The first experience of implementing Dual system in Technical education has given positive signs, for a systematic and good planed deployment of this experience in the near future.

Dual system can become a viable alternative for El Salvador, where the rates of youth unemployment could decrease, since the company integrated in the educational process, helps a better professional preparation of the students and develops in them labor experience. This type of formation can be an alternative in the short-term (2 ½ years), which may decrease the big social and economic problems that currently has El Salvador with the youth. For companies, means to have the appropriate personnel to the enterprise needs, allowing them to improve their levels of productivity and competitiveness.

Besides, well prepared people are an attractive for national and international new investments, and it could be a support the foreign direct investment besides other actions.

Of course the deployment will need the technical assistance for the international cooperation, with the appropriate studies about the following new implementations.

- **Possibilities and problems using competences**

The purpose was to analyze possibilities and problems using competences approach for student's development and employability. The scientific question for this aim were: (a) How the dual system could be a possibility for raising competences on student's development and employability?, and (b) Which are the problems using dual system for raising competences on student's development and employability?

Dual system as a possibility for raising competences on student's development and employability

The Vocational Training Act (BIBB, 2006), establish that vocational training's primary aim is to help young people acquire comprehensive vocational competence that will enable them as gainfully employed persons not only to perform tasks autonomously, on their own responsibility and in cooperation with others, but also to perform them efficiently, effectively and in innovative ways. In this context the Law defined the competence approach as a model of learning.

As has been established in Germany, Dual system could be a strategy for raising competences on student's development and employability. This will be explained making the difference between qualify people into the educational system or develop competences to the people.

As has been explain before in the theoretical part of this research, the understanding of qualification is a set of knowledge and skill of the people. These are developed in controlled situation; it certified that the person know and can do something, but this not guarantee that this person will be successful in non-controlled situation, resolving problem in the real life. Qualifications are not competencies; competencies include them, but competencies are more than that because include the action capability in non-controlled situation that can be open, unsafe and complex (Erpenbeck & Rosenstiel, 2007).

Competences are used in most VET national systems[78] to describe the expected professional profile of the learners. Professional competences are linked to the tasks that the learner will have to fulfill when holding a position in an enterprise and are directly

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[78] It is referred to the European countries.

linked to his job. Social competences are those linked to labor, the workplace and the ability to work in a team and are closely linked to the notion of self-competences. (Mouillour, 2005).

Different understanding of competences refers to the ability to successfully meeting complex demands in a particular context. Competent performance or effective action implies the mobilization of knowledge, cognitive and practical skills, as well as social and behavior components such as attitudes, emotions, and values and motivations (OECD, 2003b).   represent a transferable, multifunctional package of knowledge, skills and attitudes that all individuals need for personal fulfillment and development, inclusion and employment European Commission (2003b). "…dispositions of self-organized acting, as self-organizational dispositions" (Erpenbeck & Rosenstiel, 2007). Competences from social context formative model emphasize in the interpretation, argumentation and problem solving the external context (Fraile, Calva, Rodriguez, & Álvarez, 2012).

In this context, Traditional system just qualified people with a set of knowledge and skill in controlled situations, into the classrooms, laboratories and workshops. Meanwhile, Dual system support the process for raising competences on the students' development and employability, since in this system, students have to be into the enterprise during the formation process,   applying theoretical knowledge and skill, as well as social and behavior components such as attitudes, emotions, and values and motivations; solving real labor problems in non-controlled situation. In the interviews, decisions makers from enterprises have pointed out, that Dual system allow to have people with better competences according the needs of the company.

Problems using Dual system for raising competences on student's development and employability

Competence is recognized in the context of the real world; the development of competences is also based in real-world experiences and takes into account the full spectrum of learning opportunities (informal, non-formal and formal learning) throughout the life span. Competencies are broader than knowledge or skills, and are acquired in an ongoing, lifelong learning process across the whole range of personal, social and political contexts (Deakin, 2008). Deakin has pointed out the challenge on developing indicator and assessment tool to evaluate and measure competence.

Like has been developed by Flores (2011) in his article about complexity and education, it is not enough to change the method or the curricula, but it is necessary a change of

thought and the mental constructs. The competence approach has to be addressed from the complex reality that includes integral aspects as the acting, the suitability, flexibility and performance.

As has been pointed out by Bonilla (2010), the education and training initiatives based on performance standards usually favor of one type of competencies, not more of them. Although it is desirable gradual and consistent development of a wide range of knowledge, skills and values relevant to learning and training of people, their relationship is far from addressed comprehensively and continuously through the education and training systems with this approach. Moreover, plans and policies for skills training programs, both in academia and at work, often favoring one type of competency (basic, key, academic, professional, labor), regardless of the extent and diversity of knowledge, skills and values involved in the promotion of competencies itself.

The formation based on competence approach in the dual system, requires in depth review of assessment systems that linkage the skills developed during formation in the company, where the student must demonstrate proficiency in full and comprehensive knowledge, their skills, but above all their willingness to solve problems in complex and unexpected situations. Dual systems means to have career according the industry demands, better-qualified people for the employment.

In this investigation, the measurement of the level of competences should be reviewed in order to incorporate the assessment from the enterprise with more weight and updating the evaluation instruments. Besides, it is necessary to analyze the process of evaluation, and how it can be improved in order to have a closer competence approach.

In the other hand, the connection between tutors and teacher must be strengthened with the purpose to reinforce the curriculum, the training and learning process, the evaluation, and to understand the enterprise's needs, for competences to develop on the students. If teachers subscribe to the view that learning can only take place in classrooms where the teacher stands at the front and talks, then it will be extremely difficult to deliver vocational and technical programs effectively.

- **Better competences for students in Dual system**

To determine if the students of cohort 2008 - 2010 who study under using dual system`s elements acquire better professional competences to be inserted in the productive process that those of the traditional system was the aim. The two scientific questions were: (a)

under which conditions does the Dual system contribute to raise the competences level and improve the employability on students in technical education? And (b) how is the point of view of students and tutors about the new system?

The investigation to find the answer to these question were based in the hypothesis H1, where the aim was to prove if students of Cohort 2008 to 2010 that were formed under some elements of the Dual System, have acquired better competences than students in the same cohort that were formed in the traditional system. This was probe by two sub hypothesis related to probe the level of competences (H1.1) and the other about the employability conditions that include job in less time and salary conditions (H1.2). The test of the sub hypothesis showed the follow results comparing the Dual group with traditional group: a) There was no difference in the level of competences; b) the Dual group got job in less time; and c) the Dual group got better salary (See Table 6.1-1).

Table 6.1-1. Summary result for Hypothesis 1

Hypothesis	Dual group	Traditional group
Competences level	Same	Same
Time to get job	Less time	More time
Better salary	Higher salary	Lowest salary

Taking in consideration the three factors measured, Dual system has contributed to maintain a good level of competence (97% in intermediate level) as has been test with sub hypothesis H1.1 with the dual group.

Besides, students in Dual system had better job conditions with good rate of placement time (85% in the first six months and 41% retention level) and better salary comparing with the traditional group and with the technician from other careers who have graduated at the same time. The test of this sub hypothesis showed that there is a significant difference in the salaries between dual group and traditional group, having dual group better salaries.

On the other hand, student opinions about their study system (for dual and traditional), were explored by following variables: global perceptions, the formation at academy, enterprise practice, job opportunity, recommend others, advantages, and disadvantages. Analyzing the result of these opinions, the conclusions are:

At the beginning, both groups (dual and traditional) had very favorable opinion about their system of study in each variable. These opinion changes at the end of their studies, having more favorable opinion, the dual group than the traditional group. This change was evident in the variable 'Recommend other', where the question was if they recommend others to study in the system that they have been formed. Students in Dual system recommend other to study in this system (4.2)[79], and students in traditional system have a more unfavorable opinion (2.7) about recommend to study in the traditional system.

 About recommending the system of study where they were former to others (variable "Recommend others"), there was the major difference between two groups, because students in Dual system maintain their opinion, but students in Traditional systems decrease from a very favorable opinion (4.2) to an unfavorable opinion (2.7).

Students in dual system pointed out advantages of the system about combine theory and real practice, job opportunity, labor experience, tutor support and teacher support; but they recognized as the most important advantages the "Labor experience". Otherwise traditional group, find out as advantages the teacher support, access to academy resources, more time to do different tasks, the practices at the Academy and do not have compromise with enterprises.

About tutors, the main objective was to explore their opinion, about the student´s development formation who were in the new system and about the Dual System. Their opinions were explored by following variables: global perceptions, formation at academy, enterprise practice, job opportunities, recommend others, about dual system, advantages, and disadvantages.

According the results, during the formation process, tutors had maintained their very favorable opinion about different factors of dual system and students in this method. The most favorable opinion was for variable "Recommend others", showing that they have good perception and opinion about the new system.

The advantages according tutors were job opportunity, labor experience, less time for enterprise training, prepares future worker, and communication between academy and enterprise**.** From factors identified, the most pointed out were labor experience of the students in group dual, and the opportunity for enterprises to prepare future workers.

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[79] The scale to measure the opinion was a liker scale from 1 to 5, where 5 is the most favorable opinion and is the most unfavorable opinion.

Then, the main aim was to find out if students of cohort 2008 - 2010 who study under using dual system`s elements acquire better professional competences to be inserted in the productive process that those of the traditional system.

Taking only the grades at the Academy there were not significant differences between both group. In these grades were reflected the measurement competences method of the Academy. Here is important to remember about difference between qualifications and competences, pointed out before in chapter two where qualification is understanding as a set of knowledge and skill of the people. Competences are developed in controlled situation; it certified that the person know and can do something; but this not guarantees that this person will be successful in non-controlled situation, resolving problem in the real life.

So, it is possible to asseverate that both group acquire the same lever of professional qualifications, because the evaluation by final grades were under controlled situations.

But, considering that Dual group has developed its formation, taking contact with the real world word, exposed to solve real problems, and according the interviews (opinions from students and tutors), they got a very good level of competences. Besides, The results about job opportunities (time to get a job and salary conditions) were better for Dual group.

Considering all these facts, It is possible to affirm that students of cohort 2008 - 2010 who studied under dual system has acquired better professional competences to be inserted in the productive process that those of the traditional system

In conclusion:

Dual system could be a possibility to have a better quality in technical higher education, raising the competences level and improving the employability of the students, preparing them for the labor life.

Besides, in order to have better measurements at Academy about students' competences level, where it is necessary to reevaluate the actual measurement system including a better evaluation for competences developed in non-controlled situation in the real work life. It has to consider[80] (a) personal competences; (b) Activity and implementation-oriented competences; (c) technical and methodological competences; and (d) social and communicative competences.

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[80] Competences measurement is addressed in chapter II.

- **Industrialist motivation for participate in dual system**

The objective was to determine, factors that motivates the industrialists to participate in the student's formation by using elements of dual system. The scientific questions were (a) Which are the industrialist motivations to be part of Dual system?, and (b) how do the employers support the new system?. To find the industrialist motivations to be part of Dual system and how do they support the system, the hypothesis 2 was tested by qualitative method using interviews and expert advisor studies.

The motivations to be part of Dual system have been as follow: (a) the previous knowledge about the system; (b) to have people with better competences, according the needs of the company; (c) to reduce the risk to hire wrong people; (d) to reduce or optimize the training costs; (e) the innovation in new career that enterprise needs; (f) corporate social responsibility; and (g) to improve the productivity and quality.

About how the employees support their participation on Dual system, they starting paying US\$75.00 per month for each student, in this year (2012), they are paying US\$125.00 for each student. According the interviews for the industrialist, the quantity is for them an investment for having well prepared people to be hired by the company; besides, through the time to have an optimization of the training cost. On the other hand, the companies do not have to pay salary during the formation's process and the student support the production in many cases. With new employees, the company has to pay salary; training and they do not produce at the beginning. During the formation process, for some enterprises is the opportunity to have in the production process some students, who will improve the productivity, without labor costs.

Other factor that was present in some enterprises was the corporate social responsibility, where it is included to contribute with Salvadoran education, giving spaces to students for making practices into the company. They believe that enterprise practices allow more job opportunity, and in this way they can contribute for employability of youth.

Besides, they support the program by sponsoring each student who makes the practice in their enterprise paying for the tuition and some other expenses. They assign a tutor for the following, during the formation process and some resources from the company like equipment and tools.

In conclusion, the motivations of industrialist to be part of Dual system are:

The factors that motivate the industrialists to participate in the dual system were:

>   *(a) the previous knowledge about the system;*
>
>   *(b) to have people with better competences according the needs of the company;*
>
>   *(c) to reduce the risk to hire wrong people; (d) to reduce or optimize the training costs, (e) the innovation of a new career that enterprise needs;*
>
>   *(f) for corporate social responsibility; and*
>
>   *(g) to improve the productivity and quality*

- **Consequences of implementing Dual system**

The aim was to show consequences of implement dual system elements under the Salvadoran reality and develop suggestions its adaptation. Three scientific questions were formulated for this aim, as follows: (a) Under which conditions the system could be implemented in El Salvador?; (b) how could the Dual system improve the quality of technical education?; and (c) how can the new system improve the linkage between the academy and the enterprise?

Taking in consideration the results of the experience with the Dual group of the cohort 2008 - 2010 of Mechatronic career, the interview to the students, tutors, industrialist and key people; and the documental investigation; conclusion to these are as follow:

Conditions to be implemented the Dual system

The Education at a Glance 2010 report (OECD, 2010), has focused on how education has affected global workers during the economic downturn, it appoint that good education increases employability. Focusing on labor market conditions in 2008, the data show that in countries[81] hit early by the recession, people with lower levels of education had more difficulties finding and keeping a job. The report appoints that will require education systems that have often tended to operate supply-driven to develop effective mechanisms

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[81]   The OECD member countries are: Australia, Austria, Belgium, Canada, Chile, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Korea, Luxembourg, Mexico, the Netherlands, New Zealand, Norway, Poland, Portugal, the Slovak Republic, Spain, Sweden, Switzerland, Turkey, the United Kingdom and the United States. The Commission of the European Communities takes part in the work of the OECD.

to understand and respond to the rapidly changing economic and social demands for competencies. Besides, demands effective policies where will require a solid understanding not just of the development of competencies, but also of how effectively economies use their talent pool, and of how better competencies feed into better jobs, higher productivity, and ultimately better economic and social outcomes.

In El Salvador, the expansion and strengthening of the Dual system may be an opportunity for generating better conditions of life to the youth, decreasing unemployment and other social and economic problems as immigration, delinquency and crime. Also, support for the company to have the human talent with labor competencies to enable them to improve their productivity and competitiveness. Besides, the formation of youth, under this system could mean a new attraction for foreign and domestic investment in the productive sector, by having the right people to implement their companies in El Salvador. As part of the corporate social responsibility, enterprises can be assigned apprenticeships space for the young that enroll in the dual system.

The experience of implementation of Dual system in one technical career (Mechatronic) in the year 2008, and the expansion to other technical career (Logistic and Custom, Industrial Electronics and Computer Numerical Control), has laid the basic condition for the deployment to more careers and other institutions. One important results of this implementation is positive linkage between Industry and Academy that has been generated, where both work together in order to have better qualified people.

These recently studies in El Salvador: (a) Partnership for Growth (USG & GOES, 2011), (b) Private Sector Survey on Youth Employment: Challenges and Opportunities and Recommendations (USAID & GIZ, 2011), and (c) Science, Technology & Innovation Policy Review (UNCTAD & CEPAL, 2011) have pointed out that the educational system for young people need to be closely linked with the productive sector. But, for the deployment of the Dual system, it is necessary to generate other conditions in El Salvador, as follows:

It is necessary the facilitator role of the Government in this system, implementing programs the framework in order to warranty the quality, the suitable relations between the stakeholders, the economic and fiscal incentives, the wide dissemination of the results, benefits and difficult of the systems, among others. However, any changes to laws and regulations, must widely discussed with the sectors involved, to avoid resistances in the future. In fact, the decisions makers of the companies have expressed the convenience of continuing working through cooperation agreements between academia and companies.

This means that institutions like Ministry of Education, Ministry of Economy and Ministry of Labor and Social Security have to be involved in the deployment of the system.

Also in its role as facilitator, the government could request to the international cooperation support to increase the technical assistance, the development of technological infrastructure and the scientific monitoring to the expansion of the dual system for different educational institutions that implemented it.

On the other hand, enterprise sector by their industry association and chamber of commerce have to be involved facilitating the process providing information on training needs and projections for future development of the industry, as well as support the deployment of the dual system in their companies.

For its part, the higher educational institutes (HEI) which will be part of the Dual system, have to supply those career that really have demand in the industry, and make the curricular transformation, assure the process of teaching and learning and built the relationship with the enterprises.

Hagen Kramer[82], has noted that it does not make sense that the European countries support that students have formation in sectors where there are not labor demand. In terms of employability, Dual system is important in sector where there is labor demand; it is going to benefit young people, industry and contributors, only if students have prospects for employment in companies, which are committed to investing in them and develop new products.

As has been pointed out by Badía (Annex 24, Key person Interview [K2], November 9th 2011, lines 172-177, 262-268), the dual system is a good concept, which could give better results if it is applied on a sectorial. It is an experience that should continue expanding, and making the evaluation of the new results.

In the other hand, it is clear that Dual system is being implemented in a small universe, so with these results It is not possible to conclude over the entire national system for technical education. But, this should lead to build in a prospective way the new scenarios about the future of technical education, assuring positive consequences in the youth employability and the increase of the quality of life for those who are in social and economics disadvantages. This must be taking in count the real conditions of El Salvador.

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[82] Professor of Economy from German University of Karlsruhe.

Improving the quality of technical education

The term adopted by UNESCO (1999) Technical and Vocational Education and Training (TVET) is the combined process of education and training and recognize the common objective of employment as their immediate goal. It is concerned with the acquisition of knowledge and skills for the world of work (Power, 1999).

The quality is a critical point for TEVT systems in order to be according the demands of the industry and the society. To be truly a source of competitive advantage for industry, it must have   a minimum level of quality. The aim at improving the quality of skills training as a means toward enhanced global competitiveness.

The deployment of Dual system in technical educations demands to improve the quality in the formation process, in the study plan (according the enterprise needs), the professional level of the teachers, the technological infrastructure, the administrative process among others. To improve the quality, the international accreditation of these programs could be an action with a real great impact for the quality in technical education in El Salvador and for the competitiveness of the industry.

In contrast with Europe[83], in El Salvador there is not a framework for qualification in TVET in the moment of this investigation, but there are international accreditations for programs that could be applied in order to guarantee the quality.

Implementing Dual system, is a possibility to improve the quality in technical education because it work with the competence approach as model of learning, where the linkage with the industry during the formation process allow the students to apply the knowledge and skill for different complex situations where they have to respond. With Dual system is possible to have the curricula with the participation of the employers, how Huddleston & Unwin (2007) have recommended.

It requires from the Academy to maintain a continue review of its formation programs to ensure they are pertinent to the needs of the enterprises and demand-driven of the industry. The Dual system works in those careers where the potential exists for recruitment

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[83]   Various initiatives and policy instruments have been developed in recent years for quality, transparency and recognition of qualifications. Examples are European standards and guidelines for higher education, the European Quality Assurance Reference Framework for Vocational Education and Training (EQAVET), the European Qualifications Framework for Lifelong Learning, the Qualifications Framework of the European Higher Education Area, the European Credit Transfer and Accumulation System (ECTS) and the European Credit System for Vocational Education and Training (ECVET).

of students into the industry. Besides, demand for the teachers in the processes more domains of knowledge, technologies and techniques applied in industry.

This system gives the possibility to improve the quality and the perception of the stakeholder about the quality of the education in El Salvador, because it makes a real connection with the needs of the industry for well prepare people for the employment.

The successful of Dual system have mainly marked by the linkage with the industry. Important facts like the level of retention[84] of the student after their graduation, the employment rate and the salary conditions confirm the relevance of this linkage.

Improving the linkage between academy and the enterprise

The most important requirement for successful systems of skills development is close links with industry and employers. Employers know best what skills are needed in the economy (ADB, 2004, p. 104). Dual system demands a much closer relationship between academy and enterprises. This kind of system allows the opportunity to have the appropriated relation between academy and enterprise, since both has to work in a strong collaboration in order to reach their own aims. The strengthening of the relationship between Academies - Enterprise where both institutions have taken responsibility in the process of formation in technical education, is one of the key components of Dual education. This relations means, actions in two ways as follows:

(a) Academic institutions have to be compromised with the quality of their formation process, taking in considerations and understanding the enterprise's needs, and changing their traditional way to make education; and this process also demands a much closer relationship between teachers and employers to ensure that the former is up to date with regard to changes in workplace procedures.

(b) On the other hand, enterprises have to be open to the new way to prepare the people for employment, giving the spaces into the company for the students and supporting the formation process. Besides, decision makers on the enterprises have to understand that formation process is not only to prepare for a good worker, beyond that is to prepare people for the life, like a good citizen with better living conditions. This is a compromise relation with the youth of El Salvador, which in the middle term will affect in a positive way the competitiveness of the industry.

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[84] Level of retention is the percent of student that are hired in the enterprise where they did the practice.

- **About the research**

In Latin America there is limited documental information related to the implementation of the dual system (Carlson, 2002, pp. 17-18). This research helps to document the experience in El Salvador, on the implementation of the Dual System in technical training, which can provide a basis for future research. In addition, it gives information that could support the measures to expand the system in other careers and in other institutions at national and international spheres.

6.2   Further investigations

It is important the follow-up given to this first cohort, that was first implemented at the dual system of higher education, creating positive expectations, they deserve to follow-up to the new cohorts in the same career and other disciplines, for not abandoning a system that has high impact in Germany and other countries.

Additionally, it is important to investigate about competency assessment; the integration of the academy and enterprise evaluation; and identify the reforms required in the evaluation system.

Other important area to investigate is the Dual system´s evaluation Germany vs. the evaluation in El Salvador, and the conditions to implement a new assessment bases in competences approach.

With regard to employability could follow up other conditions of employability as are the diversity of job opportunities, salary increase over time, mobility and its impact on youth employment rates.

Other research could be, about the systems of incentives and regulations that may promote the development of the Dual system.

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Annexes

Annex 1.   Formal educational structure and laws in El Salvador

The Educational System of El Salvador is divided into two categories: formal and informal education how it is define in the General Education Act (MINED, 2005), which establishes:

- **Formal Education** is taught in educational institutions authorized in a regular sequence of years or school year, subject to guidelines, progressive curriculum leading to degrees and diplomas. Formal education is for the preschool, kindergarten, primary, secondary and higher education (See Illustration Annex 1-1).

- **Non-Formal Education** is offered with the aim of completing, updating, supplying expertise and training, in academic or work without being subject to the system of levels and degrees of formal education. Is systematic and responds to short-term needs of individuals and society.

It also defines the **Informal Education**, which is acquired as freely and spontaneously, from persons, institutions, mass media, traditions, customs and other non-structured.

Illustration Annex 1-1. Educational structure of El Salvador
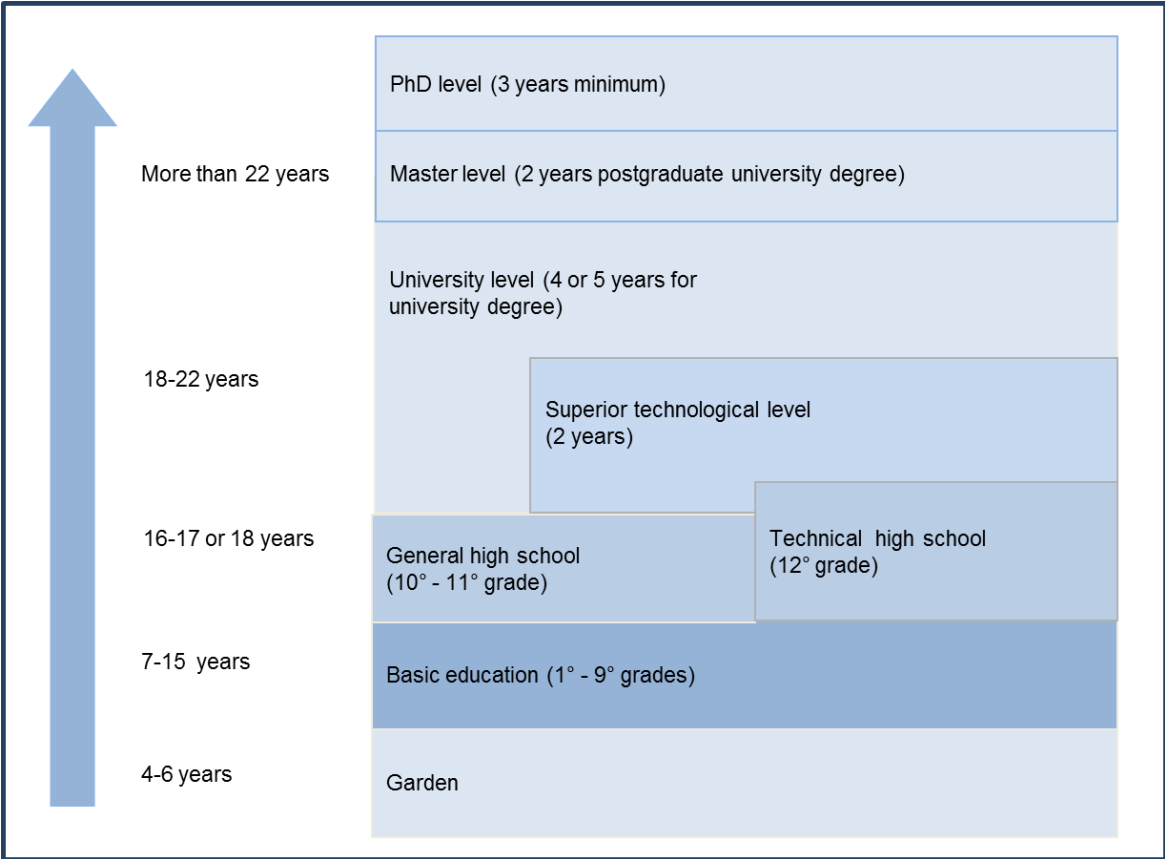
Kindergarten Education typically involves three years of study, where students are four to six years old. The curriculum components foster the integral development of the student, involving the family, school and community. The accreditation of the culmination of preschool, allows access to basic education, but it is not required.

Primary education is normally offered to students from 7 to 15 years old and is mandatory. Students from 6 years may be admitted provided they demonstrate maturity under educational criteria to start these studies and there are resources in schools. Basic education covers nine grades, divided into three cycles of three years each.

Secondary education can be provided in two forms, General (two years of study in daytime) and Technical-vocational (three years). The official educational institutes imparting education at this level are defined as national institutes, while private institutions are called colleges or high schools. The end of the Secondary education studies is with a diploma high school degree and it allows pursuing higher studies or joining the workforce.

In terms of evaluation, medium level legislation provides a scale of 0 to 10 in the basic and technical area. The score needed to pass a subject at the end of the school year is 6.

It also manages the learning and aptitudes test for graduates (PAES), which is targeted at measuring the achievement of student learning and allows establishing their performance and effectiveness in different areas of curricular attention.   Each student is required to get tested, regardless of their results. PAES results, are used by students, as indicators of achievements, in formal education, by educational institutions in order to analyze the performance of their students and know which areas your education has been successful or poor, and the Ministry of Education to help schools and colleges to improve the quality of education. On the other hand, universities and the business sector may be considered in applications for admission or selection (UNESCO, 2010d).

Higher education

Higher education is governed by the Law on Higher Education (MINED, 2004), has as a prerequisite Secondary education studies or equivalent. Offer studies giving the right to the award of diplomas and degrees, in areas of Technical Education and Higher Education.

Technical education has as its purpose the training of professionals and technical specialists in the application of knowledge and skills in different areas of science and humanistic. **Grade of Technician i**t is given to the student who has adopted a curriculum

that covers all the essentials for practical knowledge and skills in a scientific or humanistic, art or specific technique. The academic curriculum for obtaining the degree of Technician, will last not less than two years and a minimum requirement of sixty-four credit units.

University education is one that is focused on career training in multidisciplinary studies in science, art, culture and technology, scientific and humanistic training and lead to obtaining university degrees. Universities can provide academic degrees: technical (two years of study), teacher (three years); technologist (four years), licensed, engineer and architect (five years); master (two years of career); PhD (not less than three years after the master degree), specialist (only for doctors and dentists).

Fundamental laws in the education system

The education system in El Salvador is mainly regulated by follows laws:

Constitution of the Republic of El Salvador

It was defined by Legislative Decree No 38, which includes in the third section, the purpose of national education and basic provisions for the organization of the education system (Asamblea Legislativa, 1983).

The General Education Act

Created by Legislative Decree No. 917, establishes the foundations, principles, characteristics, general objectives of education and regulates the organization and functioning of the education system. The relevant aspect contained in this Act is referred to the policies of access to education, the educational structure, the orientation of the national curriculum, a national system of evaluation and research and monitoring and management processes that emphasize education organized community participation. It has regulations about the service of official and private institutions (MINED, 2005).

The Teaching Profession Act

Created by Legislative Decree No. 665, aims to regulate relations between the state and the educational community with educators to serve the State, autonomous institutions, municipalities and private, and systematically assess the salary scale, both in their education, as in its age of service. It was created to encourage the improvement and efficiency of teachers in the exercise of the profession (MINED, 2006a).

The Higher Education Act

Created by Legislative Decree 468, is a special way to regulate higher education and the establishment and operation of state and private institutions that delivered. Define academic degrees. It define the functions of teaching, scientific research and social outreach, and all about academic degrees. Besides include institutions that will warranty the quality of the education (MINED, 2004).

MEGATEC program

Moreover, there is MEGATEC program (Educative Gradual Model of Technical and Technological Learning), which was an initiative of the Government management of the period 2004 -2009, to strengthen secondary technical education and higher education Technological, in line with the requirements of the productive development of different regions of the country (MINED, 2007).

MEGATEC is an integrated system of secondary and higher education, aimed at human capital formation in technical and technological areas related to national and regional productive development. It is structured from the third year technical high school. The options are integrated in the curriculum to ensure consistency and continuity of studies to higher levels. Therefore, the technical high school graduate will have the option of entering the second year of technical careers of higher education, to get the degree of technical; technologist and engineer (MINED, 2006b).

Model MEGATEC currently, articulates the curriculum in two levels of technical education Technological: Secondary Education and Higher Education. Different campus of MEGATEC, offer careers in technical and Technological; and they are located in areas of the country that were been considered as poles of development in the government of 2004 to 2009. Began operations since 2006, and his administration is under higher education institutions already exist (MINED, 2006b).

Annex 2.   Structure of the Education System in Germany

The basic structure of the Educational System in the Federal Republic of Germany (See Illustration Annex 2-1), that is described above[85] was taken from documents published by the documentation and information service of the Secretariat of the Standing Conference of the Ministers of Education and Cultural Affairs of the Länder (KMK, 2009).

Illustration Annex 2-1. Educational System of Germany

Further Ed.

CONTINUING EDUCATION

(various forms of continuing general, vocational and academic education)

Tertiary Education

Doctorate (Promotion) Degree or examination after a first course of study (Diplom, Magister, Staatsprüfung; Bachelor, Master)

Diplom, Bachelor

BERUFSAKADEMIE

UNIVERSITÄT

TECHNISCHE UNIVERSITÄT/ TECHNISCHE HOCHSCHULE PÄDAGOGISCHE HOCHSCHULE KUNSTHOCHSCHULE MUSIKHOCHSCHULE FACHHOCHSCHULE VERWALTUNGSFACHHOCHSCHULE

Qualification of vocational further education

Allgemeine Hochschulreife

FACHSCHULE

ABENDGYMNASIUM/ KOLLEG KOLLEG

secondary level II — Grade 13, 12, 11, 10 / Age 19, 18, 17, 16, 15

Berufsqualifizieren der Abschluss

Fachhochschulreife

Fachgebundene Hochschulreife

Allgemeine Hochschulreife

BERUFSSCHULE and ON-THE-JOB-TRAINING (Dual System of vocational education) 2)

BERUFS-FACH-SCHULE

FACHOBER-SCHULE

BERUFSOBERSCHULE

GYMNASIALE OBERSTUFE in the different school types: Gymnasium, Berufliches Gymnasium/ Fachgymnasium, Gesamtschule

Mittlerer Schulabschluss (Realschule leaving certificate) after 10 years,
First general education qualification (Hauptschule leaving certificate) after 9 years

Secondary level I — Grade 10, 9, 8, 7, 6, 5, 4 / Age 16, 15, 14, 13, 12, 11

10th grade

SONDERSCHULE

HAUPTSCHULE

REALSCHULE

GESAMT-SCHULE

GYMNASIUM

Orientation phase

Primary Education — Grade 3, 2, 1 / Age 10, 9, 8, 7

SONDERSCHULE

GRUNDSCHULE

Pre-school Educ. — Age 6, 5, 4, 3

SONDERKINDERGARTEN

KINDERGARTEN (optional)

Grade / Age

---

[85] Published by Secretariat of the Standing Conference of the Ministers of Education and Cultural Affairs, of the Länder, in the Federal Republic of Germany (KMK, 2009).

The distribution of the school population in 2007 was as follows: Hauptschule 20.6 per cent, Realschule 26.5 per cent, Gymnasium 33.4 per cent, integrierte Gesamtschule 8.5 per cent, types of school with several courses of education 6.4 per cent, special schools 3.8 per cent. The main aspects of this educational system are as follows:

1. The ability of pupils to transfer between school types and the recognition of school-leaving qualifications is basically guaranteed if the preconditions agreed between the Länder are fulfilled. The duration of full-time compulsory education (compulsory general education) is nine years (10 years in four of the Länder) and the subsequent period of part-time compulsory education (compulsory vocational education) is three years.

2. In some Länder special types of transition from pre-school to primary education (Vorklassen,Schulkindergärten) exist. In Berlin and Brandenburg the primary school comprises six grades.

3. The disabled attend special forms of general-education and vocational school types (partially integrated with non-handicapped pupils) depending on the type of disability in question. Designation of schools varies according to the law of each Land.

4. Irrespective of school type, grades 5 and 6 constitute a phase of particular promotion, supervision and orientation with regard to the pupil's future educational path and its particular direction (Orientierungsstufe or Förderstufe).

5. The Hauptschule and Realschule courses of education are also offered at schools with several courses of education, for which the names differ from one Land to another. The Mittelschule (Sachsen), Regelschule (Thüringen), Erweiterte Realschule (Saarland), Sekundarschule (Bremen, Sachsen- Anhalt), Integrierte Haupt- und Realschule (Hamburg), Verbundene oder Zusammengefasste Hauptund Realschule (Berlin, Hessen, Mecklenburg-Vorpommern, Niedersachsen) Regionale Schule (Mecklenburg-Vorpommern, Rheinland-Pfalz), Oberschule (Brandenburg), Duale Oberschule (Rheinland-Pfalz), Regionalschule (Schleswig-Holstein) and Gemeinschaftsschule (Schleswig-Holstein), as well as comprehensive schools (Gesamtschulen) fall under this category.

6. The Gymnasium course of education is also offered at comprehensive schools (Gesamtschule). In the cooperative comprehensive schools, the three courses of

education (Hauptschule, Realschule and Gymnasium) are brought under one educational and organisational umbrella; these form an educational and organizational whole at the integrated Gesamtschule. The provision of comprehensive schools (Gesamtschulen) varies in accordance with the respective educational laws of the Länder.

7. The general education qualifications that may be obtained after grades 9 and 10 carry particular designations in some Länder. These certificates can also be obtained in evening classes and at vocational schools.

8. Admission to the Gymnasiale Oberstufe requires a formal entrance qualification which can be obtained after grade 9 or 10. At present, in the majority of Länder the Allgemeine Hochschulreife can be obtained after the successful completion of 13 consecutive school years (nine years at the Gymnasium). Yet in almost all Länder the gradual conversion to eight years at the Gymnasium is currently under way, where the Allgemeine Hochschulreife can be obtained after a 12-year course of education.

9. The Berufsoberschule has so far only existed in a few Länder and offers school-leavers with the Mittlerer Schulabschluss who have completed vocational training or five years' working experience the opportunity to obtain the Fachgebundene Hochschulreife. Pupils can obtain the Allgemeine Hochschulreife by proving their proficiency in a second foreign language.

10. The Fachoberschule is a school type lasting for two years (grades 11 and 12) which admits pupils who have completed the Mittlerer Schulabschluss and qualifies them to study at a Fachhochschule. Pupils who have successfully completed the Mittlerer Schulabschluss and have been through initial vocational training can also enter the Fachoberschule directly in grade 12. The Länder may also establish a grade 13. After successful completion of grade 13, pupils can obtain the Fachgebundene Hochschulreife and under certain conditions the Allgemeine Hochschulreife.

11. Berufsfachschulen are full-time vocational schools differing in terms of entrance requirements, duration and leaving certificates. Basic vocational training can be obtained during one- or two-year courses at Berufsfachschulen and a vocational qualification is available at the end of two- or three-year courses. Under certain conditions the Fachhochschulreife can be acquired on completion of a course lasting a minimum of two years.

12. Extension courses are offered to enable pupils to acquire qualifications equivalent to the Hauptschule and Realschule leaving certificates.

13. Fachschulen cater for vocational continuing education (1-3 year duration) and as a rule require the completion of relevant vocational training in a recognized occupation and subsequent employment. In addition, the Fachhochschulreife can be acquired under certain conditions.

14. Including institutions of higher education offering courses in particular disciplines at university level (e.g.theology, philosophy, medicine, administrative sciences, sport).

15. Pädagogische Hochschulen (only in Baden-Württemberg) offer training courses for teachers at various types of schools. In specific cases, study courses leading to professions in the area of education and pedagogy outside the school sector are offered as well.

16. The Berufsakademie is a tertiary sector institution in some Länder offering academic training at a Studienakademie (study institution) combined with practical in-company professional training in keeping with the principle of the dual system.

Annex 3.   Curriculum of Mechatronic Career

Mechatronic Technician career was implemented in the year 2008 in El Salvador at the Academy; its design was approved with the competence approach and structured in a modular form. This career was implemented by two ways, one in the traditional system and other under dual system. The curriculum is the same as both systems, besides students had the same classes, modules and teachers. The difference is that, students in traditional system made their practice into the Academy, and their enterprise practice were after the period 10, for 6 weeks.

According has been established in this curriculum, the graduates could be employed by enterprises with automated processes for industries such as metal mechanical, food, chemical, textile, among others. The graduates can work in the following positions: Supervisor of electrical or mechanical maintenance, Supervisor of automated production lines, Contractor, Workshop Supervisor Computer Numerical Control (CNC), Trainer of operators of automated equipment, Technical specialist automation equipment or Technical Seller.

The curriculum was designed with 39 modules, 10 months of practice (for dual system), completing a total of 240 credits. It covers the development of competences in technical areas, areas of basic education and English, each area is made up of groups of modules. The structure of the plan per area of expertise is divided into 3 major areas: mechanics, electronics and automation, where 52% is covered with modules that develop competences in the field of automation. The curriculum in modular form organized by year and period; and by period, competence area, and enterprise practice, are presented in below. Curriculum organized by year and period is in Table Annex 3-1, and with the distribution by period, competence area and enterprise practice y in Table Annex 3-2, page 267

1) Curriculum organized by year and period

Table Annex 3-1. Curriculum of Mechatronic by year and period

First year				Second year				Third year	
Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Period 7	Period 8	Period 9	Period 10
Materials Science	Technical Drawing	Fundamentals of Mechanics	Applied Mechanics	Manufacturing Processes	Computer -AID Design	Hydraulics and Pneumatics	Automation of hydraulic and pneumatic circuits	Robotics and CNC technologies	Integrated Production Systems
Electrical Circuits	Industrial Power Facilities	Electrical Drive Control Systems	Industrial Electronics	Digital Electronics	Installation and setup of PC and networks	PLC Programming	PLC Systems and Industrial Networks	Industrial Process Control	Assembly and calibration Mechatronic
Mathematics	Oral and written communication	Office	Computer Logics	Environmental management	Programming	Professional Ethics	Entrepreneurial Fundamentals	Troubleshooting	Quality control and cost management
Basic English I	Basic English II	Basic English III	Basic English IV	Intermediate English I	Intermediate English II	Intermediate English III	Intermediate English IV		Safety rules and standards

2) Curriculum organized by period, competence area, and enterprise practice

Table Annex 3-2. Curriculum by period, competence and enterprise practice

	First year				Second year				Third year	
	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Period 7	Period 8	Period 9	Period 10
	Materials Science	Technical Drawing	Fundamentals of Mechanics	Applied Mechanics	Manufacturing Processes	Computer -AID Design	Hydraulics and Pneumatics	Automation of hydraulic and pneumatic circuits	Robotics and CNC technologies	Integrated Production Systems
	Electrical Circuits	Industrial Power Facilities	Electrical Drive Control Systems	Industrial Electronics	Digital Electronics	Installation and setup of PC and networks	PLC Programming	PLC Systems and Industrial Networks	Industrial Process Control	Assembly and calibration Mechatronic
	Mathematics	Oral and written communication	Office	Computer Logics	Environmental management	Programming	Professional Ethics	Entrepreneurial Fundamentals	Trouble shooting	Quality control and cost management
	Basic English I	Basic English II	Basic English III	Basic English IV	Intermediate English I	Intermediate English II	Intermediate English III	Intermediate English IV		Safety rules and standards

(Between each period column is a vertical band reading "ENTERPRISE PRACTICE 4 WEEKS".)

Legend: Mechanical competences | Automation competences | Electronic competences | Fundamental areas

Annex 4.   Technical competences y sub competences of Mechatronic career

The detail of the competences and sub competences by module of Mechatronic career are in the table below (See Table Annex 4-1).

Table Annex 4-1. Mechatronic: Competences and sub competences

Module	Competence	Sub competence
Materials Science	A. Classify materials by their physical properties.	A1. Create list physical and technical properties of ferrous materials. A2. Create list physical and technical properties of non-ferrous materials. A3. Create list physical and technical properties of plastics. A4. Create list physical and technical properties of the composites. A5. Create list physical and technical properties of ceramic materials and semiconductors.
Electrical Circuits	B. Arm Direct current electrical circuits.	B1. Assemble circuits using resistors, capacitors, inductors. B2. Measure voltage, energy and endurance using measuring instruments. B3. Construct series circuits and parallel. B4. Specify the power drawn by an electric charge. B5. Interpret electrical diagrams of circuits directly. B6. Apply industrial safety standards to the use of equipment for measurement.
	C. Assembling three-phase electrical circuits AC.	C1. Measuring electrical parameters of an alternating signal. C2. Wire circuits with relays. C3. Measure power in three-phase circuits. C4. Draw the power triangle. C5. Measure power factor load. C6. Measuring electrical parameters of a transformer.

Module	Competence	Sub competence
		C7. Connect three-phase circuits and Star Delta configurations.
		C8. Interpret wiring diagrams of AC circuits.
Technical Drawing	D. Draw plans of machines.	D1. Draw parts of a machine by freehand.
		D2. Draw subsets of parts of a machine freehand.
		D3. Select the technical specifications of material for each piece.
		D4. Select the technical specifications of Finish for each piece.
		D5. Specify the tolerances of each piece.
Industrial Power Facilities	E. Use the tools, accessories and measuring equipment required to perform an electrical installation.	E1. Create different types of connections between electrical conductors.
		E2. Select the type of conductor to an electrical installation.
		E3. Create a list of materials, equipment and tools to use in an electrical installation.
		E4. Apply the rules for the use of materials in low voltage circuits.
		E5. Install electrical circuits for residences with various loads.
		E6. Using testing equipment for measuring electrical insulation.
		E7. Use equipment for measuring the quality of energy.
		E8. Read electrical drawings.
Fundamentals of Mechanics	F. Testing of metallic materials.	F1. Preparing the equipment for testing materials.
		F2. Handling machines for testing materials.
		F3. Get the graphics for each assay.
		F4. Specify the most important data for obtained during the tests.
Electrical Drive Control Systems	G. Use different electrical machines for industrial applications.	G1. Register the data of nameplate motor.
		G2. Properly connect single-phase motors under practical conditions.

Module	Competence	Sub competence
		G3. Draw the curves of torque - speed three-phase motor.
		G4. Connect three-phase induction motors in Delta or Star.
		G5. Make circuits of control of three phase motors.
		G6. Connect the different types of DC machines.
		G7. Connect transformers and auto transformers in different combinations.
		G8. Measuring electrical parameters of a distribution transformer.
	H. Arming circuits contactor control.	H1. Selecting contactors for industrial applications.
		H2. Properly install the different types of control relays.
		H3. Make contactor circuits for starting the engine.
		H4. Perform preventive and corrective maintenance to basic control circuits frequently used in industry.
		H5. Detect the reasons for failures in the contactors.
		H6. Read control circuit levels.
Office	I. Manage office software.	I1.Handle basic PC and Internet.
		I2.Use word processors.
		I3.Using Spreadsheets.
		I4. Develop software presentations.
Applied Mechanics.	J. Prepares request for a technical installation.	J1. Write technical requirements for a machine foundation.
		J2. Write technical requirements of the electrical system for a machine.
		J3. Write technical requirements of fluid delivery requirements for a machine.
	K. Prepares list of parameters of a Mechatronic	K1. Record the electrical parameters of the Mechatronic system.
		K2. Specify the electronic parameters of a Mechatronic system.
		K3. Specify the mechanical parameters of the mechanical

Module	Competence	Sub competence
	system.	system.
		K4. Specifying parameters of Mechatronic system programming.
Industrial Electronics	L. Use semiconductor devices for electronic power control and fault detection equipment, commercial and industrial application.	L1. Static testing with semiconductor devices, in order to determine if defective.
		L2. Identify the different terminals of semiconductor devices.
		L3. Wire rectifier circuit with diodes.
		L4. Make control circuits of control with transistors.
		L5. Identify the electrical symbol of the leading semiconductor.
		L6. Constructing operational amplifier circuits.
		L7. Draw graphs of operation of the SCR and TRIAC.
		L8. Make power control circuit with the SCR and TRIAC.
		L9. Measuring the electrical signals generated by the rectifier.
		L10. Interpret wiring diagrams of frequency inverters and soft starters.
		L11. Using variable frequency drives to control the speed of an AC motor.
		L12. Using voltage regulators.
		L13. Measuring electrical parameters of voltage regulators.
		L14. Build circuits constant current load.
		L15. Read electrical and electronic diagrams.
Computer Logics	M. Develop Computational Logic.	M1. Apply truth tables and Operator Hierarchy.
		M2. Develop algorithms and flowcharts.
		M3. Perform general structure of a program.
		M4. Apply basic programming structures.
Manufacturing Processes	N. Making parts by hand.	N1. Drawing on rough part.
		N2. Cut materials with hand saw.
		N3. Perform surface finishing lime.

Module	Competence	Sub competence
		N4. Using welding equipment.
		N5. Perform MIG welding equipment.
		N6. Perform TIG welding equipment.
		N7. Use Plastic injection equipment.
		N8. Place molds.
		N9. Fill material for injection molds.
		N10. Operate injection equipment.
		N11. Make cold forming and hot.
		N12. Prepare material for die cutting.
		N13. Mount the die in the press.
		N14. Operating cold forming equipment.
		N15. Prepare material for mold.
		N16. Perform mold assembly in the press.
		N17. Operate hot forming equipment.
	O. Manufacture of parts to machine tools.	O1. Manufactures mechanical parts in lathe.
		O2. Manufactures parts in milling.
		O3. Correcting parts in machine of cylindrical and surface grinding.
Digital Electronics	P. Use combinational and sequential digital circuits, to develop control systems and digital editing equipment failures.	P1. Use different numbering systems.
		P2. Identify the electrical symbol of the different logic gates.
		P3. Use combinational and sequential logic circuits for small and medium scale integration.
		P4. Trace and correct faults in basic digital systems.
		P5. Identify the different types of RAM and ROM by number of integrated construction.
		P6. Build digital logic circuits containing gates, encoders, multiplexers, counters, memories and other devices of wide application.

Module	Competence	Sub competence
	Q. Detect and correct faults in systems based on programmable logic devices, microprocessors and microcontrollers.	Q1. Draw the block diagram of a system based on microprocessors. Q2. Develop basic assembly language programs. Q3. Programming, a microprocessor in assembly language. Q4. Detect faults in microprocessor-based systems. Q5. Select a type of microcontroller according to the project. Q6. Loaded from a computer program to the microcontroller. Q7. Develop computer programs microcontroller. Q8. Arm microcontroller-based systems.
Programming	R. Develop application programs for the control of electrical and electromechanical devices through the computer.	R1. Use tools integrated development environment. R2. Create user interfaces. R3. Develop forms for data capture. R4. Using basic control structures. R5. Encoding software.
Computer -AID Design	S. Using CAD software.	S1. Draw parts of a machine with all specifications. S2. Draw sets of parts. S3. Draw a plane, and do printing. S4. Draw 3-dimensional parts.
Installation and setup of PC and networks	T. Installing the various components of hardware and software you need a PC to operate.	T1. Install the existing hardware with their drivers. T2. Install an operating system. T3. Apply the tools of hardware and software maintenance. T4. Make a diagnosis with system failures.
	U. Wiring and configuration of a data transmission	U1. Distinguish elements of a network. U2. Performed, the wiring network.

Module	Competence	Sub competence
	network.	U3. Setup, communication across a network. U4. Check the communication between components.
Hydraulics and Pneumatics	V. Hydraulic and pneumatic arm.	V1. Properly connecting valves and actuators. V2. Use auxiliary devices in circuits. V3. Make, armed circuits testing. V4. Regular circuit variables
	W. Connect hydraulic and pneumatic power.	W1. Interpret diagrams of hydraulic and pneumatic circuits. W2. Properly connecting valves and control systems. W3. Use mechanical control devices.
PLC Programming	X. Develop ladder programs for programmable logic controllers (PLC).	X1. Draw a block diagram of the main parts of a PLC. X2. Programming basic relay circuits with a PLC. X3. Connect the PC-PLC interface. X4. Use arithmetic and logic operations of a PLC. X5. Programming counters and timers with selectors
	Y. Apply different types of proximity sensors to generate input signals to PLC.	Y1. Connect optical proximity sensors. Y2. Connect inductive proximity sensors. Y3. Connect capacitive proximity sensors. Y4. Using proximity sensors to detect the presence of objects. Y5. Using proximity sensors to develop a PLC counters.
Automation of hydraulic and pneumatic circuits.	Z. Electro and electro-connect circuits.	Z1. Build circuits with opto sensors - electronics for hydraulic and pneumatic (counting and detection of objects). Z2. Build circuits with proximity sensors for the control of hydraulic and pneumatic circuits. Z3. Interpret diagrams of electrical circuits.

Module	Competence	Sub competence
		Z4. Properly connect solenoid valves and control systems.
		Z5. Use electrical control devices.
	AA. Using PLC for hydraulic and pneumatic control circuits.	AA1. Interpret diagrams of control circuits.
		AA2. Connect the circuit elements to the PLC.
		AA3. Check the operation of control circuit
PLC Systems and Industrial Networks.	AB. Use automatic programmable industrial control.	AB1. Programming with PLC control circuits.
		AB2. Install extension modules in PLC systems.
		AB3. Detect faults in control circuits to PLC.
		AB4. Repair faults in control circuits to PLC.
	AC. Install communication protocols for industrial networks.	AC1. Determine the maximum distance of a protocol implementation.
		AC2. Set up a system of industrial communication bus.
		AC3. Install a system for connecting to standard protocols.
		AC4. Install a system for connecting with industry protocols.
		AC5. Configuring the display panel.
Robotics and CNC technologies	AD. Using simulation software (WinUnisoft and CADCAM).	AD1. Set control parameters around.
		AD2. Set control parameters Machining Center.
		AD3. Building lathe parts C.N.C.
		AD4. Build parts Machining Center.
	AE. Programming robotic units for industrial processes	AE1. Link hardware components of the robot.
		AE2. Programming routines for robot operation.
		AE3. Adjust timing and sequence events.
		AE4. Adjust positioning actuators
		AE5. Check operation

Module	Competence	Sub competence
Industrial Process Control.	AF. Use measurement equipment for different physical variables.	AF1. Use, equipment for mechanical measurements. AF2. Use, equipment for optical measurements. AF3. Utilize thermal measurement equipment.
	AG. Apply the different types of sensors and transducers for monitoring of physical variables in the process control industry.	AG1. Apply opto-sensing circuits - electronic control processes (counting and detection of objects). AG2. Using proximity sensors for process control. AG3 Using sensors to detect the fluid level. AG4. Using temperature sensors for process control. AG5. Use instruments to measure pressure. AG6. Using sensors for flow control. AH7. Connect modules analog / digital converters.
	AH. Use automatic control and regulation of continuous processes in industry.	AH1. Control circuits used in open loop and closed loop. AH8. Troubleshoot a control loop regulation AH2. Draw the block diagram of a circuit of closed loop control. AH3. Read blueprints circuit in closed loop control. AH4. Draw the PV versus time graph of a given system a step change. AH5. Building a control circuit ON - OFF. AH6. Set parameters PID industrial controls.
Integrated Production Systems	AI. Integrate manufacturing modules.	AI1. Diagramming production sequences. AI2. Interconnect signal processing units. AI3. Installing Field bus network. AI4. Programming control modules. AI5. Adjust control units. AI6. Check hardware and software control modules.

Module	Competence	Sub competence
Assembly and Calibration Mechatronic.	AJ. Apply Techniques for the assembly of a mechanical system.	AJ1. Prepare devices, equipment, components and materials for assembly. AJ2. Perform installation of integrated production systems. AJ3. Perform installation of the systems of CNC machines. AJ4. Perform installation of a robot system. AJ5. Make amendments to parts of a Mechatronic system. AJ6. Set Mechatronic systems. AJ7. Use rules on waste disposal and recycling during assembly and disassembly.
Troubleshooting	AK. Test and Troubleshoot for Mechatronic systems.	AK1. Prepare checklists for the operation of the equipment. AK2. Apply checklists equipment operation. AK3. Detect errors in pneumatic and hydraulic systems. AK4. Troubleshoot a CNC machine. AK5. Troubleshoot a Robot. AK6. Troubleshoot Integrated Production System. AK7. Locate disturbing factors. AK8. Write reports of failures.
Quality control and cost management	AL. Apply international norms of quality in product development processes.	AL1. Interpreting the ISO 9000 quality standards. AL2. Apply ISO 9000 to the automated processes. AL3. Document the procedures under the requirements of the standard. AL4. Describe the procedure for certifying production processes.
	AM. List fixed and variable costs of production of a product in an automated system.	AM1. List of materials and their respective amounts used in the manufacture of a product. AM2. Prorate the fixed costs of production department. AM3. List the number of hours used to perform work on an

Module	Competence	Sub competence
		automated system.
		AM4. List the external services that are required in a sequential process.
		AM5. Quote of materials, man hours and services used in the manufacture of a product.
Safety rules and standards	AN. Implement Safety rules and standards in Mechatronic facilities.	AN1. Apply rules of personal protection.
		AN2. Apply standards of protection for equipment.
		AN3. Apply rules of facility security.
		AN4. Apply rules of safety tests on equipment and machinery.

Annex 5.   Inter-institutional cooperation Agreement

Logo of the company	Logo of the Academy
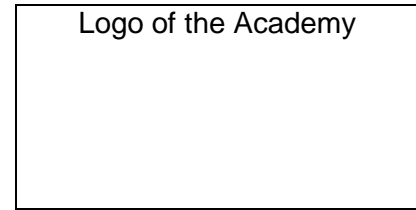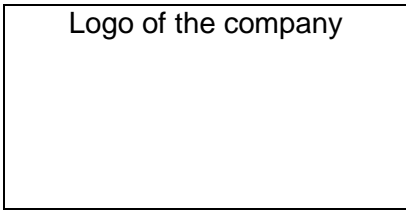
Inter-institutional Cooperation Agreement[86]

With the purpose of:

Establish the bases of cooperation for integrated development of an internship program, for the technical career in Mechatronics under the Dual system for students from this career that conduct their practices in the company through procedures and activities according to their knowledge, skills and skills acquired during each period of study.

(Name of the Academy), hereinafter referred to as Academy (Company name) celebrate this agreement between: (Legal information of the academy and the enterprise).

Preliminary considerations

1. Technical competences in Mechatronics that must be developed

At the end of their studies, Mechatronics technicians will be able to:

a) Plan, manage and control the maintenance and reparation of machinery and control systems in automated processes

b) Installing and removing mechanical, pneumatic, hydraulic, electro pneumatic and electrical

2. Concept of practice

The Academy and the Enterprise understand the practice like the application of the knowledge, values and skills that students have acquired during the gradual development of his career.

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[86] Inter-institutional Cooperation Agreement, ITCA(2007a)

3. **Situation of students**

   Students taking practice have to be properly enrolled in Academia and therefore are regulated by the rights and duties corresponding to them, which are detailed in the Manual of Academic Regulations and set out in the Student Guide.

4. **Academic character of the training**

   The company recognizes the academic and the formative of the enterprise practices program and is willing to support it in a manner consistent with these characteristics.

5. **Duration of the career**

   The career have a duration of two and half years, of which 20 months are used for theoretical and practical classes in the Academy and 10 months used for the development of the practice in the company.

Clauses

First clause – Duties and responsibilities of the Academy

   a) Propose students that have been considered appropriated for the enterprise practice in the company

   b) Monitor the student attendance during each period established for practices according the curriculum

   c) Designate a coordinator to monitor the activities of the students in the company

   d) Determine before the beginning of the practice, the conditions for student assessment in accordance with the functions that have to be performed

   e) Provide the documents control practices that have to be done by students

   f) Provide a mentor teacher to advise the student in the preparation of the final evaluation to be carried out within the company

Second clause – Duties and responsibilities of the Company

   a) The company can nominate candidates for the career, having care of the requirements of Academy that are established in the Student Guide

   b) Select students for the enterprise practice, based on the suggestion made by Academy, at least four weeks before the beginning of the classes

   c) To provide students office and equipment for the proper performance of their practices

   d) Respect periods established for theoretical and practical study that have to be performed at Academy

e) Allow the Academy staff follow-up activities for students, in each enterprise practice according to a schedule established by mutual agreement.

f) The company must designate a tutor to be responsible for the following functions:

- Determine the practice activities that students must develop which will relate to its theoretical and practice formation.

- Establish and define the monthly schedule of activities and places where practice will be developed, taking into account the regulations, internal standards, availability of specific areas and needs of the enterprise.

- Conduct performance evaluations of student during the enterprise practice, according to parameters and dates set by Academy.

- Provide the results of evaluations and any information relevant about the students regarding to their performance and their behavioral aspects through the designated coordinator.

g) The company will allow tutors the participation in the technical and methodological training with a duration of 12 hours, which will be provided by the Academy at no cost for enterprise

h) Participation of the tutor jointly with the teacher in the preparation and evaluation of final projects, which students have to make during the last three months of his career

Third clause – Financial considerations

It will provide students in support of sustainability concept, a sum not less than $ 75.00 per month, which must be enter according to the following forms:

a) Directly Academy, who in turn will pay the tuition established for students of this career. Every month, has to be a pay for the surplus to each student, the amount given to Academy is considered a scholarship awarded by the ENTERPRISE to the student

b) Directly to students, who will be responsible to pay their tuition to the institution, and manage any surplus for education and personal expenses.

Fourth clause – Number of students

Academia and the company will determine the number of students whom will practice within the facilities of the Company. If the company does not consider any candidate proposed by Academia, this contract does not take effect.

Fifth clause – Duration of daily schedule

The practices that the students within the company will be 44 hours per week, always respecting the Labor Code.

Sixth clause – Exclusion of employment

People from the Academy participating in this agreement, such as managers, teachers and coordinators, will conduct their activities with complete independence and autonomy of the enterprise, and these will not generate any employment relationship, nor be subject to payment of some kind of compensation, benefits or compensation related to employment by the company.

Seventh clause – Supervision and management

The supervision and management of the agreement will be in charge of the Academy, who will provide students, ongoing advice through the Coordinator assigned.

Eighth clause - Exclusiveness

This agreement does not limit the right of parties to holding the same or similar agreements with other institutions.

Ninth clause - Termination of the Agreement

This agreement may be terminated for the following reasons:

a) Mutual agreement between the parties

b) When one of the parties notifies the other with an advance of three (3) months of its intention not to continue with it, explain the reasons for it

Tenth clause - Confidentiality

Students in enterprise practice must sign a commitment to confidentiality to the company, by means of which they undertake not to divulge to third parties, all matters relating to production processes, working methods and technologies used, and any information that the company considers confidential to protect the industrial secrets of each company.

Eleventh clause - Companies need to establish a special cooperation agreement with another company

Companies that cannot support the full realization of the practices by students, according to the requirements of the curriculum must sign a special cooperation agreement, with another company that has an automated production line, so that students have been allowed to do some of their practices there. The modalities for the implementation of practices and relevant details should be detailed in the said agreement.

Twelfth Clause – Situations not covered

Situations not covered by this agreement will be resolved by the parties through the representatives of the Academy and of the joint venture agreement.

Any change that is the subject of this agreement must be in writing and be signed by the parties involved in it.

Thirteenth clause – Legal regime

This agreement is governed in general by the current legislation on higher education, as well as the rules and regulations of each institution.

This agreement is signed in duplicate in the city of _____, the day of _____, two thousand _____.

Signatures

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       By the Academy   By the enterprise

   Representative of the Academy   Representative of the enterprise

Annex 6.   Enterprise and student agreement

Logo of the Academy	Logo of the Company

Apprenticeship Agreement between the company and the Student[87]

The company _____

Represented by _____

With identification number _____

In his capacity as _____

Conscious of the importance of adequate formation human resources, accordance with the needs of enterprise, and also as part of its social responsibility, has decided to support the Dual formation program on the Career of Mechatronics Engineering Technician. This is part of an agreement between the Academy and the signatory company, where company have agreed to receive students from this career for enterprise practice into its facilities; on the other hand, the student (a):

_____

With con identification number _____ , student from the Career of Mechatronics Engineering Technician under the Dual system, conscious of the opportunity that has for developing their practical training with this company, agree to enter into this apprenticeship agreement:

Section 1. Duration of the career

The company allow the student develop the enterprise practice as established in the curriculum Mechatronics Technician career in the period of 30 months, where after two months of theoretical and practical training at the Academy, the student will attend for one

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[87] Apprenticeship Agreement between the company and the Student, ITCA(2008a)

month at the enterprise to completing the enterprise practices. The total months of formation in the enterprise are 10.

Section 2. Place of the formation

The theoretical and practical training will take place at the Academy and the enterprise practice will take place at the facilities of the enterprise, located at _____. The place of practical training may switch to other company facilities if considered necessary for the achievement of learning objectives with the prior consent of the Academy.

Section 3. Training hours per week in the enterprise

The student will spend 44 hours per week at the company training, adapting to the schedule established by it.

Section 4. Days off and holidays

The student during its formation in the enterprise have the right to one day off a week, which cannot be compensated by money, the same way have the right to general holiday, as set out in the Labor Code.

Section 5. Student obligations

During the period of formation in the enterprise the student will:

a) Comply with the schedule established by the enterprise, at accordance with clause 3 of this agreement

b) Comply with Hygiene and Industrial Security of each work area

c) Inform the tutor in case you need to be absent from the enterprise

d) To fulfill the tasks assigned by the tutor

e) Handle confidential company information

f) Submit notes and receipts, the enterprise whenever required

g) To fulfill the academic requirements of the Academy

Section 6. Realization of the aims of the formation company

The company shall ensure that the formation of students, in its facilities is consistent with the objectives of the training set out in the curriculum of the career.

Section 7. Equipment and materials for the formation at the Company

The company will provide equipment and materials necessary for the proper development of the training, including uniform if it is required.

Section 8. Agreement termination clauses

This agreement will terminate for any of the following causes:

Student:

a) If absent two consecutive days or three alternate without cause, in the training period in the enterprise

b) Does not meet the company's internal regulations regarding behavior and rules of Hygiene and Industrial Security

Company:

a) If the assigned activities threaten the health or the life of the student

b) If activities are not commensurate with the practical curriculum submitted by the Academy

In witness whereof we sign this Apprenticeship Agreement between the company and the student and witness Mechatronics Coordinator.

City _____, Date _____

Signatures:

Representative of the enterprise	Student	Coordinator of the enterprise practice

Annex 7. Agreement between enterprises

Logo of the company A (that send students)	Logo of the Company B (that receive students)	Logo dof the Academy
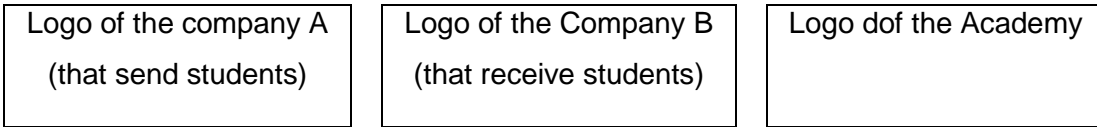
Inter-enterprise Cooperation Agreement[88]

This Agreement is entered under the following terms:

1. This agreement is based on the contents of Inter institutional Cooperation Agreements, that have signed between Enterprise A and B with the Academy.

2. The company B is expressed with this agreement, its willingness to receive students selected by Company A, in its facilities to complement the practices referred in the Practical Curriculum.

3. The company B is committed to form students sent by the company A, with the same care as its own students, completing the respective documents; besides, accepts all rights and obligations that have with them as with its students themselves, with the exception of the financial obligation.

4. The company B expresses that understand that has to maintain its financial commitment on the Inter institutional Cooperation Agreement including the months that students take their practice outside its facilities.

Signatures:

_____	_____	_____
Name and title of representative of Company A	Name and title of representative of Company B	Coordinator of the enterprise practice for the Career of Mechatronics from the Academy

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[88] Inter-enterprise Cooperation Agreement, ITCA(2008b)

Annex 8.   Binnacle example

The Binnacle is a guide for students where are developed 10 enterprise guides that include the competences to be developed, space for observations, grades and so on.

This binnacle has information about (a) data and practice (visit) control (See Table Annex 8-1 page 293 and Table Annex 8-2 page 294); (b) task to do (See Table Annex 8-3 page 296); (c) attitudes evaluation (See Table Annex 8-4 page 299); and (d) weekly monitoring of the activities (See Table Annex 8-5 page 300). The tasks during the month of practice, is the main component of the Binnacle, which identify following:

- The objectives of the practice

- The training area

- Competences to be assess

- Evaluation

- Content / topics

- The significant task

- Grades from the tutor, the coordinator and the overall grade

Also, there is an evaluation form for attitudes; this is measured by observing student behavior related to their willingness to do and (Erpenbeck & Rosenstiel, Handbuch Kompetenzmessung [Manual Competence Measurement]., 2007), as well as methodological components about to the organization the student.

The aspects that evaluated are: responsibility, initiative, teamwork, willingness to collaborate and apply knowledge, planning, order; respect the safety and the environment; and rational use of resources.

The follow example presented in tables below has been extracted from The Student Guide Binnacle (ITCA, 2008c); this example of about the sixth month of practice in the enterprise:

- **Data and practice control**

Table Annex 8-1. Example of Binnacle – Control information

Information of the student
Name : _____ Id : _____ Group : _____ Telephone : _____
Information of the enterprise
Name : _____ Address : _____ Telephone : _____ Fax : _____
Information of the tutor
Name : _____ E- mail : _____ Telephone : _____
Information of the coordinator
Name : _____ E-mail : _____ Telephone : _____ Mobile : _____

Table Annex 8-2.Example of Binnacle - Visit control

Visits of signature control	

1
 	
Date   : _____
 	
Signature : _____
             Coordinator´s signature
	
	Signature : _____
	             Tutor, seal

2
 	
Date   : _____
 	
Signature : _____
             Coordinator´s signature
	
	Signature : _____
	             Tutor, seal

3
 	
Date   : _____
 	
Signature : _____
             Coordinator´s signature
	
	Signature : _____
	             Tutor, seal

4
 	
Date   : _____
 	
Signature : _____
             Coordinator´s signature
	
	Signature : _____
	             Tutor, seal

Visits of signature control

5

Date   : _____

Signature : _____
                    Coordinator´s signature

Signature : _____
                    Tutor, seal

6

Date   : _____

Signature : _____
                    Coordinator´s signature

Signature : _____
                    Tutor, seal

7

Date   : _____

Signature : _____
                    Coordinator´s signature

Signature : _____
                    Tutor, seal

8

Date   : _____

Signature : _____
                    Coordinator´s signature

Signature : _____
                    Tutor, seal

- **Task to do in the enterprise practice (Example of the sixth month)**

Table Annex 8-3. Example of Binnacle - Task control

Objectives:			
• Perform installation, maintenance and administration of computers in mechatronics machines.			
• Draw mechatronic machines in 2D and 3D.			
Area.	Training profile	Competences to be assess	Evaluation
		Is competent: • Skills • Knowledge • Understanding • Application • Capacity Analysis • Synthesizing Capacity	Is competent: • Advanced (9.1-10.0) • Intermediate (7.6-9.0) • Basic (6.9-7.5) • Is not competent (0-
	Contents/Topics to developed *(*Suggested time for learning. It is also recommended combining the content holistically. Example: Reading of maintenance manual and real tasks of maintenances, or work only in industrial security)	**Competence:** Student is able of installing, maintain and generate the administrative conditions for the operation of information technology in mechatronics' equipment, considering aspects of data security (theft, back-ups, anti-virus)	**Grades**

		Performs preventive maintenance on computers in mechatronic machines. (2 weeks) • Generates service data sheet. • Performs cleaning hardware. • Assemble and test computer. • Performs preventive maintenance of the software. • Performs cleaning records, defragmentation. • • Performs scan of virus. • Connects to computer network of the plant or company	Knows the software used in the company including equipment used in mechatronics, and is able to install, maintain and manage it, considering aspects of data security.	
Mainte nance.				
			Knows the hardware used in the company, including equipment used in mechatronics, and is able to install, maintain and manage it.	
			Apply his theoretical knowledge of information technology in company and is able to assess to what extent a enterprise's electronic systems can be networked and what external interfaces can be generated, considering aspects of data security.	
		Contents/Topics to developed *(*Suggested time for learning. It is also recommended combining the content holistically. Example: Reading of maintenance manual and real tasks of maintenances, or work only in industrial security)	**Competence:** Student is able to design components of simple equipment with generate based on processing of these, one simple production,	**Grades**
Mainte nance.		**Draw a mechatronic parts (1 week)** • Draw diagrams of electrical and electronic control. • Draw pneumatic and hydraulic systems. • Draw mechanical parts in 2D or 3D. • Draw special circuits.	Dominates the CAD / CAM software for the 2D or 3D drawing in its area of operation and is able to generate simple production processes based on these, considering aspects of job security	

Mainte nance.	**Check the application of environmental standards. *** **(1 week intensive, integrate each month)** • Check if it complies with the relevant standards for automated production. • Evaluates resources (machinery, raw materials, lubricants, ...) used for production according to ecological criteria and depending on the possibility of replacing it • Presents improvement plan about environmental standards compliance.	Analyzes machinery and raw material used in mechatronic systems, according to ecological criteria, and is able to offer more ecological substitutes based on technical descriptions		
	Significant task: Performs preventive and corrective maintenance of computers in the mechatronic machines; makes the memory of the work done and analysis of the efficiency of employee resource in the mechatronic system including economic and ecological criteria.	**Coordinator grade:**	**Tutor grade:**	**Overall grade:**

Source: reedited from Binnacle for students of Dual system in the Mechatronic career

- **Attitudes evaluation**

Table Annex 8-4. Example of Binnacle - Attitude control

	Grade (Only one global grade)	Comments
Respect the company schedules		
Has initiative		
Is able to work as a team		
Pay collaboration when is prompted		
Performs tasks with responsibility, dedication and high quality results		
Implementing plans and executes activities assigned in the time allocated		
Keeps clean and ordered work area		
Describes and presents his work week working on the binnacle		
.Apply safety and environment norms in the performance of the labors		
Plans and executes tasks in the time assigned		
Apply theoretical knowledge in the performance of the labors. Use appropriately the expendable material		

Source: reedited from Binnacle for students of Dual system in the Mechatronic career

- **Weekly monitoring of the activities.**

Week: _____ From _____ To _____ Month _____ Year _____

Table Annex 8-5. Example of Binnacle - Learning week activities

Area	Day	Activities	Hours	Total.
	Monday			
	Tuesday			
	Wednesday			
	Thursday			
	Friday			
	Saturday			
		Total of hours per week		

Source: reedited from Binnacle for students of Dual system in the Mechatronic career

Annex 9.   PAES results

The following data belong to Mechatronic students in the cohort 2008-2010, who underwent the test called PAES, in 2007. It does not include some of the students, because at the time they graduated from high school, this test did not exist.

The analysis is done from considering the studio system, where seeks to determine whether there is significant difference in the results of the PAES among students of the Dual System and the Traditional.

The test is applied for testing differences between means, by the T-Student for independent samples[89]. The mean value obtained for the Study System and other statistical data as the standard deviation and standard error of the mean, is shown below (See Table Annex 9-1):

Table Annex 9-1. PAES 2007: Mean and Std. Deviation

Group Statistics					
	Study System	N	Mean	Std. Deviation	Std. Error Mean
PAES_2007	Dual	32	7.5688	1.25092	.22113
	Traditional	13	6.7154	1.75064	.48554

Considering the means obtained, is tried to determine if there are significant differences between the two measurements, for which of the following hypothesis:

$$H_0: \mu_{PAES\_Dual} = \mu_{PAES\_Traditional}$$

$$H_1: \mu_{PAES\_Dual} \neq \mu_{PAES\_Traditional}$$

Applying the T-Student test, gives the data results presented in the table with the inferential statistics (See Table Annex 9-2). The columns labelled "Levene's Test for Equality of Variances", tell it whether an assumption of the t-test has been met. The t-test assumes that the variability of each group is approximately equal. Then **Levene test.**

$$Sig. = 0.038 < 0.05$$

---

[89] Results from the database "Final Student Profile.sav" processed by the software: Statistical Package for the Social Sciences (SPSS).

Because the value (0.038) is less than or equal to α level for the test (.05), then the null hypothesis is reject where the variability of the two groups is equal, **implying that the variances are unequal**. Then, **T-Student for unequal variances:**

$$\text{Sig. (p)} = 0.128 > 0.05$$

The t test failed to reveal a statistically reliable difference between the mean of PAES, that students of Dual System have (μPAES_Dual = 7.5688, s= 1.25092), and students of Traditional system have (μPAES_Traditional= 6.7154, s= 1.75064), t(17) = 1.599, p = 0.128, α = 0.05.

> H_0 is accepted, then there is not significant differences in the PAES between the two groups.
>
> $\mu_{PAES\_Dual} = \mu_{PAES\_Tradicional}$

Table Annex 9-2. Independent Samples Test for PAES 2007

		Levene's Test for Equality of Variances		t-test for Equality of Means					95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
PAES_2007	Equal variances assumed	4.565	.038	1.842	43	.072	.85337	.46319	-.08076	1.78749
	Equal variances not assumed			1.599	17.208	.128	.85337	.53353	-.27124	1.97797

Annex 10. Results of Course admission

The course admission was part of the selection process of candidates for the career of Mechatronic of the cohort 2008-2010; this test was submitted whole study population of this research, with the exception of students who entered the career by the admission mechanism by equivalence. The data processed were 54 (95% of the population), which are detailed in Table Annex 10-1.

Table Annex 10-1. Detail of grades in admission course

Case	Study System	Admission Grade	Case	Study System	Admission Grade	Case	Study System	Admission Grade
1	Dual	9.52	19	Dual	7.44	37	Dual	5.14
2	Dual	9.29	20	Dual	7.34	38	Traditional	9.65
3	Dual	9.17	21	Dual	7.28	39	Traditional	9.39
4	Dual	9.00	22	Dual	7.17	40	Traditional	8.73
5	Dual	8.81	23	Dual	7.17	41	Traditional	8.31
6	Dual	8.60	24	Dual	7.16	42	Traditional	7.99
7	Dual	8.58	25	Dual	7.15	43	Traditional	7.56
8	Dual	8.37	26	Dual	7.00	44	Traditional	7.48
9	Dual	8.25	27	Dual	6.99	45	Traditional	7.45
10	Dual	8.21	28	Dual	6.72	46	Traditional	7.36
11	Dual	8.03	29	Dual	6.65	47	Traditional	7.31
12	Dual	7.97	30	Dual	6.44	48	Traditional	7.14
13	Dual	7.96	31	Dual	6.34	49	Traditional	7.04
14	Dual	7.88	32	Dual	6.14	50	Traditional	7.03
15	Dual	7.85	33	Dual	6.03	51	Traditional	6.66
16	Dual	7.79	34	Dual	5.99	52	Traditional	6.62
17	Dual	7.75	35	Dual	5.88	53	Traditional	6.53
18	Dual	7.73	36	Dual	5.55	54	Traditional	6.42
Total N								54

The following data belong to Mechatronic students in the cohort 2008-2010, who have done the admission course in 2007. It does not include some of the students, because they have got the admission by equivalence entrance.

The analysis is done from considering the study system, where determines whether there is significant difference in the results of admission grades among students of the Dual system and the Traditional system.

The test is applied for testing differences between means, by the T-Student for independent samples[90]. The mean value obtained for the Study system and other statistical data as the standard deviation and standard error of the mean, is shown below in Table Annex 10-2.

Table Annex 10-2. Admission course: Mean and Std. Deviation

Group Statistics					
	Study System	**N**	**Mean**	**Std. Deviation**	**Std. Error Mean**
Admission grades	Dual	37	7.4686	1.08671	.17865
	Traditional	17	7.5688	.95965	.23275

Considering the means obtained, is tried to determine if there are significant differences between the two measurements, for which of the following hypothesis:

$$H_0: \mu_{course\_admission\_Dual} = \mu_{course\_admission\_Traditional}$$

$$H_1: \mu_{course\_admission\_Dual} \neq \mu_{course\_admission\_Traditional}$$

Applying the T-Student test, gives the data results presented in the table with the inferential statistics (See Table Annex 10-3 page 308). The columns labelled "Levene's Test for Equality of Variances", tell it whether an assumption of the t-test has been met. The t-test assumes that the variability of each group is approximately equal. Then **Levene test.**

$$Sig. = 0.405 > 0.05$$

Because the value (0.405) is greater than α level for the test (.05), then the null hypothesis is accepted where the variability of the two groups is equal, **implying that the variances are equal**. Then, **T-Student for equal variances:**

$$Sig. (p) = 0.746 > 0.05$$

---

[90] Results from the database "Final Student Profile.sav" processed by the software: Statistical Package for the Social Sciences (SPSS).

The t test failed to reveal a statistically reliable difference between the mean of Course admission, that students of Dual System have ($\mu_{course\_admission\_Dual}$ = 7.4686, s= 1.08671), and students of Traditional system have ($\mu_{Acourse\_admission\_Traditional}$= 7.5688, s= 0.95965), t(52) = 0.326, p = 0.746, α = 0.05.

In conclusion:

> H_0 *is accepted, then there is not significant differences in the* **Course admission** *between the two groups.*
>
> $\mu_{Admission\_course\_Dual} = \mu_{Admission\_course\_Tradicional}$

Table Annex 10-3. Admission course T-Student

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Admission grades	Equal variances assumed	.705	.405	-.326	52	.746	-.10017	.30743	-.71709	.51674
	Equal variances not assumed			-.341	35.007	.735	-.10017	.29341	-.69582	.49547

Annex 11. Result of psychological test

Students in both groups were evaluated with a parametric test, in the areas of personality, values and character in order to know if there was significant difference in psychological aspects that could give advantages to one group from other in the learning process. This was done using **Gordon Personal Profile – Inventory (GPP-I)**, and **Gordon´s Survey of Personal Values (SPV)**[91], in order to establish the level of psychological functioning at the time to start the career. Tests were supervised and controlled administration by professional of Psychology[92]. Students were organized in 3 groups, where group A (19 students) and B (19 students) belonged to Dual System, and group C was students in Traditional System (18 students). The test´s objective is described as follow:

1. Gordon Personal Profile – Inventory (GPP-I)

This test measured personality traits and self-esteem. The Gordon Personal Profile Inventory helps to identify the degree to which the candidates possess the personality-based competencies necessary for success in a job. Each job or role requires a unique combination of personality characteristics for optimal performance. The GPP-I consists of a Profile Section and an Inventory Section to provide a complete picture of an individual's personality. The Profile Section identifies the following traits: Ascendancy, responsibility, emotional stability, and sociability; the Inventory Section identifies the following traits: Cautiousness, Original Thinking, Personal Relations, and Vigor (Pearson, 2009a).

2. Gordon´s Survey of Personal Values (SPV)

This test evaluates a fundamental aspect of personality: personal values that serve as support, and largely explain the actions and how people act. The application of this instrument is multiple, it can be used in guidance and counseling for different populations of subjects. Its use in the selection allows us to predict how the candidate will face problems 'everyday' of his working life. The SPV provides measures of the relative importance of six areas of personal values - Practical mindedness (P), Achievement (A), Variety (V), Decisiveness (D), Orderliness (O), and Goal orientation (G) (Pearson, 2009b).

Data process method

To make a comparative analysis of the results, it was applied the following procedure:

---

[91] Leonard V. Gordon is the author of the tests.

[92] The tests were administered by Hada de Escalante and Carlos Mario Pacheco who are professional in Psychology in El Salvador (Escalante & Pacheco, 2008).

a) Definition of ranges of performance

Making three ranges depending on the score obtained on each test as well:

Upper range   =   71 to 100 points

Intermediate range =   30 to 70 points

Lower range   =   30 or fewer points

b) Determination of frequency

It was counting the number of students achieving at each rank in each of the aspects or variables evaluated in each test (row b).

c) Determination of accumulated frequency range

For each rank is obtained the accumulated frequency range (row c).

d) Calculation of Points per range

The score range is calculated by multiplying the cumulative frequency of each range by a value "x", so, in upper range x = 3, for the intermediate range x = 2, and for the lower range x = 1 (row d).

e) Sum of points per range

The sum of the scores of the three ranks gives the score on the test (cell D2).

f) Average score (cell E2)

It is the result of dividing the test score (cell D2) by the number of subjects that make up the group evaluated.

Data for students in Dual System and in traditional system related with personality evaluation are in: (a) Table Annex 11-1 page 312, (b) Table Annex 11-2 page 313, and (c) Table Annex 11-3 page 314 .

Table Annex 11-1. Personality evaluation data: Dual group - Group A

Tests and factors evaluated		Group A-Dual							
Personality evaluation									
		Total		Upper range		Intermediate range		Lower range	
		f	%	f	%	f	%	f	%
		1	2	3	4	5	6	7	8
GPP-I	A								
1. Ascendancy (ASC)	B	19	100	12	63	5	26.32	2	10.53
2. Responsibility (Res)	B	19	100	5	26	10	52.63	4	21.05
3. Emotional Stability (Est)	B	19	100	8	42	8	42.11	3	15.79
4. Sociability (Soc)	B	19	100	2	11	16	84.21	1	5.263
6. Self Esteem (Aut)	B	19	100	6	32	12	63.16	1	5.263
7. Cautiousness (Cau)	B	19	100	2	11	10	52.63	7	36.84
8. Original thinking (Ori)	B	19	100	3	16	12	63.16	4	21.05
9. Personal relations (Com)	B	19	100	6	32	7	36.84	6	31.58
10. Vigour (Vit)	B	19	100	6	32	10	52.63	3	15.79
Accumulated frequency range	C			50		90		31	
Points per range	d	299		88		180		31	
Average score	e	**15.7**							
Personal values (SPV)	a								
1. Practical mindedness (P)	b	19	100	3	16	13	68.42	3	15.79
2. Achievement (A)	b	19	100	2	11	16	84.21	1	5.263
3. Variety (V)	b	19	100	3	16	16	84.21	0	0
4. Decisiveness (D)	b	19	100	0	0	14	73.68	5	26.32
5. Order and Method (O)	b	19	100	0	0	19	100	0	0
6. Goals (G)	b	19	100	0	0	12	63.16	7	36.84
Accumulated frequency range	c			8		90		16	
Points per range	d	220		24		180		16	
Average score	e	**11.6**							

Table Annex 11-2. Personality evaluation data: Dual group - Group B

Personality evaluation									
Tests and factors evaluated		**Group B – Dual**							
		Total		**Upper range**		**Intermediate range**		**Lower range**	
		f	%	f	%	f	%	f	%
		9	**10**	**11**	**12**	**13**	**14**	**15**	**16**
GPP-I	A								
1. Ascendancy (ASC)	B	19	100	11	57.89	8	42.11	0	0
2. Responsibility (Res)	B	19	100	11	57.89	8	42.11	0	0
3. Emotional Stability (Est)	B	19	100	7	36.84	12	63.16	0	0
4. Sociability (Soc)	B	19	100	3	15.79	13	68.42	3	15.79
6. Self Esteem (Aut)	B	19	100	11	57.89	8	42.11	0	0
7. Cautiousness (Cau)	B	19	100	5	26.32	13	68.42	1	5.263
8. Original thinking (Ori)	B	19	100	4	21.05	13	68.42	2	10.53
9. Personal relations (Com)	B	19	100	6	31.58	11	57.89	2	10.53
10. Vigour (Vit)	B	19	100	7	36.84	9	47.37	3	15.79
Accumulated frequency range	C			65		95		11	
Points per range	D	396		195		190		11	
Average score	E	**20.8**							
Personal values (SPV)	A								
1. Practical mindedness (P)	B	19	100	1	5.263	15	78.95	3	15.79
2. Achievement (A)	B	19	100	3	15.79	16	84.21	0	0
3. Variety (V)	B	19	100	5	26.32	14	73.68	0	0
4. Decisiveness (D)	B	19	100	0	0	13	68.42	6	31.58
5. Order and Method (O)	B	19	100	2	10.53	16	84.21	1	5.263
6. Goals (G)	B	19	100	1	5.263	13	68.42	5	26.32
Accumulated frequency range	C			12		87		15	
Points per range	D	225		36		174		15	
Average score	E	**11.8**							

Table Annex 11-3.Personality evaluation data: Traditional group

Personality evaluation								
Tests and factors evaluated		Group C – Traditional						
		Total		Upper range		Intermediate range		Lower range	
		f	%	f	%	f	%	f	%
		17	18	19	20	21	22	23	24
GPP-I	a								
1. Ascendancy (ASC)	b	18	100	9	50	6	33.33	3	16.67
2. Responsibility (Res)	b	18	100	9	50	8	44.44	1	5.556
3. Emotional Stability (Est)	b	18	100	7	38.89	11	61.11	0	0
4. Sociability (Soc)	b	18	100	2	11.11	13	72.22	3	16.67
6. Self Esteem (Aut)	b	18	100	9	50	7	38.89	2	11.11
7. Cautiousness (Cau)	b	18	100	5	27.78	12	66.67	1	5.556
8. Original thinking (Ori)	b	18	100	3	16.67	12	66.67	3	16.67
9. Personal relations (Com)	b	18	100	6	33.33	10	55.56	2	11.11
10. Vigour (Vit)	b	18	100	6	33.33	12	66.67	0	0
Accumulated frequency range	c			56		91		15	
Points per range	d	365		168		182		15	
Average score	e	**20.3**							
Personal values (SPV)	a								
1. Practical mindedness (P)	b	18	100	1	5.556	14	77.78	3	16.67
2. Achievement (A)	b	18	100	7	38.89	9	50	2	11.11
3. Variety (V)	b	18	100	0	0	17	94.44	1	5.556
4. Decisiveness (D)	b	18	100	2	11.11	13	72.22	3	16.67
5. Order and Method (O)	b	18	100	1	5.556	16	88.89	1	5.556
6. Goals (G)	b	18	100	0	0	15	83.33	3	16.67
Accumulated frequency range	c			11		84		13	
Points per range	d	214		33		168		13	
Average score	e	**11.9**							

Results in test

- **Gordon Personal Profile – Inventory (GPP-I)**

In relation to the PPG-IPG test, group A (Dual) received a global score of 361 and an average of 19 points per subject, while group B (Dual) received an overall score of 396, giving an average of 21 points, meanwhile the group C, had values of 365 points overall and an average of 20. As can be seen, there is a very slight advantage on the average score of the group B on the other two groups, 2-point advantage in relation to group A and a point with respect to C.

- **Gordon´s Survey of Personal Values (SPV)**

With regard to Survey of Personal Values (SPV), although there are differences in scores by Range, it disappears when comparing the averages of the tests because the three groups had an average score of 12.

In conclusion, by inspection of the results, it can say, there are no differences in psychological characterization of the subjects that form the different groups. This means that when starting the training process the groups are homogeneous.

The above is convenient because, any changes in further evaluations will mean that. It is probably the result of educational treatment that has been exposed to each group.

Annex 12. Students questionnaire instrument

The instrument to get information about student´s opinion was a questionnaire, which is presented in this annex with its objectives, the population, the sample, the data collection method, valuation scale, and other important information. In the last section is the instrument with all its questions.

General Goal

To explore Mechatronic students opinion about the formation development who are receiving under the new system vs. those that are under the traditional system.

Specific objectives

- To explore students opinion about their formation at Academia

- To identify students opinion about enterprise practice (for students in dual systems)

- To have information about students opinion related to advantages and disadvantages of their study system (dual or traditional)

Size and design of the Sample

a. Population

Student populations in Mechatronic career of the cohort 2008-2010 are 56. From this population 39 students belong to Dual System and 17 to Traditional System.

b. Sample

Because the population is not too big, this questionnaire was passed to most of the students except those who reject to participate.

c. Data collection method

The instrument has passed to the students in the classroom and in their office.

d. Estimated time

The time necessary to fill out the questionnaire was estimated in 30 minutes per student.

e. Survey design Type

Repeated questionnaire. This was passed three times between the year 2009 and 2010. This design was because the necessity to observe the opinions of the students thru of determinate period of time about their process formation, identifying how the students opinions change in the time. The technique is a Survey and the instrument is the Questionnaire.

Valuation scale

a. Likert Scale

Most of the questions use Likert Scale with the following typical five-lever (See Illustration Annex 12-1):

1. Strongly disagree (--)

2. Mainly disagree (-)

3. Neither agree nor disagree (+/-)

4. Mainly agree (+)

5. Strongly agree (++)

Besides, include the decline option: Do not know (?).

Illustration Annex 12-1. Questionnaire liker scale - student

	Strongly agree	Mainly agree	Neither agree nor disagree	Mainly Disagree	Strongly disagree	Do not know
For each of the statements below, please indicate the extent of your agreement or disagreement by placing a tick in the appropriate column						
	++	+	+/-	-	--	?

b. Open question

With the proposed to have extra information about some topic, in the questionnaire are included open questions.

Categories to explore in the survey

The categories that were explored are:

- Formation at the Academy

- Enterprise practice

- About advantages and disadvantages of the study system (dual or traditional),

- Preconditions information

Matrix by categories

All the questions classified by categories are in matrix presented as follow (See Table Annex 12-1).

Table Annex 12-1. Questions: Student's questionnaire

Category	Related objective	Variable	Item #	Question
Academy formation (Both: students in dual and in traditional system)	To explore students opinion about their formation at Academy	Useful Knowledge, skill, abilities	1.	Academy is giving me … a) Knowledge b) Skills c) Abilities … That will be useful to me in my professional development
		solve problems in autonomous way, with support	2.	At Academy, I am developing the ability to solve real labor problems… a) in autonomous way b) with support
		Interpersonal relations	3.	At Academy, I have not learned how to improve my relations with others like teacher, students
		Apply the knowledge	4.	Applying knowledge gives great pleasure to me when I do practices at Academy
		Practice fulfill expectation	5.	The practices at Academy fulfill my expectations of professional development all in all
		Teachers behavior	6.	I do not feel satisfied with the guide that I receive from the teachers
		Condition of formation	7.	Academy gives me the followings resources… a) Learning materials b) Computer workstations c) Internet access d) Library facilities e) Furnishing of Classrooms f) Equipped workshops g) Equipped Laboratories … which are useful to me in order to have

Category	Related objective	Variable	Item #	Question
				quality in education
		Relation between theoretical and practice	8.	I do not feel satisfied with the relation between theoretical part and the practice at workshops
Enterprise practice **(Only students in dual system**)	To identify students opinion about enterprise practice (for students in dual systems)	Knowledge, skill, abilities	9.	In the enterprise practice, I am getting… a) Knowledge b) Skills c) Abilities … That will be useful to me in my professional development
		solve problems in autonomous way, with support	10.	At the enterprise practice, I am developing abilities to solve real labor problems… a) In autonomous way b) With support …..
		Labor relations	11.	I have not learned how to improve my labor relations with others employees
		Understanding word labor´s exigencies	12.	The practice in the company is helping me to understand the labor world´s exigencies
		Activities in the enterprise	13.	I feel satisfied with the diversity of activities that I make in my enterprise practice
		Apply the knowledge	14.	Applying knowledge gives great pleasure to me when I do the enterprise practice
		Practice fulfill expectation	15.	The practices in the company does not fulfill my expectations of professional development
		Tutor´s behavior	16.	I feel satisfied with the guide that I receive from the tutor
		Tutor´s behavior	17.	If I have a question , then I can always ask my tutor
		Resources of the company	18.	I consider that the company where I make the practice has not all the resources necessaries for my formation

Category	Related objective	Variable	Item #	Question
Advantages and disadvantages (both: dual and traditional)	To have information about students opinion related to advantages and disadvantages of their study system (dual or traditional) and their expectative about job opportunities	Job opportunities	19.	I expect to have a job opportunity after I finished my studies
		Recommendation to other students	20.	I would not recommend other students to participate in this study program
		Advantages	21.	According your experience studying with study system (dual or traditional), which are the most important advantages of its. Your answers could be in relation to the practice at Academy , the tutors if you are in dual system, the teachers, the enterprise where you do the practice (for dual system), between others
		Disadvantages	22.	According your experience studying with study system (dual or traditional), which are the most important disadvantages of its. Your answers could be in relation to the practice at Academy , the tutors if you are in dual system, the teachers, the enterprise where you do the practice (for dual system), between others
		Extra comments	23.	In case that you want to give extra comment about the questionnaire, about the dual or traditional system or more that you think is important for my knowledge, please feel free to do it here
Precondition information		Age	24.	Mi age is in this range: _____ Between 18 - 21 _____ Between 22- 25 _____ Between 26 - 29 _____ 30 and older
		Previous experience	25.	I have had labor experience (any kind of job) before to start my studies in Mechatronic at Academy. ___ Yes ___ No If your answer is YES, please explain which your experience is: _____

Statement of Agreement

The statement of agreement was part of the questionnaire, and was signed for each involved person. This was written as follow:

Questionnaire Statement of Agreement

I agree to voluntarily take part in an interview by a questionnaire within the framework of research on rising competences in technological education by implementing dual system´s elements under El Salvador conditions in the field of Mechatronic realized by Msc. Reina Elizabeth Durán de Alvarado.

I was informed about intention, content and complexity of the research, procedure of data collecting, data processing and data evaluating, the kind of scientific data use and data destruction after the end of the research.

I was assured that my answers will be collected and handled in an anonymous way. Employees of the research project have a data access exclusively. In publications, results will be used in an anonymous and generalized way, so that there is no reference to any living person.

With my signature I agree with the research procedure and the use of data.

I confirm to have received a copy of the statement of agreement and the instructions.

Place: _____, El Salvador.   Date:_____

Name: _____

Signature: _____

Questionnaire

The Questionnaire which included all questions presented in de Matrix by categories and topics was this:

Mechatronic Students Questionnaire

Dear student of Mechatronic career, this questionnaire has been elaborated with the proposed to know your opinion about study´s system that you are receiving at Academy in your technical career.

This information will be used in the Research on rising competences in technological education by implementing dual system´s elements under El Salvador conditions in the field of Mechatronic realized by Msc. Reina Elizabeth Durán de Alvarado with the support of the Faculty of Pedagogy from Technische Universität Dresden in Germany.

Instructions

Read carefully the instructions in each part, and if you have doubts, ask to the person who is giving support in this process. Please be totally honest with your answers and do not leave any question without answer.

Part I

Academy formation

In this part, you have to give your opinion how you perceive your formation at Academy

	For each of the statements below, please indicate the extent of your agreement or disagreement by placing a tick in the appropriate column	Strongly agree	Mainly agree	Neither agree nor	Mainly Disagree	Strongly disagree	Do not know
		++	+	+/-	-	--	?
1.	Academy is giving me …						
	a. Knowledge ……………………………						
	b. Skills ……………………………………..						
	c. Abilities ……………………………………..						
	… That will be useful to me in my professional development						
2.	At Academy, I am developing the ability to solve real labor problems…						
	a. In autonomous way ………………………						
	b. With support ………………………………						
3.	At Academy, I have not learned how to improve my relations with others like teacher, students						
4.	Applying knowledge gives great pleasure to me when I do practices at Academy						
5.	The practices at Academy fulfill my expectations of professional development all in all						
6.	I do not feel satisfied with the guide that I receive from the teachers						
7.	The Academy gives me the followings resources…						
	a. Learning materials …………………….						
	b. Computer workstations ……………….						
	c. Internet access ………………………..						
	d. Library facilities ……………………….						
	e. Furnishing of Classrooms ……………						
	f. Equipped workshops ………………….						
	g. Equipped laboratories ………………….						
	… which are useful to me in order to have quality in education						
8.	I do not feel satisfied with the relation between theoretical part and the practice at workshops						

Part II (only for students in dual system)

Enterprise practice

In this part, you have to give your opinion about enterprise practices

	For each of the statements below, please indicate the extent of your agreement or disagreement by placing a tick in the appropriate column	Strongly agree	Mainly agree	Neither agree nor disagree	Mainly Disagree	Strongly disagree	Do not know
		++	+	+/-	-	--	?
9.	In the enterprise practice, I am getting…						
	a. Knowledge …………………………………..						
	b. Skills ………………………………………….						
	c. Abilities ………………………………………						
	… That will be useful to me in my professional development						
10.	At the enterprise practice, I am developing abilities to solve real labor problems…						
	a. In autonomous way ………………………….						
	b. With support ………………………………….						
11.	I have not learned how to improve my labor relations with others employees						
12.	The practice in the company is helping me to understand the labor world´s exigencies						
13.	I feel satisfied with the diversity of activities that I make in my enterprise practice						
14.	Applying knowledge gives great pleasure to me when I do the enterprise practice						
15.	The practices in the company does not fulfill my expectations of professional development						
16.	I feel satisfied with the guide that I receive from the tutor						
17.	If I have a question , then I can always ask my tutor						
18.	I consider that the company where I make the practice has not all the resources necessaries for my formation						

Part III

Advantages and disadvantages of study system (Dual or Traditional)

You have been studying under one of the study system program (dual or traditional); considering this experience please identify some advantages or disadvantages of this study system.

	For each of the statements below, please indicate the extent of your agreement or disagreement by placing a tick in the appropriate column	Strongly agree	Mainly agree	Neither agree nor disagree	Mainly Disagree	Strongly disagree	Do not know
		++	+	+/-	-	--	?
19.	I expect to have a job opportunity after I finished my studies						
20.	I would not recommend other students to participate in this study program						

21. According your experience studying with study system (dual or traditional), which are the most important advantages of its. Your answers could be in relation to the practice at Academy, the tutors if you are in dual system, the teachers, the enterprise where you do the practice (for dual system), between others.

_____

_____

_____

22. According your experience studying with study system (dual or traditional), which are the most important disadvantages of its. Your answers could be in relation to the practice at Academy, the tutors if you are in dual system, the teachers, the enterprise where you do the practice (for dual system), between others.

_____

_____

_____

23.   In case that you want to give extra comment about the questionnaire, about the dual or traditional system or more that you think is important for my knowledge, please feel free to do it here.

_____

_____

_____

Part V

Precondition information.

Please provide the following information about you:

24.   My age is in this range:

_____ Between 18 - 21

_____ Between 22- 25

_____ Between 26 - 29

_____ 30 and older

25.   I have had labor experience (any kind of job) before to start my studies in Mechatronic at Academy.

___ Yes

___ No

If your answer is YES, please explain which your experience is:

_____

_____

_____

Thanks for your cooperation

Annex 13. Tutor questionnaire instrument

The tutor´s opinion about student`s development in the formation process was collected by a questionnaire instrument. Information about the goal, specific objectives, population, sample, the survey type, valuation scale, the questionnaire and other information related are in this annex.

General Goal

To explore Mechatronic tutors opinion about the student´s development formation who are in the new system and about the Dual System.

Specific objectives

- To identify tutors opinion about enterprise practice and its incidence in the professional student development.

- To evaluate how tutors perceive the students formation at the Academy and his incidence in the students enterprise practice.

- To determinate tutors opinions about how they see in the future the Dual System in El Salvador and the student opportunities.

- To have information about tutors opinion related with advantages or disadvantages of this study system.

Size and design of the Sample

 a. Population

Tutors populations in Mechatronic career of the cohort 2008-2010 are 28.

b. Sample

Because the population is not too big, this questionnaire was passed to all tutors except those who reject to participate.

c. Data collection method

The instrument was passed to tutors in the enterprise or in a workshop.

d. Estimated time

The time necessary to fill out the questionnaire is estimated in 30 minutes per tutor.

 e. Survey design Type

Repeated questionnaire. This was passed three times between the year 2009 and 2010. This design was because is necessary to observe the opinions of tutors thru determinate period of time about students´ formation process, identifying how the tutors opinions change in the time. The technique was a Survey and the instrument was the Questionnaire.

Valuation scale

a. Likert Scale

Most of the questions use Likert Scale with the following typical five-lever (See Illustration Annex 13-1):

1. Strongly disagree (--)

2. Mainly disagree (-)

3. Neither agree nor disagree (+/-)

4. Mainly agree (+)

5. Strongly agree (++)

Besides, include the decline option: Do not know (?)

Illustration Annex 13-1. Questionnaire liker scale - tutor

For each of the statements below, please indicate the extent of your agreement or disagreement by placing a tick in the appropriate column	Strongly agree	Mainly agree	Neither agree nor disagree	Mainly Disagree	Strongly disagree	Do not know
	++	+	+/-	-	--	?

b. Open question

With the proposed to have extra information about some topic, in the questionnaire are included open questions.

Categories and topics to explore in the survey

a. Categories

The categories that were explored are:

- Enterprise practice

- Formation developed at the Academy and the Enterprise

- About the Dual System

- Advantages and disadvantages of Dual System

- Precondition information

b. Matrix by categories and topics

All the questions classified by categories and topic (See Table Annex 13-1) are in matrix presented in the table following:

Table Annex 13-1. Questions: tutor's questionnaire

Category	Related objective	Variable	Item #	Question
Practice at enterprise	To identify tutors opinion about enterprise practice and its incidence in the professional student development.	Knowledge	1.	The student is getting **knowledge** for his professional development
		Skills	2.	The student is getting **skills** for his professional development
		Ability to solve real labor problems	3.	The student is developing the **ability to solve real labor problems** in autonomous way
		Responsibility	4.	The student **fulfills all the tasks** which are in his **binnacle** practice
		Relations	5.	The students is getting good **labor relations** with others employees
		Tutor time	6.	The **time** that I have dedicated to the students has not been problem with my workings within the company.
		Attitude	7.	The student always **fulfills** his assigned task with **good attitude**
		Responsibility	8.	The student **fulfills** schedule
		Responsibility	9.	The student **attend** the enterprise rules
		Attitude	10.	The student has good **motivation** in each assigned tasks
		Expectative	11.	The student could have a good **job in a short period of time** immediately he finishes his

Category	Related objective	Variable	Item #	Question
				studies.
		Expectative	12.	The student could have a good **salary** in a short period of time immediately he finishes his studies.
		Tutor acceptance	13.	I feel comfortable with the student enterprise practice
		Enterprise acceptance	14.	My enterprise feels comfortable with students making enterprise practice with Dual System
Formation at Academy	To evaluate how tutors perceive the students formation at Academy and his incidence in the students enterprise practice	Knowledge	15.	The Academy is giving good knowledge to students in order to apply these learning in the enterprise practice
		Practice	16.	The Academy is giving good laboratory practice to students in order to apply these learning in the enterprise practice
		Teachers	17.	Teachers from the Academy are preparing the student in order to develop them like a good professionals
		Workshops	18.	Workshops at the Academy are according the enterprise needs for students learning.
		Communication	19.	The communication between the Academy and my enterprise is suitable for a good student practice development.
		Selection process	20.	The student selection process was objective in order to have good students in Mechatronic career
		About coordinator	21.	The person who coordinated the practice from the Academy is opportune in order to have a good student practice development
Dual system	To determinate tutors opinions about how they see in the future the Dual System in El Salvador and the student opportunities	implementation	22.	Dual system must be implemented in all professional careers in El Salvador
		Enterprise support	23.	All the enterprises in El Salvador must be in Dual System supporting with the students practice
		Enterprise economic support	24.	All the enterprises in El Salvador must be in Dual System giving economic support to the students.
		Acceptance of more students	25.	I would like to work with more students making their practice in my enterprise
		Acceptance of more students	26.	My enterprise could accept more students with this Dual System with the same economic conditions that It has now.

Category	Related objective	Variable	Item #	Question
		Expectative	27.	Our enterprise expects to give a job opportunity to the students who are making enterprise practice with us under Dual System
		Acceptance of dual system	28.	I would recommend other companies to participate in this Dual System
		Change in labor laws	29.	I consider important to make changes in labor laws in order to open more space for students practice in the enterprises
Advantages and disadvantages	To have information about tutors opinion related with advantages or disadvantages of this study system	Selection criteria	30.	The student **selection criteria** in order to accept him in the company was
		Advantages	31.	According your experience working with Dual System, which are the most important **advantages** of its.
		Disadvantages	32.	According your experience working with Dual System, which are the most important **disadvantages** of its.
		Extra comments	33.	In case that you want to give extra comment, please do it here.
Precondition information		Enterprise size	34.	The Enterprise where I work has ___ Until 10 employees ___ Until 50 employees ___ Until 100 employees ___ More than 100 employees
		Time for students	35.	How much time per week do you use in order to give support to the students who are in this model Approximately _____ hours per week
		Previous experience	36.	I have previous experience like a teacher or trainer in an educative institution. ___ Yes ___ No
		Previous experience	37.	In case to have previous experience like teacher or trainer in an educative institution, please explain.

Statement of Agreement

The statement of agreement was part of the questionnaire, and it was signed for each involved person. This was written as follow:

Questionnaire Statement of Agreement

I agree to voluntarily take part an interview by a questionnaire which has the objective to have my opinion about the Dual System under students from Mechatronic are formed. I have participated in this system   like **enterprise tutor.** This interview is within the framework of research on rising competences in technological education by implementing dual system´s elements under El Salvador conditions in the field of Mechatronic realized by Msc. Reina Elizabeth Durán de Alvarado, with the support of the Faculty of Pedagogy from Technische Universität Dresden in German

I was informed about intention, content and complexity of the research, procedure of data collecting, data processing and data evaluating, the kind of scientific data use and data destruction after the end of the research.

I was assured that my answers will be collected and handled in an anonymous way. Employees of the research project have a data access exclusively. In publications, results will be used in an anonymous and generalized way, so that there is no reference to any living person.

With my signature, I agree with the research procedure and the use of data.

I confirm to have received a copy of the statement of agreement and the instructions.

Place: Santa Tecla, El Salvador.   Date: _____

Name: _____

Signature: _____

Questionnaire

The Questionnaire, which included all questions presented in de Matrix by categories and topics, was this:

Mechatronic Tutor Questionnaire

Dear Tutor of the students from Mechatronic career, this questionnaire has been elaborated in order to know your opinion about the Academy study system in this Career, where elements of German Dual Education System are applied.

This information will be used in the research on rising competences in technological education by implementing dual system´s elements under El Salvador conditions in the field of Mechatronic realized by Msc. Reina Elizabeth Durán de Alvarado with the support of the Faculty of Pedagogy from Technische Universität Dresden in German.

Before answer this, you will receive the Questionnaire Statements of Agreement about the use and confidentiality of this information.

Instructions

Read carefully the instructions in each part, and if you have doubts, ask to the person who is giving support in this process. Please be totally honest with your answers and do not leave any question without answer.

Part I

Enterprise practice

Your opinion about enterprise practice and its incidence in the professional student development is important in this section.

	For each of the statements below, please indicate the extent of your agreement or disagreement by placing a tick in the appropriate column.	Strongly agree	Mainly agree	Neither agree nor disagree	Mainly Disagree	Strongly disagree	Do not know
1.	The student is getting **knowledge** for his professional development.						
2.	The student is getting **skills** for his professional development.						
3.	The student is developing the **ability to solve real labor problems** in autonomous way.						
4.	The student **fulfills all the tasks**, which are in his **binnacle** practice.						
5.	The student is getting good **labor relations** with others employees.						
6.	The **time** that I have dedicated to the students has not been problem with my workings within the company.						
7.	The student always **fulfills** the assigned task with **good attitude.**						
8.	The student **fulfills** schedule.						
9.	The student **attends** the enterprise rules.						
10.	The student has good **motivation** in each assigned tasks.						
11.	The student could have a good **job in a short period of time** immediately he finishes his studies.						
12.	The student could have a good **salary** in a short period of time immediately he finishes his studies.						
13.	I feel comfortable with the student enterprise practice.						
14.	My enterprise feels comfortable with students making enterprise practice with Dual System.						

Part II

Formation developed at the Academy and in the Enterprise

In this part, you have to give your opinion how you perceive the students formation at Academy and its incidence in the students enterprise practice.

	For each of the statements below, please indicate the extent of your agreement or disagreement by placing a tick in the appropriate column.	Strongly agree	Mainly agree	Neither nor disagree agree	Mainly Disagree	Strongly disagree	Do not know
15.	The Academy is giving good knowledge to students in order to apply these learning in the enterprise practice.						
16.	The Academy is giving good laboratory practice to students in order to apply these learning in the enterprise practice.						
17.	Teachers from the Academy are preparing the student in order to develop them like a good professional.						
18.	Workshops at the Academy are according the enterprise needs for students learning.						
19.	The communication between the Academy and my enterprise is suitable for a good student practice development.						
20.	The student selection process was objective in order to have good students in Mechatronic career.						
21.	The person who coordinated the practice from the Academy is opportune in order to have a good student practice development.						

Part III

About the Dual System

Please, give your opinions about how you see in the future the Dual System in El Salvador and the student opportunities.

	For each of the statements below, please indicate the extent of your agreement or disagreement by placing a tick in the appropriate column	Strongly agree	Mainly agree	Neither agree nor disagree	Mainly Disagree	Strongly disagree	Do not know
22.	Dual system must be implemented in all professional careers in El Salvador.						
23.	All the enterprises in El Salvador must be in Dual System supporting with the students practice.						
24.	All the enterprises in El Salvador must be in Dual System giving economic support to the students.						
25.	I would like to work with more students making their practice in my enterprise.						
26.	My enterprise could accept more students with this Dual System with the same economic conditions that It has now.						
27.	Our enterprise expects to give a job opportunity to the students who are making enterprise practice with us under Dual System.						
28.	I would recommend other companies to participate in this Dual System.						
29.	I consider important to make changes in labor laws in order to open more space for students practice in the enterprises.						

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Part IV

Advantages and disadvantages of Dual System

You have been working with students from Mechatronic career for 1 year; considering this experience please identify some advantages or disadvantages of this study system.

30. The student selection criteria in order to accept him in the company were.

_____

_____

_____

_____

31. According your experience working with Dual System, which are the most important **advantages** of its.

_____

_____

_____

_____

32. According your experience working with Dual System, which are the most important **disadvantages** of its.

_____

_____

_____

_____

33. In case that you want to give extra comment, please do it here.

_____

_____

_____

_____

Part V

Precondition information.

Please provide the following information about your company or yourself:

34. The Enterprise where I work has

___ Until 10 employees

___ Until 50 employees

___ Until 100 employees

___ More than 100 employees

35. How much time per week do you use in order to give support to the students who are in this model

Approximately _____ hours per week

36. I have previous experience like a teacher or trainer in an educative institution.

___ Yes

___ No

37. In case to have previous experience like teacher or trainer in an educative institution, please explain.

_____

_____

_____

_____

Thanks for your kindly cooperation

Annex 14. Student questionnaire results

Results

Students opinions were explore by following variables: global perception, the formation at academy, enterprise practice, job opportunities, and recommendation of the system, advantages and disadvantages.

In this annex results for every variable are presented, comparing dual group with traditional. Most of the variables were measured using liker scale, from 1 to 5, being 1 the most unfavorable opinion and 5 the most favorable opinion

About enterprise practice

Because students in the Dual system, received part of their studies in the company (which did not happen with the traditional group), was explored how their opinion was about the competences developed in the company; results showed that these students had a favorable opinion about the formation received at enterprise (See Graph Annex 14-1).

Graph Annex 14-1. Dual student: Enterprise practice perception
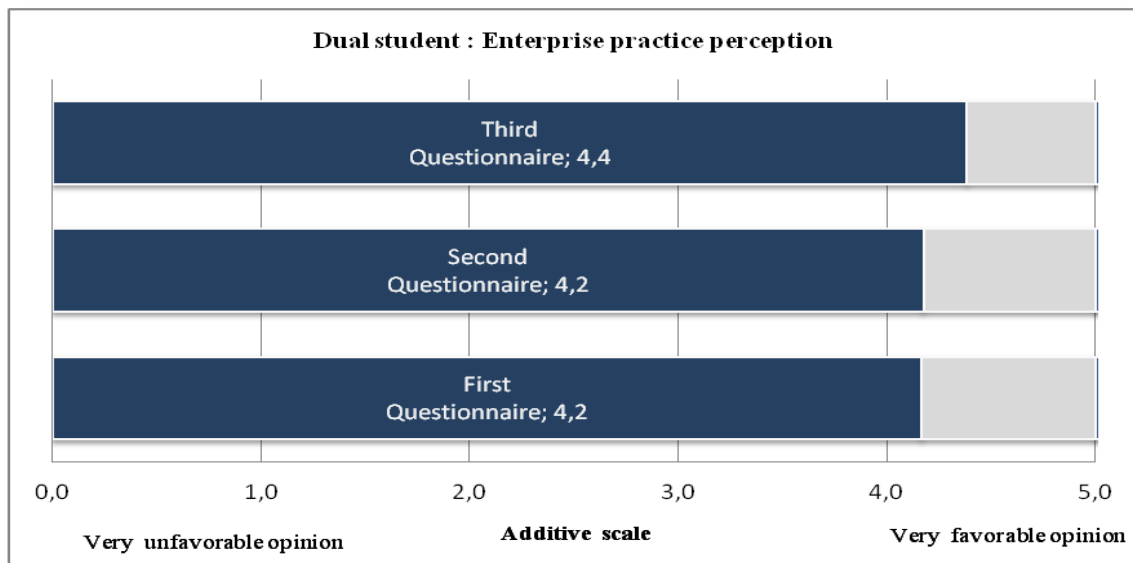
About study system in general

It is generally observed in additive scale that, students in the Dual group have improved their perception about their formation process, while the traditional group students decreased their favorable opinion (See Graph Annex 14-2 and Graph Annex 14-3).

Graph Annex 14-2. Dual student: global perception
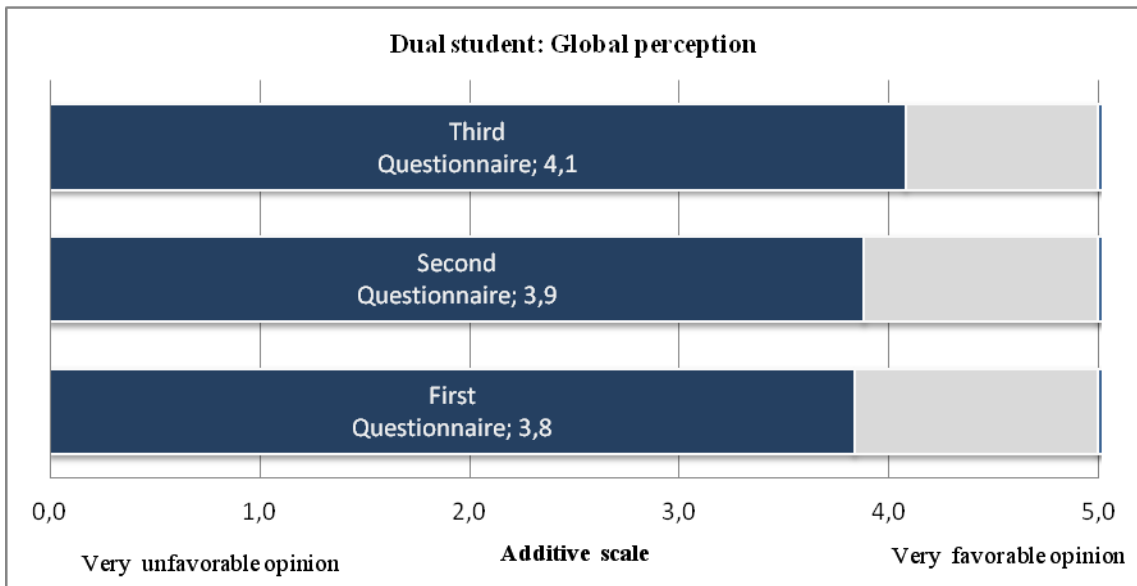
Graph Annex 14-3. Traditional student: global perception
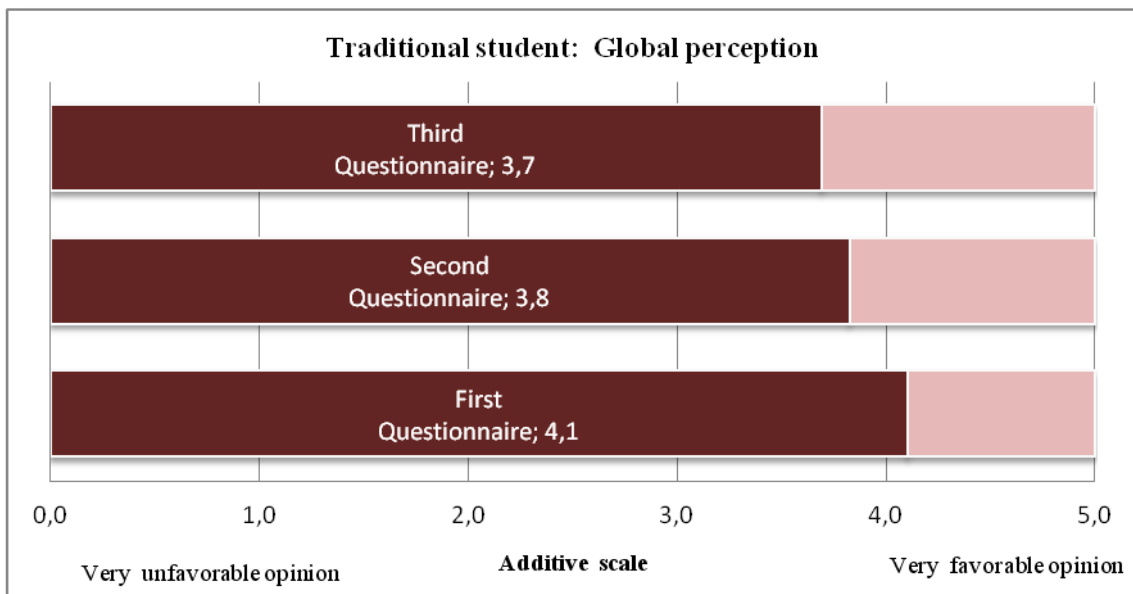
About formation at academy

Exploring students opinion about formation at Academy, both groups had favorable opinions, but Dual group improved their perception from 3.5 to 3.8, meanwhile traditional down4.1 to 3.7 (See Graph Annex 14-4 and Graph Annex 14-5).

Graph Annex 14-4. Dual student: Formation at Academy perception
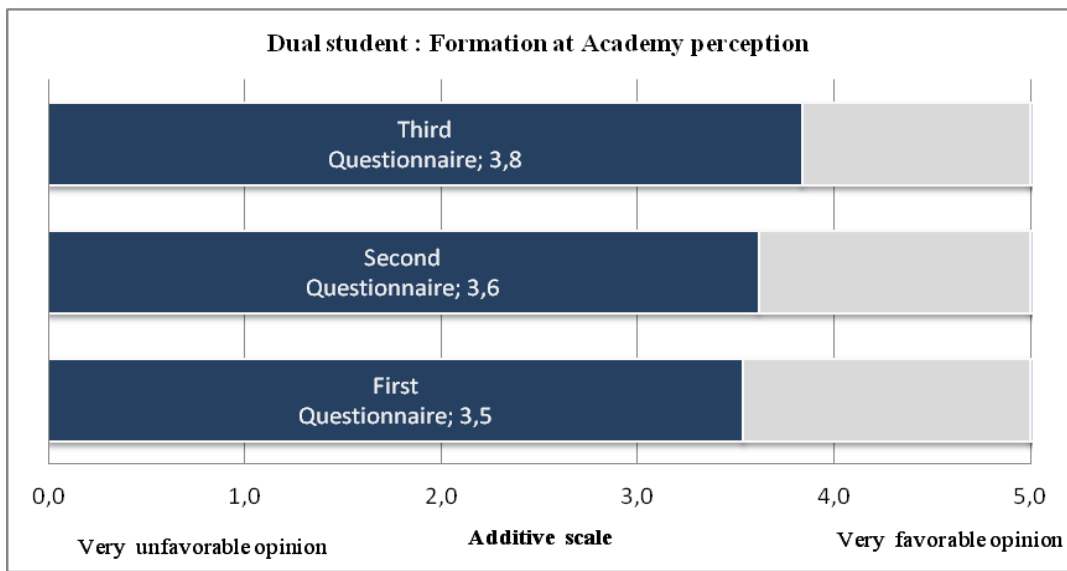
Graph Annex 14-5. Traditional student: Formation at Academy perception
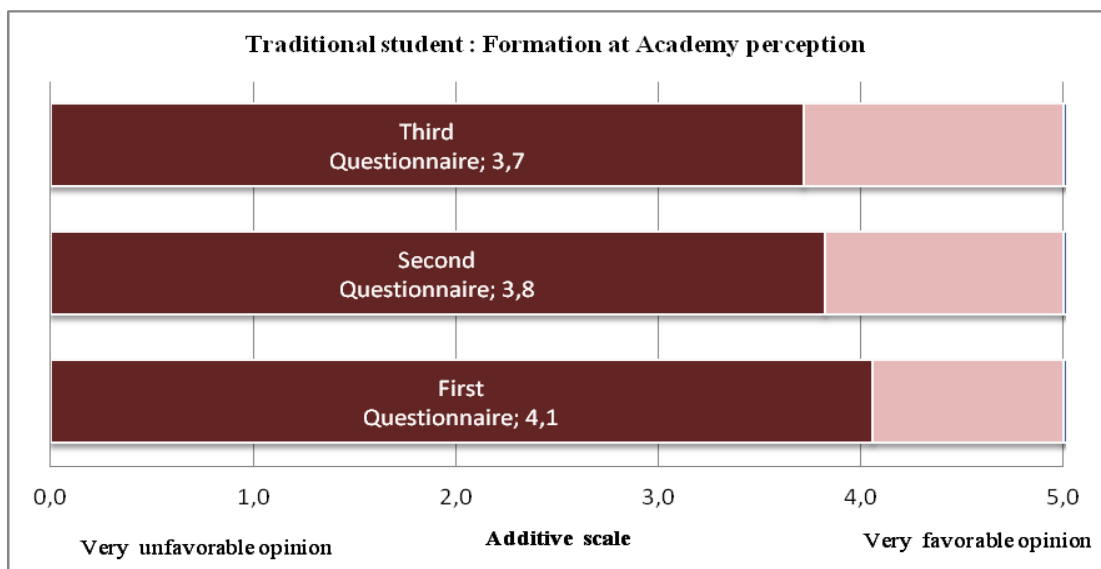
About job opportunities

Even though, both groups had very good opinions about job opportunities, this opinion had a little decrease at the end of their studies (See Graph Annex 14-6 and Graph Annex 14-7). Data detail for these graph are in the Table Annex 14-1 page 350.

Graph Annex 14-6 Dual student: Job opportunity perception
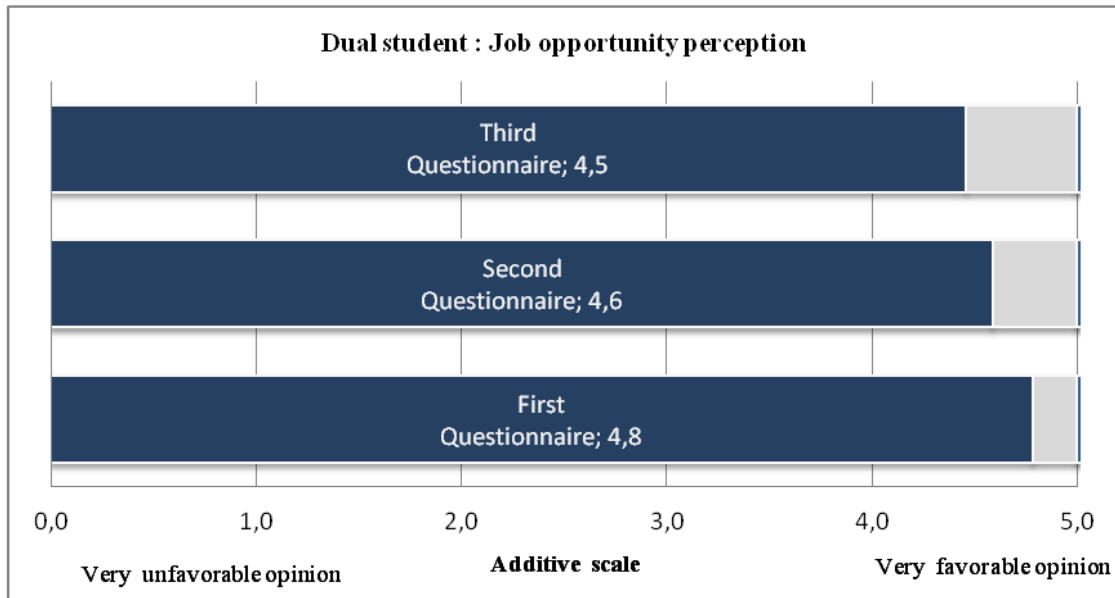
Graph Annex 14-7 Traditional student: Job opportunity perception
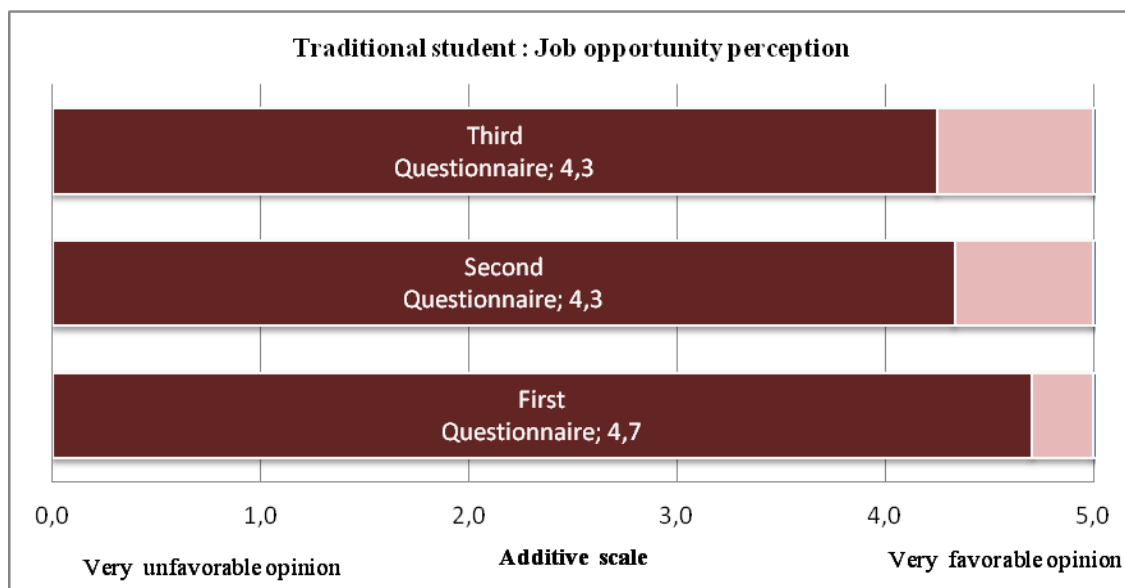
About recommend the system of study where they were formed

In this variable, there was the major difference between two groups, because students in Dual system maintain their opinion, but, students in Traditional systems decrease from a very favorable opinion (4.2) to an unfavorable opinion (2.7) (See Graph Annex 14-8Graph Annex 14-9).

Graph Annex 14-8. Dual student: Recommend system opinion
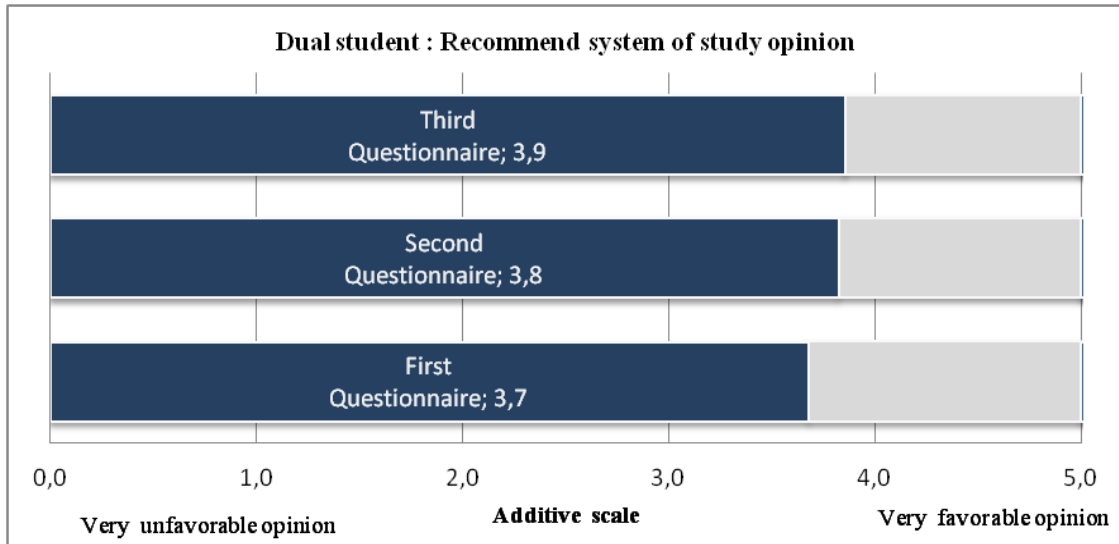
Graph Annex 14-9. Traditional student: Recommend system opinion
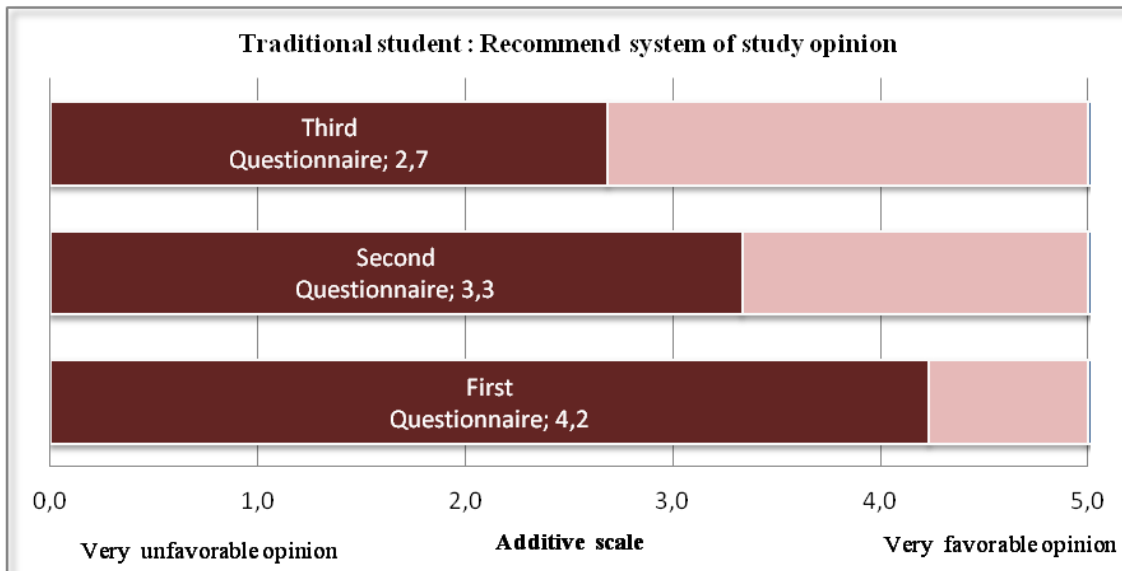
Advantages and disadvantages opinions

The purpose of this section was to have information about students opinion related to advantages and disadvantages of their study system (dual or traditional); the information was obtained by "Student Questionnaire", in questions 21 and 22 (See Annex 12), and data was classified and grouped using SPSS software. The results were:

For advantages:

Basically, there were five factors that students pointed out about advantages of Dual system: Combine theory and real practice, job opportunity, labor experience, tutor support and teacher support; but they recognized as the most important advantages the "Labor experience" (See Graph Annex 14-10), opinion that was present in the three measurements.

Graph Annex 14-10. Dual system: Advantages according student's opinion
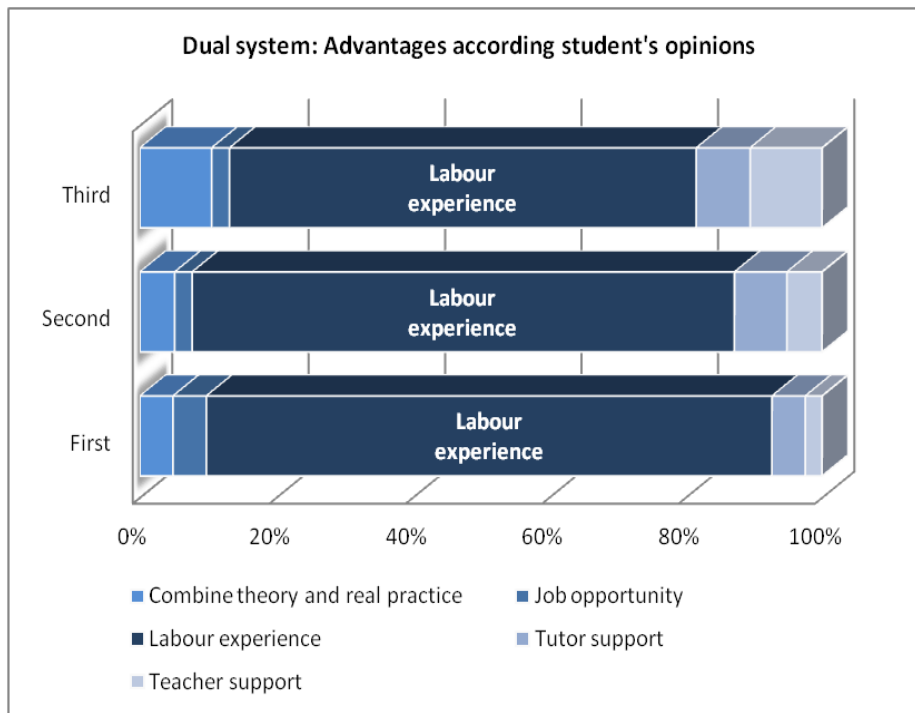
Otherwise traditional group, find out as advantages the teacher support, access to academy resources, more time to do different tasks, the practices at the Academy and do not have compromise with enterprises. As the time of their formation had passed, this

group gave more importance to the teacher support, the resources at the academy and the practices (See Graph Annex 14-11).

Graph Annex 14-11. Traditional system: Advantages - student's opinions
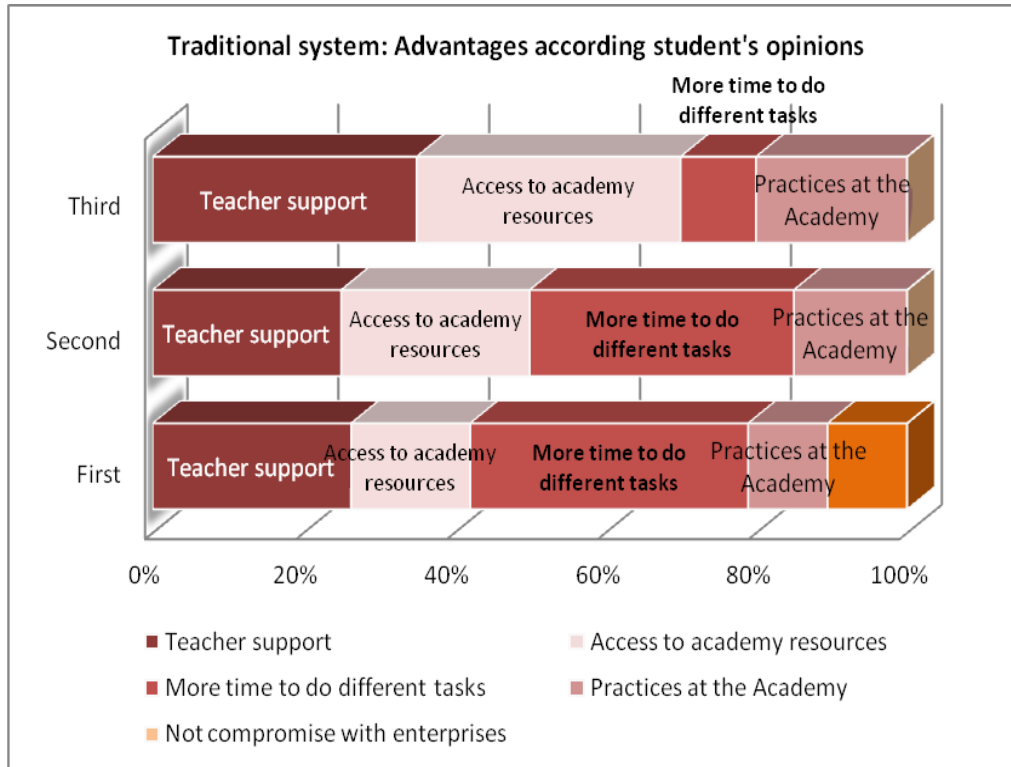
About disadvantages:

For Dual group, the most important disadvantages of dual system were Lack of coordination at the academy, Lack of resources at the Academy, Lack of experience of teachers and the situation that the study plan was not completely developed. Otherwise, for Traditional group, the principal disadvantages were lack of coordination, lack of resources at the Academy, lack of experience of teachers, study plan was not completely developed and does not company practice. In both group there were coincidences with these disadvantages: lack of coordination, lack of resources at the Academy and lack of experience of teachers (See Graph Annex 14-12 and Graph Annex 14-13).

Graph Annex 14-12. Dual system: Disadvantages - student's opinions
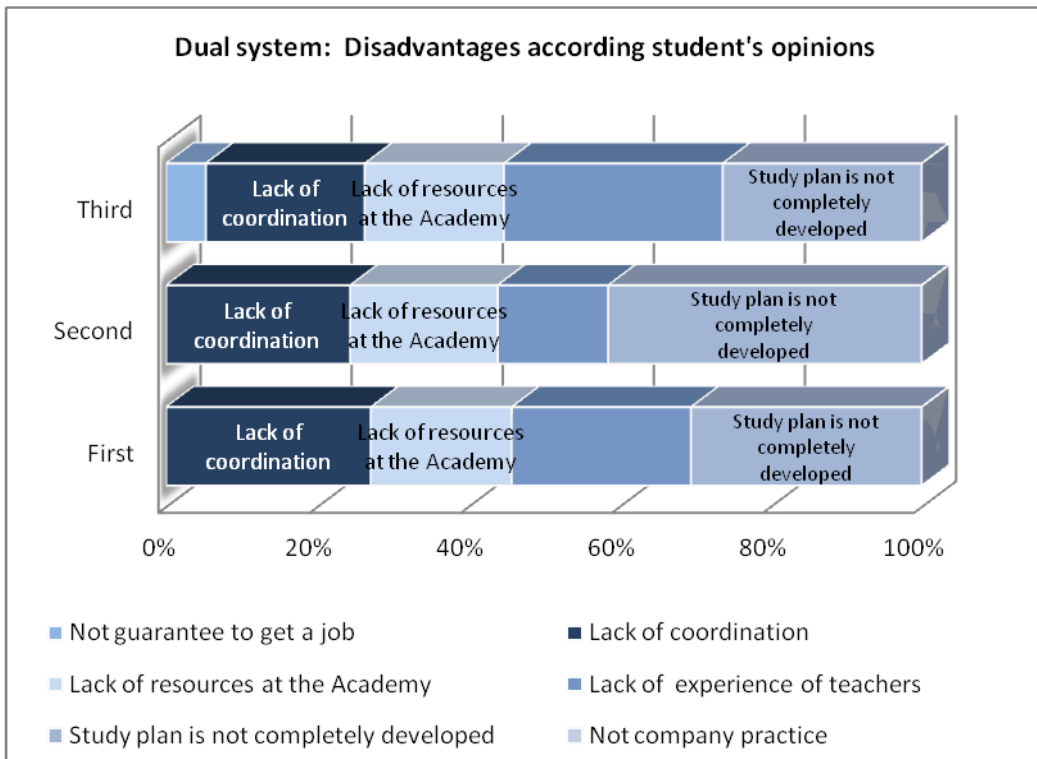
Graph Annex 14-13. Traditional system: Disadvantages - student's opinions
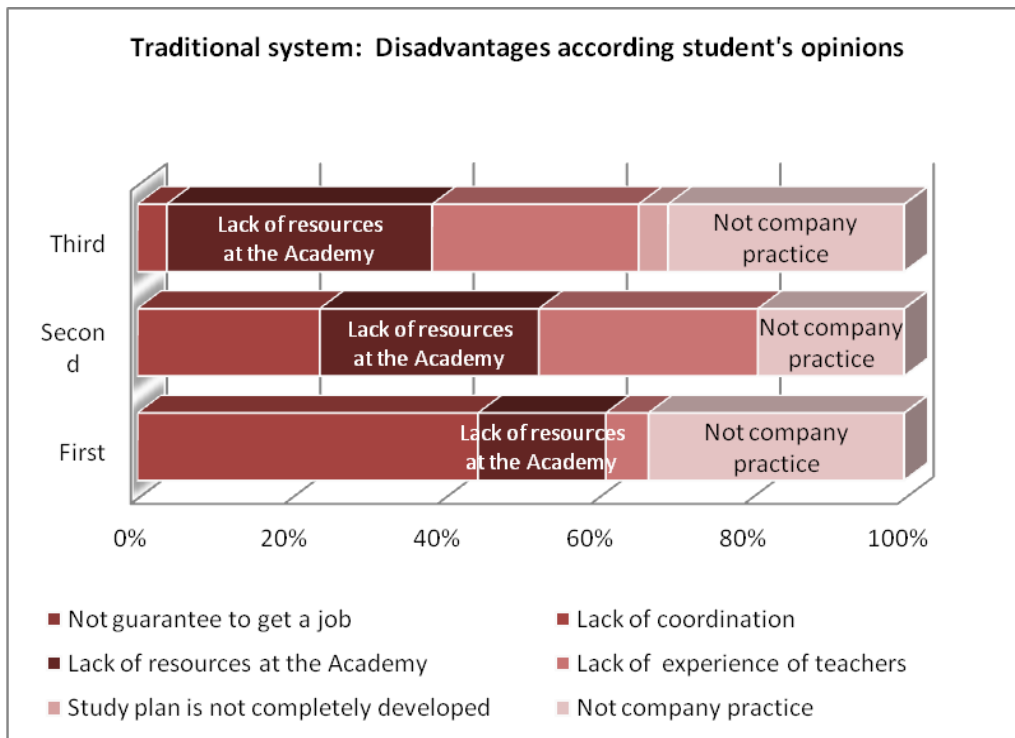
Table Annex 14-1. Data Perception – Calculation sheet

System	Measurement	Perception for all variables			Perception about formation at Academy			Perception about formation at Enterprise			Perception about job opportunity			Opinions abut recommend the study system		
		First Questionnaire	Second Questionnaire	Third Questionnaire	First Questionnaire	Second Questionnaire	Third Questionnaire	First Questionnaire	Second Questionnaire	Third Questionnaire	First Questionnaire	Second Questionnaire	Third Questionnaire	First Questionnaire	Second Questionnaire	Third Questionnaire
System	**Measurement**															
	Minimum scale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Maximum scale	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Dual	Number of cases for dual	37	34	35	37	34	35	37	34	35	37	34	35	37	34	35
	Number of questions for dual	32	32	32	17	17	17	13	13	13	1	1	1	1	1	1
	Maximum points for dual (Maximum scale * number of cases for dual * number of questions for dual)	5920	5440	5600	3145	2890	2975	2405	2210	2275	185	170	175	185	170	175
	Total of point obtained for dual	**4542**	**4222**	**4570**	**2226**	**2091**	**2285**	**2003**	**1845**	**1994**	**177**	**156**	**156**	**136**	**130**	**135**
	Liker Interval (Maximum points/maximum scale)	1184	1088	1120	629	578	595	481	442	455	37	34	35	37	34	35
	Liker scale equivalent (Total of point obtained / Liker interval	3.8	3.9	4.1	3.5	3.6	3.8	4.2	4.2	4.4	4.8	4.6	4.5	3.7	3.8	3.9
	Complement Likert scale	1.2	1.1	0.9	1.5	1.4	1.2	0.8	0.8	0.6	0.2	0.4	0.5	1.3	1.2	1.1
Traditional	Number of cases for traditional	17	15	16	17	15	16				17	15	16	17	15	16
	Number of questions for traditional	19	19	19	17	17	17				1	1	1	1	1	1
	Maximum points for traditional (Maximum scale * number of cases for traditional * number of questions for traditional)	1615	1425	1520	1445	1275	1360				85	75	80	85	75	80

		Perception for all variables			Perception about formation at Academy			Perception about formation at Enterprise			Perception about job opportunity			Opinions abut recommend the study system		
	Total of point obtained for traditional	**1325**	**1090**	**1122**	**1173**	**975**	**1011**				**80**	**65**	**68**	**72**	**50**	**43**
	Liker Interval (Maximum points/maximum scale)	323	285	304	289	255	272				17	15	16	17	15	16
	Liker scale equivalent (Total of point obtained / Liker interval	4.1	3.8	3.7	4.1	3.8	3.7				4.7	4.3	4.3	4.2	3.3	2.7
	Complement Likert scale	0.9	1.2	1.3	0.9	1.2	1.3				0.3	0.7	0.8	0.8	1.7	2.3
Global	Maximum points (maximum point for dual + maximum point for traditional)	7535	6865	7120	4590	4165	4335				270	245	255	270	245	255
	Total of point obtained	**5867**	**5312**	**5692**	**3399**	**3066**	**3296**				**257**	**221**	**224**	**208**	**180**	**178**
	Liker Interval (Maximum points/maximum scale)	1507	1373	1424	918	833	867				54	49	51	54	49	51
	Liker scale equivalent (Total of point obtained / Liker interval	3.9	3.9	4.0	3.7	3.7	3.8				4.8	4.5	4.4	3.9	3.7	3.5
	Complement Likert scale	1.1	1.1	1.0	1.3	1.3	1.2				0.2	0.5	0.6	1.1	1.3	1.5

Annex 15. Tutor questionnaire results

Results

Tutors opinions were explore by following variables: enterprise practice, formation at academy and the enterprise, about dual system, and advantages and disadvantages. The results are only about Dual system, because traditional did not have enterprise practice. Most of the variables were measured using liker scale, from one to five, being 1 the most unfavorable opinion and 5 the most favorable opinion.

The tutor´s opinion about student`s development in the formation process was collected by a questionnaire instrument (See Annex 13). In this instrument is the information about the goal, specific objectives, population, sample, the survey type, valuation scale, the questionnaire and other related information.

About study system in general – Global perception

The global perception of the tutors have changed in a positive way through the time (See **Graph Annex 15-1Graph Annex 14-1. Dual student: Enterprise practice perception**).

Graph Annex 15-1. Tutor: Global perception
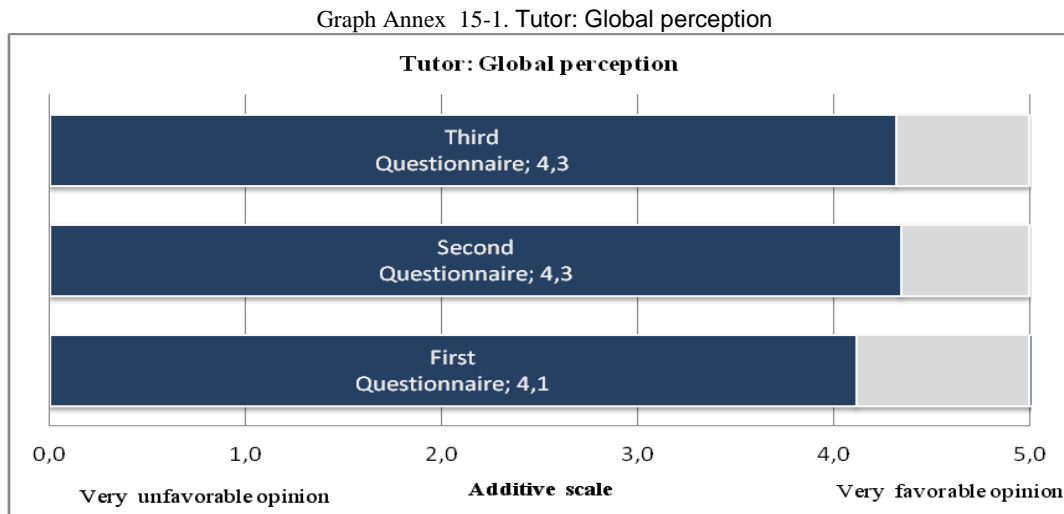
About formation at academy

Exploring tutor's opinion about formation at Academy, had a very favorable opinion in every point of the time (See Graph Annex 15-2).

Graph Annex 15-2. Tutor: Formation at Academy perception
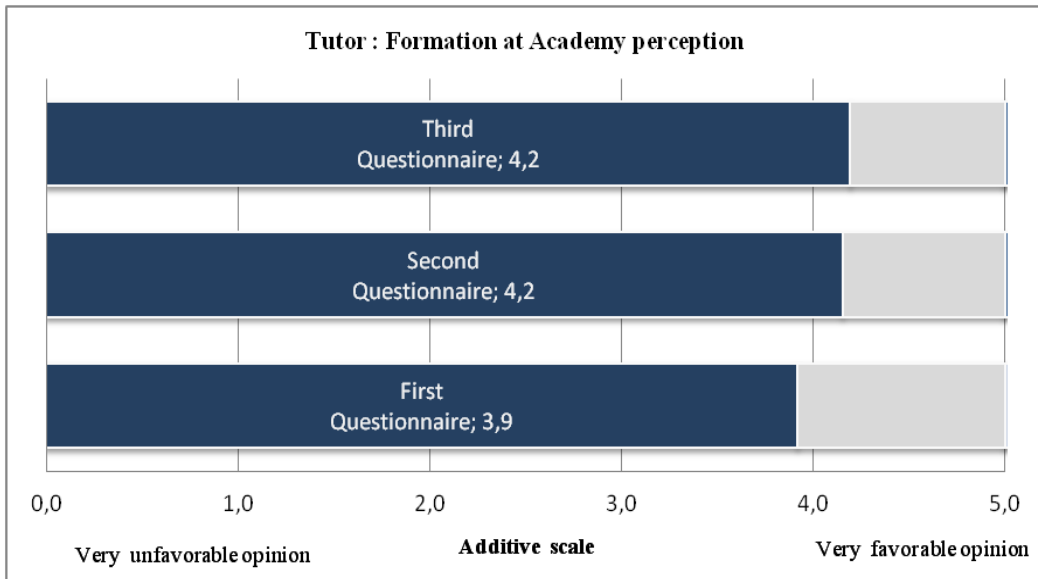
About enterprise practice

Related with enterprise practice, the result are similar with a very favorable opinion (See Graph Annex 15-3).

Graph Annex 15-3. Tutor: Enterprise practice perception
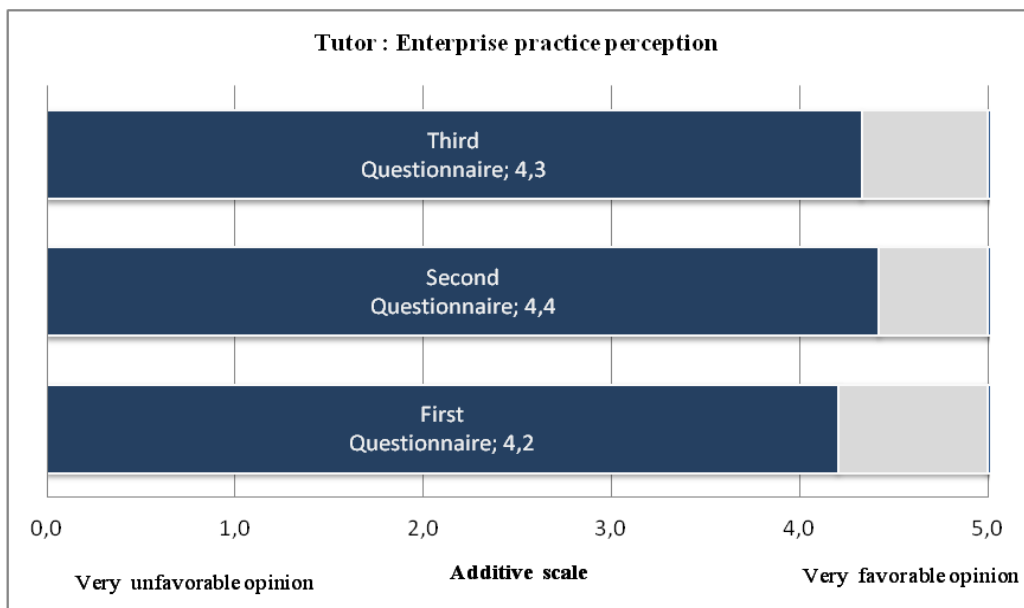
About job opportunities

In the first year, the opinion was less favorable than the second and third measurement, but with good opinions (See Graph Annex 15-4).

Graph Annex 15-4. Tutor: Job opportunity perception
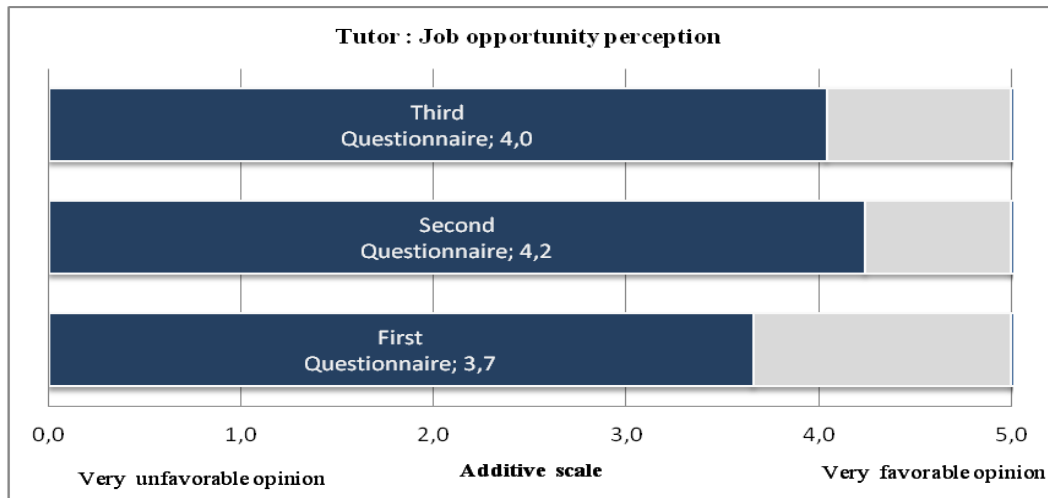
About recommend the system of study where students were formed

In this variable, there was the best favorable opinion made by tutors through the time (See Graph Annex 15-5).

Graph Annex 15-5. Tutor: Recommend system of study opinion
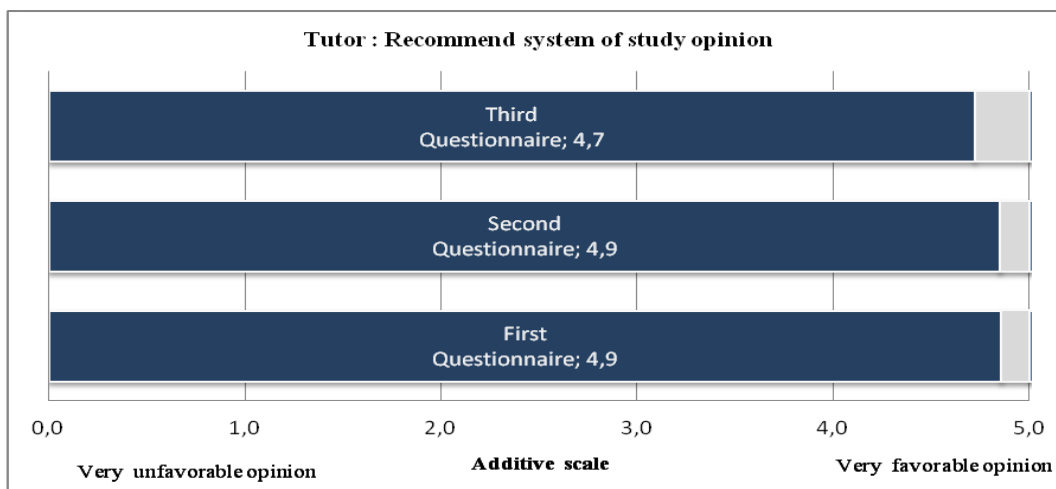
About Dual system

Asking about the dual system, the opinions were in the scale between four and five with a very favorable opinion (See Graph Annex 15-6).

Graph Annex 15-6. Tutor: Dual system opinion
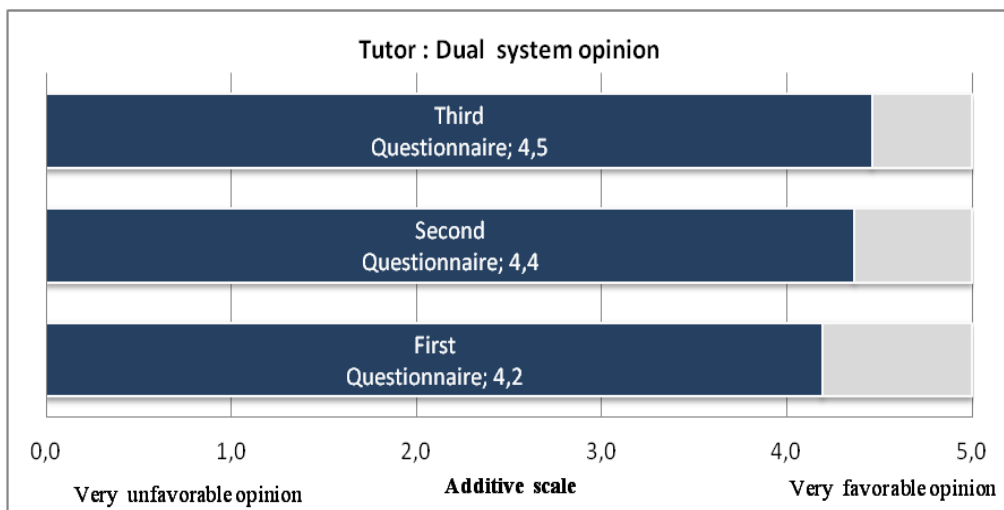

Advantages and disadvantages opinions

The purpose of this section was to have information about tutor´s opinion related to advantages and disadvantages of dual system. The results were:

For advantages

The principal advantages pointed out by tutors were the labor experience through the time, the other factor that was presented is the job opportunity. (See Graph Annex 15-7).

Graph Annex 15-7. Advantages according tutor's opinions
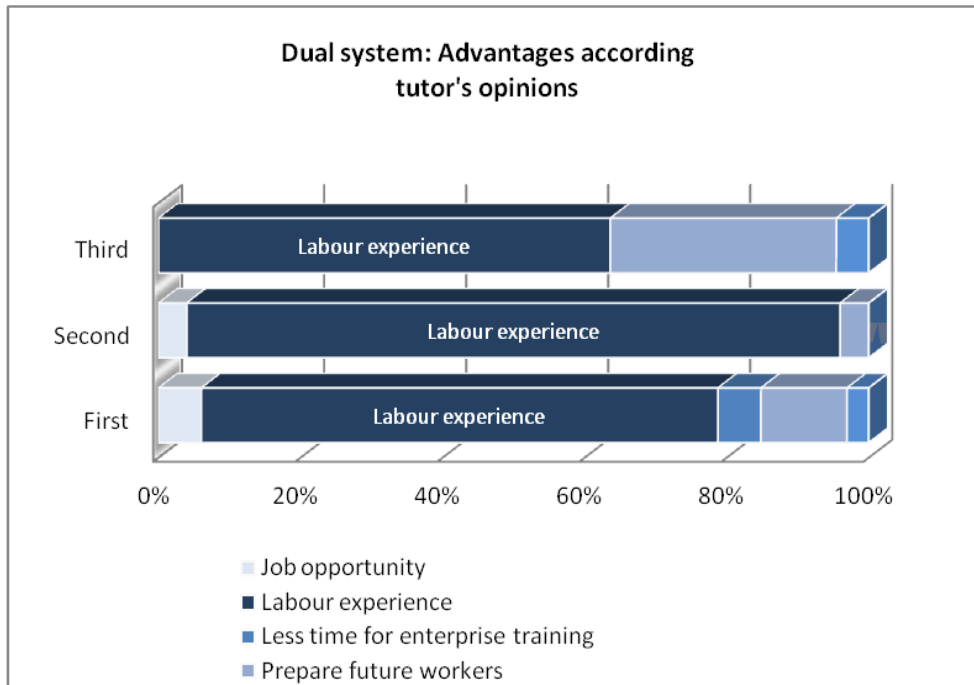
About disadvantages

According tutors, five factors have been the disadvantages of Dual group: (a) Lack of coordination between academy and enterprise, (b) Lack of resources at the academy, (c) The binnacle is not completely developed, (d) students has not compromised to work in the company, and (d) The lack of enterprise support. (See Graph Annex 15-8).

Graph Annex 15-8. Disadvantages according tutor's opinions
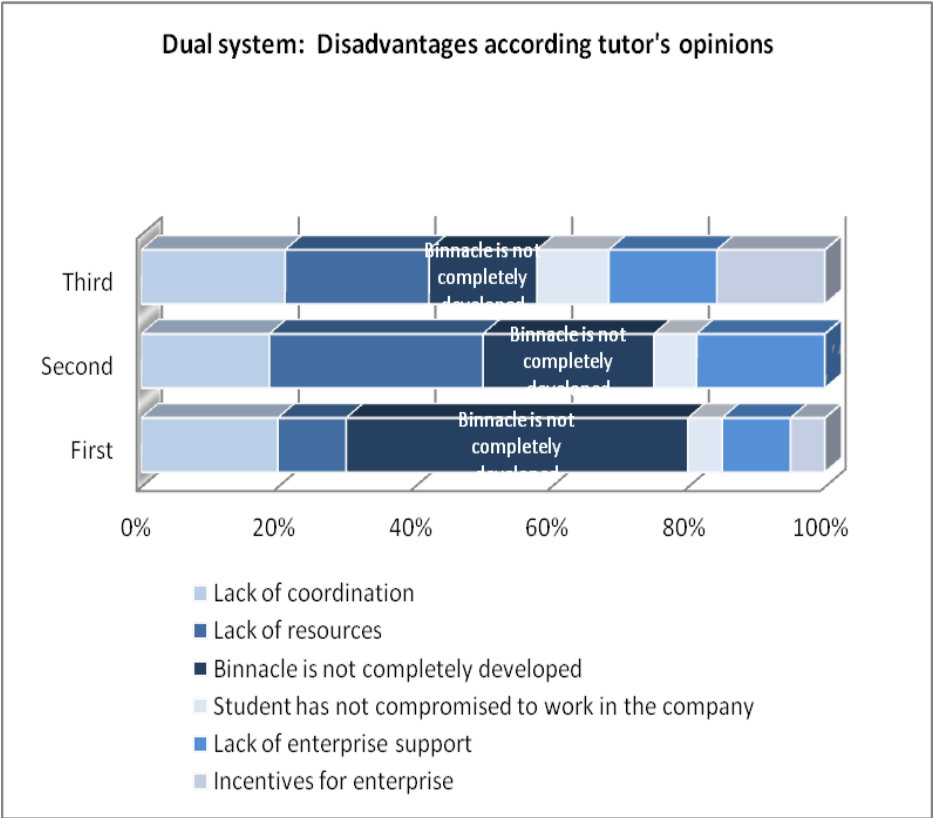
Annex 16. Time to get a job and salary

Information about salary conditions were collected from students from Traditional and Dual who participated in this research. Because the confidentiality agreement their name is not in any part of this document. Data about salary and employment for Dual group is in **Table Annex 16-1** page 360, and data about Traditional group is in **Table Annex 16-2** page 361.

Table Annex 16-1. Dual group – data about salary and employment

Dual group									
Case	Graduate on time	Working	Salary (US$)	Time to get Job since graduation	Case	Graduate on time	Working	Salary (US$)	Time to get Job since graduation
1	No	Working	400.00	Six o more months after	21	Yes	Working	800.00	Immediately after graduation
2	No	Working	490.00	Immediately after graduation	22	Yes	Working	490.00	Immediately after graduation
3	Yes	Working	500.00	One month after	23	Yes	Working	490.00	One month after
4	No	Working	600.00	Three months after	24	Yes	Not Working	.00	
5	Yes	Not Working	.00	.	25	Yes	Working	480.00	Immediately after graduation
6	Yes	Working	350.00	One month after	26	Yes	Working	350.00	Immediately after graduation
7	Yes	Working	650.00	Immediately after graduation	27	No	Not Working	.00	Immediately after graduation
8	Yes	Working	346.00	One month after	28	Yes	Working	375.00	Five months after
9	Yes	Working	400.00	Six o more months after	29	Yes	Working	450.00	One month after
10	Yes	Working	500.00	Immediately after graduation	30	Yes	Working	450.00	Immediately after graduation
11	No	Working	350.00	Immediately after graduation	31	Yes	Working	400.00	Immediately after graduation
12	Yes	Working	400.00	One month after	32	Yes	Working	375.00	Immediately after graduation
13	Yes	Not Working	.00	.	33	Yes	Working	850.00	Immediately after graduation
14	Yes	Working	400.00	Six o more months after	34	No	Working	450.00	Six o more months after
15	Yes	Working	346.00	Immediately after graduation	35	Yes	Working	350.00	One month after
16	Yes	Working	350.00	Immediately after graduation	36	Yes	Working	550.00	One month after

				Dual group					
Case	Graduate on time	Working	Salary (US$)	Time to get Job since graduation	Case	Graduate on time	Working	Salary (US$)	Time to get Job since graduation
17	No	Working	300.00	Two months after	37	Yes	Not Working	.00	
18	Yes	Not Working	.00	.	38	Yes	Working	N/A	One month after out the country
19	Yes	Working	550.00	Immediately after graduation	39	No	Working	450.00	Immediately after graduation
20	Yes	Working	1000.00	One month after	40				

Table Annex 16-2. Traditional group – data about salary and employment

				Traditional group					
Case	Graduate on time	Working	Salary (US$)	Time to get Job since graduation	Case	Graduate on time	Working	Salary (US$)	Time to get Job since graduation
1	Yes	Working	350.00	One month after	10	Yes	Working	300.00	Five months after
2	No	Not Working	.00	.	11	No	Not Working	.00	.
3	Yes	Not Working	.00	.	12	Yes	Not Working	.00	.
4	No	Not Working	.00	.	12	Yes	Not Working	.00	.
5	Yes	Working	300.00	One month after	14	Yes	Working	330.00	One month after
6	Yes	Working	300.00	One month after	15	No	Working	660.00	One month after
7	Yes	Not Working	.00	.	16	No	Working	350.00	One month after
8	Yes	Working	300.00	Three months after	17	No	Not Working	.00	.
9	Yes	Working	330.00	One month after					

Annex 17. Student interview

General Goal

To explore in deep way, Mechatronic students' opinion, about the formation development that they have received under the new system.

Specific objectives

- To know if they work in area that were formed

- Explore the experience being formed in the Dual system

- Identify limitations in dual system

- Explore about the evaluation of the competences that they have had

- Explore how their studies, have influenced in better job opportunities

- Know their opinion about the dual system expansion

Size and design of the Sample

Population

The students who were formed in Mechatronic career under the Dual system. They began in the cohort 2008 – 2010. The number of students was 39.

Sample

At least five interviews. These were for students with their tutors.

Data collection method

Interview was semi structured, and was passed in a meeting with students. These take results from questionnaires and other data.

Estimated time

The time necessary to carry out the interview was estimated in 30 minutes per person.

Valuation scale

Open question

Categories to explore

The categories that were explored are:

- Work in the area where was formed

- Experience in the system

- Limitations

- Evaluation method

- Job opportunities

- Measures to expand the system

- Preconditions information

Matrix by categories

All the questions classified by categories are in matrix presented as follow (See Table Annex 17-1).

Table Annex 17-1. Questions for Student Interview

Category	Related objective	Variable	Item #	Question
Work in the area where was formed	To know if they work in area that were formed	Job related with the formation area	Q1	What is your position in the company? Is your job related to the area in which you have been trained?
Experience in the system	Explore the experience being formed in the system.	Experience in general and the formation process	Q2	How has been your experience studying in the Dual System? How do you evaluate formation process?
Limitations	Identify difficult in the development of their studies	Limitations dual system development	Q3	What do you consider are the factors that could limit the development of Dual system?

Category	Related objective	Variable	Item #	Question
Evaluation method	Explore the point of view of the students about the evaluation of the competences that they has had.	Evaluation of competences	Q4	How has the system of evaluation in the academy, for measurement the achievement of competence? How has it been in the company? What have been the differences?
Job opportunities	Explore how their studies, has influence in better job opportunities.	Employability	Q5	How the company practice, has allowed better job opportunities for the students?
Measures to expand the system	Know the point of view of the students about the dual system expansion.	Measures to expand	Q6	What should be the measures to be implemented in order to expand coverage of Dual System: in the Academy, Enterprise, Industry, Government and International cooperation?
Precondition information		Job position, enterprise		Position (It could be student practice or job position)

Statement of Agreement

The statement of agreement was part of the interview, and was signed for each involved person. This was written as follow:

Interview Statement of Agreement

I agree to voluntarily take part in an interview within the framework of research on rising competences in technological education by implementing dual system´s elements under El Salvador conditions in the field of Mechatronic realized by Msc. Reina Elizabeth Durán de Alvarado.

I was informed about intention, content and complexity of the research, procedure of data collecting, data processing and data evaluating, the kind of scientific data use and data destruction after the end of the research.

I was assured that my answers will be collected and handled in an anonymous way. Employees of the research project have a data access exclusively. In publications, results will be used in an anonymous and generalized way, so that there is no reference to any living person.

With my signature I agree with the research procedure and the use of data.

I confirm to have received a copy of the statement of agreement and the instructions.

Place: _____

Date: _____

Enterprise: _____

Name: _____

Signature: _____

The Interview protocol

All questions presented in de Matrix by categories and topics are in this instrument:

Depth interview for Students

Interview protocol

Dear participant, this interview has been developed in order to know your experiences and vision about implementing the dual system.

This information will be used in the research on rising competences in technological education by implementing dual system´s elements under El Salvador conditions in the field of Mechatronic realized by Msc. Reina Elizabeth Durán de Alvarado with the support of the Faculty of Pedagogy from Technische Universität Dresden in Germany.

Instructions

In this interview, the interviewer will make some questions to explore and extend information; please feel free with your answers, and if you have any questions, do not hesitate to ask the person who is supporting this process.

General information

Name of interviewee	
Name of interviewer	
Company	
Position of interviewee	
Date	
Time	
Location	
Transcription by	_____ MP3 _____ DVD _____ PDF

Questions

1. What is your position in the company? Is your job related to the area in which you have been trained?

2. How has been your experience studying in the Dual System? How do you evaluate the formation process?

3. What do you consider are the factors that could limit the development of Dual system?

4. How has the system of evaluation in the academy, for measurement the achievement of competence? How has it been in the company? What have been the differences?

5. How the company practice has allowed better job opportunities for the student?

6. What should be the measures to be implemented in order to expand coverage of Dual System: in the Academy, Enterprise, Industry, Government and International cooperation?

Thanks for your kindly cooperation.

Annex 18. Tutor´s interview

General Goal

To explore in deep way,   tutors' opinion about dual system: process, evaluation and opportunities.

Specific objectives

- To know the experience being tutor in the Dual system

- To identify factors that limit the development of the Dual system

- To explore about the evaluation process

- To explore how Dual system has influenced in better job opportunities

- To know their opinions about which measures should be implemented to expand of Dual System

Size and design of the Sample

Population

The population was tutors from Mechatronic cohort 2008 – 2010. The tutors were 28.

Sample

At least 5 interviews

Data collection method

Interview was been   semi structured, and it was passed into the enterprises.

Estimated time

The time necessary to carry out the interview was estimated in 30 minutes per person.

Valuation scale

Open question

Categories to explore

The categories explored were:

- Experience in the system

- Evaluation method

- Limitations

- Job opportunities

- Measures to expand the system

- Preconditions information

Matrix by categories

All the questions classified by categories are in matrix presented as follow (See Table Annex 18-1).

Table Annex 18-1. Questions for Tutor Interview

Category	Related objective	Variable	Item #	Question
Experience in the system	To know the experience being tutor in the Dual system	Experience in general and formation process	Q1.	How has been your experience participating in the Dual System? How do you evaluate formation process?
Limitations	To identify factors that limits the development of the Dual system	Limitations dual system development	Q2.	What do you consider are the factors that could limit the development of Dual system?

Category	Related objective	Variable	Item #	Question
Evaluation method	To explore about the evaluation process	Evaluation of competences	Q3.	How has been the system of evaluation, for measurement of competence in the company for students?
Job opportunities	To explore how Dual system has influenced in better job opportunities.	Employability	Q4.	How the company practice, has allowed better job opportunities for the students?
Measures to expand the system	To know their opinions about which measures should be implemented to expand of Dual System	Measures to expand	Q5.	What should be the measures to be implemented in order to expand coverage of Dual System: in the Academy, Enterprise, Industry, Government and International cooperation?

Statement of Agreement

The statement of agreement was part of the interview, and was signed for each involved person. This was written as follow:

Interview Statement of Agreement

I agree to voluntarily take part in an interview within the framework of research on rising competences in technological education by implementing dual system´s elements under El Salvador conditions in the field of Mechatronic realized by Msc. Reina Elizabeth Durán de Alvarado.

I was informed about intention, content and complexity of the research, procedure of data collecting, data processing and data evaluating, the kind of scientific data use and data destruction after the end of the research.

I was assured that my answers will be collected and handled in an anonymous way. Employees of the research project have a data access exclusively. In publications, results will be used in an anonymous and generalized way, so that there is no reference to any living person.

With my signature I agree with the research procedure and the use of data.

I confirm to have received a copy of the statement of agreement and the instructions.

Place : _____

Date: _____

Enterprise: _____

Name: _____

Signature: _____

The Interview protocol

All questions presented in de Matrix by categories and topics are in this instrument:

Depth interview for Tutors

Interview protocol

Dear participant, this interview has been developed in order to know your experiences and vision about implementing the dual system.

This information will be used in the research on rising competences in technological education by implementing dual system´s elements under El Salvador conditions in the field of Mechatronic realized by Msc. Reina Elizabeth Durán de Alvarado with the support of the Faculty of Pedagogy from Technische Universität Dresden in Germany.

Name of interviewee	
Name of interviewer	
Company	
Date	
Time	
Location	
Transcription by	____ MP3 ____ DVD ____ PDF

Instructions

In this interview, the interviewer will make some questions to explore and extend information; please feel free with your answers, and if you have any questions, do not hesitate to ask the person who is supporting this process.

General information

Questions

1. How has been your experience participating in the Dual System?

2. How do you evaluate formation process?

3. How has been the system of evaluation, for measurement of competence in the company for students?

4. What do you consider are the factors that could limit the development of Dual system?

5. How the company practice, has allowed better job opportunities for the students?

6. What should be the measures to be implemented in order to expand Dual System: in the Academy, Enterprise, Industry, Government and International cooperation?

Thanks for your kindly cooperation.

Annex 19. Industrialist interview

General Goal

To determine the factors that motivates the industrialists to participate in the students' formation by using elements of dual system.

Specific objectives

- To identify factors that motivate industrialist to be part of Dual system

- To explore the factors which limit the development of the Dual system

- To know from the point of view of employer that measures should be implemented to expand coverage of Dual System.

- Identifying, the actions that employers think are important to improve the level of employability of young people from the educational process.

Questions

1. How do employers support the new system?

2. Why do employers support the new system? (Which are the motivations?)

3. Under which conditions using of Dual system`s elements could be successful in El Salvador?

4. What is important for employability according the industrialist?

Size and design of the Sample

Population

Employer from manufacturing industry in El Salvador, who participated in Dual system supporting students from cohort 2008 – 2010 of Mechatronic. The enterprises in the program were 22.

Sample

At least five interviews

Data collection method and analysis

Interview was semi structured. It was taken in each enterprise and recorder in digital format. All of them were transcript and classified using matrixes and the analysis was made using the Qualitative Content Method (Mayring, 2000).

Estimated time

The time necessary to carry out the interview was estimated in 30 minutes per person.

Valuation scale

Open question

Categories to explore

The categories explored were:

- Motivations

- Limitations

- Measures to expand the system

- Actions to increase employability

- Preconditions information

Matrix by categories

All the questions classified by categories are in matrix presented as follow (See Table Annex 19-1).

Table Annex 19-1. Questions for Industrialist Interview

Category	Related objective	Variable	Item #	Question
Motivations to be in Dual system	To identify factors that motivate to industrialist to be part of Dual system	Factors of motivation	Q1.	Under your point of view, which are the factors that motivated you to participate in Dual system? - From the list below, select the 3 most important factors to participate in

Category	Related objective	Variable	Item #	Question
				Dual system _____ Lower production costs _____ Reduce hiring costs _____ Reduce training costs _____ Reduce the risk of hiring wrong people _____ Having people with better competences according to the needs of the company _____ Participate in the formation process _____ Support to improve youth employability _____Promote work experience in youth _____Improve the Academy's relationship with the Company _____ Other: _____
Factor that Limit Dual system	To explore the factors that limit the development of the Dual	Limitations	Q2.	What do you consider are the factors that could limit the development of Dual system - From the list below, select the 3 most important factors that could limit the development of Dual system ___ Coordination between Academia and the company ___ Costs to keep students in practice ___ Lack of resources in the company ___ Lack of resources in the academy ___ Lack of student interest _____ Other: _____

Category	Related objective	Variable	Item #	Question
Measures to expand the system	To know from the point of view of employer that measures should be implemented to expand coverage of Dual System	Measures to expand	Q3.	What should be the measures to be implemented in order to expand coverage of Dual System: in the Academy, Enterprise, Industry, Government and International cooperation?
Actions to increase employability	Identifying, the actions that employers think are important to improve the level of employability of young people from the educational process	Employability	Q4.	Which are the most important actions to improve the level of employability of young people from the educational process?
Precondition information		Enterprise size	6.	Please provide the following information about your company or yourself: The Enterprise where I work has ___ Until 10 employees ___ Until 50 employees ___ Until 100 employees ___ More than 100 employees

Statement of Agreement

The statement of agreement was part of the interview, and was signed for each involved person. This was written as follow:

Interview Statement of Agreement

I agree to voluntarily take part in an interview within the framework of research on rising competences in technological education by implementing dual system´s elements under El Salvador conditions in the field of Mechatronic realized by Msc. Reina Elizabeth Durán de Alvarado.

I was informed about intention, content and complexity of the research, procedure of data collecting, data processing and data evaluating, the kind of scientific data use and data destruction after the end of the research.

I was assured that my answers will be collected and handled in an anonymous way. Employees of the research project have a data access exclusively. In publications, results will be used in an anonymous and generalized way, so that there is no reference to any living person.

With my signature I agree with the research procedure and the use of data.

I confirm to have received a copy of the statement of agreement and the instructions.

Place: _____

Date: _____

Enterprise: _____

Name: _____

Signature: _____

All questions presented in de Matrix by categories and topics are in this instrument:

Depth interview for Employers

Interview protocol

Dear Sir or Madam, this interview has been developed in order to know your experiences and vision since the point of view of the enterprise, about implementing the dual system.

This information will be used in the research on rising competences in technological education by implementing dual system´s elements under El Salvador conditions in the field of Mechatronic realized by Msc. Reina Elizabeth Durán de Alvarado with the support of the Faculty of Pedagogy from Technische Universität Dresden in Germany.

Instructions

In this interview, the interviewer will make some questions to explore and extend information; please feel free with your answers, and if you have any questions, do not hesitate to ask the person who is supporting this process.

General information

Name of interviewee	
Name of interviewer	
Company	
Size of company	___ Until 10 employees ___ Until 50 employees ___ Until 100 employees ___ More than 100 employees
Position	
Date	
Time	
Location	
Transcription by	____ MP3 ____ DVD ____ PDF

Questions

1. Under your point of view, which are the factors that motivated you to participate in Dual system?

   - From the list below, select the 3 most important factors to participate in Dual system.

     ____ Lower production costs
     ____ Reduce hiring costs
     ____ Reduce training costs
     ____ Reduce the risk of hiring wrong people
     ____ Have people with better competences according to the needs of the company
     ____ Participate in the formation process
     ____ Support to improve youth employability
     ____Promote work experience in youth
     ____Improve the Academy's relationship with the Company
     ____Other: _____

2. Which do you consider are the main factors that could limit the development of Dual system

   - From the list below, select the 3 most important factors that could limit the development of Dual system

     ___ Coordination between Academia and the company
     ___ Costs to keep students in practice
     ___ Lack of resources in the company
     ___ Lack of resources in the academy
     ___ Lack of student interest
     ___ Other _____

3. What should be the measures to be implemented in order to expand coverage of Dual system: in the Academy, Enterprise, Industry, Government and International cooperation?

4. Which are the most important actions to improve the level of employability of young people from the educational process?

<div align="center">Thanks for your kindly cooperation.</div>

Annex 20. Key Person Interview

General Goal

To explore how Dual system could be expand in el Salvador from a macro vision, like a national strategic for technical education

Specific objectives

- To identify conditions to implement Dual system in El Salvador

- To explore other areas where Dual system could be implemented

- To have recommendation in order to expand Dual system

Questions

1. What conditions would you consider should be given for the Dual system to be viable?

2. What are the areas you identify could develop in the Dual system?

3. What recommendation would you do to an adequate enlargement of the Dual system?

People to Interview

The general empirical results of this research were shared with five persons who have experience en educations and employability in El Salvador, because they work or have been working in relevant educational programs for professional and technical education.

People who collaborated with this evaluation were:

- Sandra de Barraza, who was the Vice-President of the study center where the Dual System was implemented, and also has developed studies and evaluations about the education system and the industrial sector of El Salvador. Some has been like a: Coordinator of the National Commission for the Development of the Presidency of the Republic of El Salvador since 2004 to 2009; Coordinator of the Monitoring Committee of the Education Plan 2021 of the Ministry of Education since 2004 to 2009; in 2010 has worked as an expert in the Industrial Policy of El Salvador.

- Vice Minister of Education Eduardo Badía Serra, who was in the government since 2009 to January 2012.

- Carlos Cromeyer who was the Chairman[93] and Provost[94] of the study center where the Dual System was implemented (2002 - 2008) and the Provost since . Besides he was president of Salvadoran Chamber of Construction Industry (CASALCO in Spanish), Executive Committee Member of the National Association of Private Enterprise (ANEP in Spanish) and Member of the Commission to Strengthen Social (FORTAS in Spanish) that supported strengthening projects for small and micro

- Klaus Schmidt who is the German expert who have implemented the Dual system in technical careers in El Salvador with support of International German Cooperation[95]; he has experience working in project related with technical education and Dual system in Latin-American.

- Robert Brunn who is from United States of America, working in El Salvador as a Director of the program Improving Access to Employment supported by USAID El Salvador. The aims of this programs are to improve competences to people for the employment, and make the linkage with enterprises, academy and government.

Data collection method and analysis

Interview was semi structured. It was taken in the office of each person and recorder in digital format. All of them were transcript and classified using matrixes and the analysis was made using the Qualitative Content Method (Mayring, 2000).

Estimated time

The time necessary to carry out the interview was estimated in 30 minutes per person.

Valuation scale

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[93] Since 2002- to 2008

[94] Since 2008- to 2009

[95] In this case the Interview was taken from the webpage www.itca.edu.sv. It was use to verify data from empirical research. Because this the category of analysis could vary.

Open question

Categories to explore

The categories that were explored are:

- Condition for Dual system

- Areas for Dual system

- Measures to expand Dual system

Matrix by categories

All the questions classified by categories are in matrix presented as follow (See Table Annex 20-1).

Table Annex 20-1. Questions for Key Person's Interview by category

Category	Related objective	Variable	Item #	Question
Conditions for Dual system	To identify conditions to implement Dual system	Conditions	Q1.	What conditions would you consider should be given for the Dual system to be viable?
Areas for Dual system	To explore other areas where Dual system could be implemented	Areas	Q2.	What are the areas you identify could develop in the Dual system?
Measures to expand the system	To have recommendation in order to expand Dual system	Measures to expand	Q3.	What recommendation would you do to an adequate enlargement of the Dual system?

Statement of Agreement

The statement of agreement was part of the interview, and was signed for each involved person. This was written as follow:

Interview Statement of Agreement

I agree to voluntarily take part in an interview within the framework of research on rising competences in technological education by implementing dual system´s elements under El Salvador conditions in the field of Mechatronic realized by Msc. Reina Elizabeth Durán de Alvarado.

I was informed about intention, content and complexity of the research, procedure of data collecting, data processing and data evaluating, the kind of scientific data use and data destruction after the end of the research.

I was asked if my answers could be collected and handled in non-anonymous way, because I am not the subject of this study.

With my signature, I agree with the research procedure and the use of data.

I confirm to have received a copy of the statement of agreement and the instructions.

Place:_____

Date: _____

Name:_____

Signature: _____

The Interview protocol

All questions presented in de Matrix by categories and topics are in this instrument: Depth interview for Key People, as follow:

Depth interview for Key People
Interview protocol

Dear participant, this interview has been developed in order to know your experiences and vision about implementing the dual system.

This information will be used in the research on rising competences in technological education by implementing dual system´s elements under El Salvador conditions in the field of Mechatronic realized by Msc. Reina Elizabeth Durán de Alvarado with the support of the Faculty of Pedagogy from Technische Universität Dresden in Germany.

Instructions

In this interview, the interviewer will make some questions to explore and extend information; please feel free with your answers, and if you have any questions, do not hesitate to ask the person who is supporting this process.

General information

Name of interviewee	
Name of interviewer	
Company	
Date	
Time	
Location	
Transcription by	____ MP3 ____ DVD ____ PDF

Questions

1. What conditions would you consider should be given for the dual system to be viable?

2. What are the areas you identify could develop in the dual system?

3. What recommendation would you do to an adequate enlargement of the dual system?

Thanks for your kindly cooperation.

Annex 21. Student Interview's transcripts

Student Interview [S1]	
Interviewer	Reina Durán
Interviewees	Mr. [S1] – Student
Date of Interview recording	July, 08th 2011
Time duration	16.16 Minutes
Language	Spanish transcription. English translation
Italic	Ask reaction of interviewer
Standard	Answer and responses of interviewees
Bold	Special emphasis about categories

Note: The transcription can vary lightly in respect to the recording due to the conditions of anonymity of the interviews

1 This interview was developed on July 8, 2011, in the facilities of one of the participating
2 companies in the dual formation program of the mechatronics career. With the interview
3 we look to identify the opinion of the students of the mechatronics career of the class
4 2008-2010 under the dual system, about their formation process. This information will be
5 utilized in the research called "Research on rising competences in technical education by
6 implementing dual systems elements under El Salvador conditions in the field of
7 mechatronics"

8 Interviewer: Good afternoon Mr. [S1], thank you for the time given to the development of
9 this interview, as a part of the process of the research related to the implementation of the
10 dual system in the career of mechatronics of which you have been part of as a student. I
11 will start with some questions, in first place

12 Interviewer: *Could you explain to me what your position in the company is and if this is*
13 *related to the area in which you have been trained?*
14 **Mr. [S1]: Yes. The position that I have right now is to overlook the quality**
15 **maintenance**, (Category: Work in the area where was formed).

16　*Interviewer: How has it been the experience of studying in this dual system?*

17　Mr. [S1]: For me it has been very complex, because what I could see in the academy,

18　practically it's like going around in diapers, **here in the company you see things, like**

19　**saying complex, for example in the mechatronics, there are things that I never**

20　**thought, that work in that way but, thanks to what I learned in the academy it has**

21　**served me as a foundation** (Category: Experience in the system). **There is another**

22　**situation, it would be better, that what is related to the studies in the academy,**

23　**based a little more in the company, in the situations that the company requires**

24　(Category: Measures to expand the system), because there are moments that one can be

25　preparing, but you cannot be performing your position, there are things that are, very

26　complicated because one pretends to see some things in the company, but you can't

27　because you're limited to do them, because there are certain departments that have in

28　their jurisdiction to do that. Never the less with all the situations, **I feel like I am learning**

29　**here in the company and that I am teaching myself** (Category: Experience in the

30　system) and I'm going into the machines and that's why I haven't left

31　*Interviewer: And did it work the formation that was developed there in the academy?*

32　Mr. [S1]: **Yes it has worked, if you want to say it this way, up to an 80%** (Category:

33　Evaluation method), but, to say it this way I am starting right now, with this company,

34　doesn't mean I will end up here, but at least I have knowledge, and I feel that what I am

35　learning here can be utilized somewhere else.

36　*Interviewer: Looking at the whole process, where you started in 2008, 2 months, in the*

37　*academy, one month to the company. How was, that first month compared to a year later*

38　*that had already been 5 months of experimenting with the company, and then 2 and a half*

39　*years how do you evaluate this whole process, from the beginning to the end?*

40　Mr. [S1]: Well in the beginning you're always hesitant, hesitant in the aspect of what's

41　going to be in the company how am I going to do, if what I learned is going to work and all

42　that was in the first month, in the fifth month, as always you have to have things very clear.

43　Is to make friendship like, with the people that you work, I started to realize **that a**

44　**company is not selfish to transfer knowledge as long as, you can give a person**

45　**trust, because with eh time that I have now, I can tell you that I feel good, that I am**

46　**taking advantage, and that really the company also puts lots of things that I can**

47　**discover** (Category: Experience in the system).

48 *Interviewer: And comparing it to the classmates that were in the traditional, have you*
49 *encountered any difference?*
50 Mr. [S1]: Look with my classmates from traditional I didn't get along with them too much.

51 Interviewer: Do you know what happened there?
52 Mr. [S1]: Just with one of them, according to that I heard from what he has told me, that
53 when we made the practice month in the company, they had to clean the machines, then
54 those disadvantages, that they have had to practice what you saw In those 2 months, to
55 say it like that about the module. They have missed, I feel like in there **we have a**
56 **difference, that we were learning already with the company of that month but they**
57 **weren't, and they didn't have any knowledge** (Category: Evaluation method).

58 *Interviewer: Some of them have an opinion that they were more comfortable in there*
59 *because you didn't have vacation. Your load was harder wasn't it?*
60 Mr. [S1]: Yes but, as you know, if you want something good, there will always be a load,
61 but then, all of our classmate from mechatronics, were asking about the ones that were
62 from our group, **what use can you have one month resting if you can take advantage**
63 **of it being in class studying, learning something new and those things have helped**
64 **us here** (Category: Evaluation method).

65 *Interviewer: What difficulties did you find in the study plan? Inside of the situations that are*
66 *represented in the questionnaires that we have worked, it appears with frequency the*
67 *subject that the study plan was not completed. What were the difficulties that you*
68 *encountered?*
69 Mr. [S1]: Really there were **subjects, that in a certain way were not completed, for**
70 **example, we had a course that, supposedly we had to reach until certain subject**
71 **until the end, but, for a or b motive, we couldn't finish it and there were times we**
72 **had to skip subjects, then that for us brings, it brings a great, a great difference in**
73 **the aspect of obtaining knowledge, there were moments that they were skipping**
74 **subjects** (Category: Limitation), and there were problems, that we, we had to look a way
75 to get out of them, and the other things was, in respect to subjects that they repeated the
76 same thing, for example to say it like this, in module number 3 we looked at electronics, in
77 module number 6 we looked at electronics and we started almost from the same , and we
78 didn't find any sense in that, we had to go forward, and we lost time in the instead of taking
79 advantage in another knowledge.

80　*Interviewer: And what is the recommendation for this to be done?*

81　Mr. [S1]: The recommendation, would be to maintain always the schedules, for example to

82　respect the schedule for class, another thing, not having what it is, days let's say that if the

83　teacher missed because the capacity or because he has asked for permission, don't stop

84　teaching the class, always keep giving, and when he arrives, because that generates us

85　gaps.

86　*Interviewer: It means that you never got back that class?*

87　Mr. [S1]: We didn't get it back, even sometimes, the teacher, if you say it like this that from

88　pneumatics that he was absent for a month and a half, that class we missed.

89　*Interviewer: Now in respect to the evaluation system how did the system by competences*

90　*in which you were being formed worked?*

91　Mr. [S1]: Yes, everything was based on how much one could accomplish, of what it was

92　taught, well in that case for me all it was, it was related to the course that I had finished in

93　a technical high school, I accomplished, and the ones that I had difficulties with were in

94　those careers in as a matter of saying it, didn't have any knowledge, in the first modules,

95　**but really with the same companionship, they were helping me, then I start**

96　**obtaining knowledge and gaining the competences** (Category: Evaluation method).

97　*Interviewer: When you say they, who are you referring to?*

98　Mr. [S1]: **Classmates. Between all of us we share knowledge** (Category: Evaluation

99　method).

100　*Interviewer: It was supposed that you that were in the dual system, were going to*

101　*accomplish developing better competences, because, besides being inside what the*

102　*academy is with the theoretical part, the practice in the shops, when you come to the*

103　*company, here you reinforced and learn much more than the others, because you have*

104　*the opportunity to see and environment closer to real life; but the results in the level of*

105　*internal evaluations, let's say in the side of what the academy, appears very similar the*

106　*results of you compared to the ones from the other group, then what do you think it could*

107　*have happened? What I mean in here, is that if you took pneumatics and in pneumatics*

108　*you had to have developed certain competencies, then when the time to do the*

109　*evaluations, the group from dual system scored an average of 8.2 and the other could be*

110　*around 8.1, 8.3, you couldn't see a big difference, what could have happened there when*

111　*they (traditional group) didn't have that chance of practicing and you did?*

112   Mr. [S1]: It's because in there, there was another inconvenient, really for our dual career

113   and traditional career, in some courses it was the same teacher. If the teacher was absent

114   to us, was absent for them, the other thing was that we had assignments or subjects to

115   develop, and the teachers disposed them other things, assignments that they had, was not

116   subjects that we had to follow, and that what we were seeing there, compared to the other

117   classmates, that were learning with the other group, **it was that they already had**

118   **classmates that already had knowledge in those areas and they helped them**

119   (Category: Limitations), I mean they explained them, that if, really the teacher didn't teach

120   us, **there were others with experience, other people that had already worked with its,**

121   **and gave us brief summaries of how it was, of what we had to do.**

122   *Interviewer: The way the data looks, they come in equal condition, in the knowledge level;*

123   *when you evaluate each one of the different modules you had, you can't really tell a big*

124   *difference; and that it was expected that you for being in a company, to be better. But you*

125   *attribute it mostly to the teacher changing a little more the thematic. Is like that?*

126   Mr. [S1] Yes, at least there like I was saying, the same teacher for both, and that is the

127   conflict.

128   *Interviewer: In theory being the same teacher it's when you should notice the most the*

129   *difference, because when there is a change in the teacher it could happen, that the*

130   *teacher could be a little lighter to evaluate and this one could be stronger to evaluate, but if*

131   *it is the same teacher, supposedly you both have the same evaluation system.*

132   Mr. [S1]: There was a difference, that there was a teacher, that would explain certain

133   subject to a group, explained to say it like this, everything very detailed, but there was

134   another group that that same teacher explained everything too fast, like if there was

135   knowledge that the group understood but, he exceeded that too much, and that is when

136   maybe we had that problem.

137   *Interviewer: The other question is, How has the practice developed in the company, has*

138   *permitted you better job opportunities?*

139   Mr. [S1]: Really, the opportunity I have here, has been very interesting in the aspect, that I

140   **have more knowledge about the machinery, about the function, even the knowledge**

141   **that I have acquired in this company** (Category: Evaluation method), I have been able

142   to practice in another company, because there are sometimes that, they call me from

143   another company, for me to come work for them, **I feel that really in the company**

144 **having the theoretical knowledge and knowing here the practical knowledge is like,**

145 **a bigger opportunity** (Category: Experience in the system). **It gives me opportunity, to**

146 **adapt to any job** (Category: Job opportunities).

147 *Interviewer: Thinking in the expansion of the system, even though they already expanded*

148 *it to other careers, what do you think it could limit this system to keep growing? What could*

149 *be limiting the development of the dual system?*

150 Mr. [S1]: Look what I think **could be limiting is the good control of the management of**

151 **the subjects, the teaching** (Category: Measures to expand the system)**,** because, as we

152 know we were the first "guinea pig" group, what subject we were going to implement what

153 subject we were going to teach, so, the biggest limiting that I can think of that could work

154 for a career, that could be created in a dual system, is that there are no definition, how is it

155 going to be managed that career, what is it to be accomplished, how is it going to start and

156 how is it ending, that's what I think.

157 *Interviewer: What do you think should be implemented for the system to have more*

158 *coverage, what could be enlarged? And in here I want you to think from different points of*

159 *view. From the Academy side what should be done so that more people could be*

160 *beneficiated of the system?*

161 **Mr. [S1]: Yes I consider that the Academy should investigate a little more with the**

162 **company, of what are the company's' needs, because when you know what the**

163 **company needs you can define the study subjects for the student, and then, you**

164 **can obtain a benefit, but it has to be always consulting with the company always,**

165 **what are their needs.**

166 *Interviewer: In the area of Economical support from the company, what do you think? You*

167 *always need it or you could do it without the economic support?*

168 Mr. [S1]: Well, it looks like we did not see it, economic support of the subject, in the

169 Academy

170 *Interviewer: No, I mean that for you to be in the dual system, the dual system had the*

171 *support from the company*

172 Mr. [S1]: Yes exactly

173 *Interviewer: The Company was financing part of your studies and the transportation part.*

174   Mr. [S1]: It is good like that, **it's a big help, a big help that really the company gave us,**
175   **giving us money, to come here and practice something that I think that, is really**
176   **good** (Category: Measures to expand the system); the only thing is, there were some
177   observations we all made, because there were some classmates that they have been,
178   awarded with a scholarship from the company and then as they had scholarship and being
179   workers as a matter of saying it, they were part of the payroll, those were the doubts some
180   of us had, but about the economic support from the company, I consider it good.

181   Interviewer: Until here is the interview. Is there anything else you would like to contribute to
182   the research?
183   Mr. [S1]: No

184   *Interviewer: Thank you so much for your time.*

Student Interview [S2]	
Interviewer	Reina Durán
Interviewees	Mr. [S2] – Student
Date of Interview recording	July, 23th 2011
Time duration	35:04Minutes
Language	Spanish transcription - English translation
Italic	Ask reaction of interviewer
Standard	Answer and responses of interviewees
Bold	Special emphasis

Note: The transcription can vary lightly in respect to the recording due to the conditions of anonymity of the interviews

1 Interview was developed on July 23 2011, in the facilities of one of the participating
2 companies in the Dual Formation Program in the Mechatronics career. With the interview,
3 we look to identify the opinion of the students from the Mechatronics career from the class
4 2008-2010 under the dual system, about their formation process. This information will be
5 used on the research called "Research on rising competences in technical education by
6 implementing dual system's elements under El Salvador conditions in the field of
7 Mechatronics".
8 Interviewer: Good afternoon Mr. [S2], thank you so much for the time that you are giving
9 me to the development of this interview, as a part of the process of the research related to
10 the implementation of the dual system in the career of Mechatronics of which you have
11 been part as a student. I am going to make you an interview in order to know more about
12 your study program, which was developed under the Dual system. The idea is to go deep
13 into some topics that you have given through the questionnaires, but in here we could
14 talk a little more, to be able to understand, how does this teaching system has been
15 viewed from the sides of the ones that were formed under it, then the first thing that we
16 would like to know is about the formation.

17   Interviewer: *Could you explain to me what your position in the company is and if this is*

18   *related to the area in which you have been trained?*

19   **Mr. [S2]: I am working in machine maintenance**, (Category: Work in the area where

20   was formed).

21   *Interviewer: In general, how do you evaluate the formation system that you had, all that*

22   *period there in the academy?*

23   Mr. [S2]: The process seemed really good, because I think it's a good way, to form

24   yourself in an academic way and, in a direct form in the field because. It was different with

25   a traditional system, and there you only looked up theory, you can see that it's the

26   academic formation, although with labs, all of that one acquires a little bit of the skills that

27   are experimented with the devices and everything, depending on the career that you

28   study, but **in this case what I can see, really good is that you take a lot of real world**

29   **practice, in what the career is** (Category: Experience in the system). It was good, I

30   couldn't catalog it as excellent because there are equal systems, **one of the efficiencies**

31   **of the system, in what the system probably was the first time that was implemented**

32   **practically in the country, not only in the technological because there were some**

33   **deficiencies in developing the problems, the study programs, even 100% also with**

34   **respect of what the companies are, being in the companies, some were new**

35   **experiences** (Category: Limitations)**,** in my case in the company because, it was the first

36   time a student entered, or they opened the doors to what their field is related to mechanics

37   and everything related to the career, so in that way, you could say that there were many

38   inconveniences.

39   *Interviewer: Did you have the opportunity to study under the traditional system, or under*

40   *the dual system?*

41   Mr. [S2]: Under the dual system.

42   *Interviewer: If you had to choose again, for what system would you go?*

43   Mr. [S2]: **Well I would choose the dual, I liked it, I think the dual system is really**

44   **good, I mean it appears excellent** (Category: Experience in the system) because you

45   only have to be a little mature there in the side of the company, and also with the institution

46   in charge of doing it.

47   *Interviewer: How do you think of the evaluation system of this system?*

48   Mr. [S2]: **It was completely different because in the dual system, requires to acquire**

49   **a lot of knowledge and too little time I feel** (Category: Experience in the system),

50   because that's what I felt, and with the traditional system it was a process a lot or very,

51   very slow.

52   *Interviewer. Maybe with an example, you could clarify me what this means?*

53   Mr. [S2]: For example, we were in a module that was 2 months, we had to acquire that in

54   the previous system you got in 6 months, so then what was really interesting was that not,

55   help us to have at least the experience that I had, **because it encourages team work,**

56   **because it is the only way that one can acquire it, to be able to finish on time, with**

57   **the program or the evaluations that the program required because we were different**

58   **students of different careers and also each one had their knowledge** (Category:

59   Experience in the system and evaluation method), in the electric and in the mechanic, and

60   it complemented team work, to be able to do good in what the evaluation requirements

61   were in the electric, also in the mechanics and it was complemented with team work, to be

62   able to do good in what the evaluations required.

63   *Interviewer: At the end did you accomplish the objective? Because we are talking about*

64   what you looked in 6 months now you looked in 2 months.

65   **Mr. [S2]: The objective was acquired, but not 100%** (Category: Limitations)**.**

66   *Interviewer: Does this mean that in this way the objective was acquired more in the other*

67   system than in this one?

68   Mr. [S2]: Yes

69   *Interviewer: Why?*

70   **Mr. [S2]: because, they have more time like to investigate, make questions, you**

71   **could say with other people of that field** (Category: Limitations).

72   *Interviewer: And in respect to the complement that you had with the formation inside the*

73   *company, did that not supply the difference in the times.*

74   Mr. [S2]: At the end it was a complement because the doubts that you may have, for

75   example because you couldn't look 100% to the program, the company having problems

76   of real life, you could tie up your knowledge

77 *Interviewer: Do you think that the process of formation of the dual system has facilitated*
78 *you the incorporation inside the company?*
79 **Mr. [S2]: Of course, what facilitated it was that, the familiarity with the company, to**
80 **already know a little of what the equipment reach a month, this for example also the**
81 **relationship with the coworkers and all that and knowing that the work environment**
82 **that also facilitated me in equal manner to incorporate myself to what the company**
83 **is** (Category: Experience in the system and job opportunities).

84 *Interviewer: And was it always like that or do you find any difference in the beginning and*
85 *then things were changing with time? How was incorporation in the beginning?*
86 Mr. [S2]: Well at the beginning it was a little of indifference you could say, this was
87 because it was the first time a student, at least in my case, it was the first time that they
88 opened the doors to a student.

89 *Interviewer: For you what did it mean to incorporate from the beginning to a company?*
90 Mr. [S2]: **For me it was excellent I came with a lot of enthusiasm , because I had a**
91 **scholarship, in the real world, it was what really caught my attention of the career is**
92 (Category: Experience in the system and job opportunities). To have the things, closer.

93 *Interviewer: And before when you were not working?*
94 Mr. [S2}. Yes I worked, after finishing my first technical, I worked there a year in what the
95 industry is too not anymore in the industrial electronic career.

96 *Interviewer: And you left employment to study this career?*
97 Mr. [S2]: Yes, because it appeared to me very interesting because of what they study,
98 what really appears to me interesting and I decided, I had ventured to study this because
99 of in the labor side I felt that I needed to know or needed to train myself, besides of what I
100 already knew in electronics I felt that I needed to know, what is mechanics in what
101 programming is and I felt it was the automatic system.

102 *Interviewer: What difficulties have you encountered, because you have to be coming to the*
103 *company during the formation process?*
104 Mr.[S2]. Well difficulties, none.

105 *Interviewer: Why?*

106   Mr. [S2]: As I was telling you, at least in my case it is really close to where I live, the
107   schedules were like the ones in the technological, there was a time when you didn't enjoy
108   anything, and also having tutors that could follow up with me with how we develop in the
109   company, this didn't difficult me at all.

110   *Interviewer: Do you consider that this formation process of integration into the company,*
111   *helped you develop better your attitudes? We're talking about if attitudes in related to*
112   *incorporation, knowing to work as a team, acquire responsibilities, following the rules.*
113   Mr.[S2]. **Yes it has been a lot, because in each company it is a different experience,**
114   **at least in this company, it's not too big but I can see that it is the only way that I**
115   **have to be better, working as a team, because sometimes there are some serious**
116   **problems, and in a way I have seen it they solve them is** (Category: Experience in the
117   system).

118   *Interviewer: Where do you consider that the formation is better, in the Academy of here in*
119   *the company?*
120   Mr. [S2]: Well it depends on how you see it, because in the academy, you acquire lots of
121   knowledge a least that the career requires, but in the company not every knowledge is
122   used, so you could say that from what you apply here in the company, well it would be
123   divided 50 and 50 each.

124   *Interviewer: Do you think that the ones that have studied in this system, have had better*
125   *work opportunities, compared to the ones that were in the traditional?*
126   Mr. [S2]: **From the ones that were in the traditional, yes there is a big difference,**
127   **because being directly in the company, depends a lot of yourself when you finish**
128   **the career here at the company, compared too when you are in the traditional**
129   **model, well it has to be, a newer experience, to say, start from zero in a company,**
130   **then already in the dual system, one already has the advantage that you practically**
131   **are already incorporated to the company is** (Category: Job opportunities).

132   *Interviewer: All of your classmate from the dual system, Are working?*
133   Mr. [S2]: No. Not All

134   *Interviewer: Why?*
135   Mr. [S2]: Because as I was saying, well we all have the chance, when we start in a
136   company, but it depends of how one shows enthusiasm for the job

137   *Interviewer: What do you think happened to the ones that could not incorporate?*

138   Mr. [S2]: Here you could link different motives of why some of the classmates did not

139   incorporate, of the ones that I know, there is the company, they did not see like, they were

140   going to be efficient, and for others it was that the company did not have any more that

141   vision to incorporate more people to the work force.

142   *Interviewer: How do you think, that the companies should support this dual system?*

143   Mr. [S2]: **For me they should give a lot of importance to what this system is, because**

144   **the ones that are favored the most are the companies** (Category: Measures to expand

145   the system).

146   *Interviewer: Why?*

147   Mr. [S2]: From my point of view is that the company, because a student arrives, taking the

148   dual system process, compared to a process, well if the process requires a lot, it means

149   that is not too hard that, a bad student is going to end up, you could see, you could think

150   that all the students that enter the company, are good students, are excellent students,

151   from there it depends on how the company trains them for themselves**, the benefit that**

152   **they could obtain, it depends a lot on the company on how they want to acquire a**

153   **benefit with the student, but for me they have to give a lot of priority to this, because**

154   **there are a lot of young people, they are good boys and that, they could bring a lot**

155   **for them** (Category: Measures to expand the system).

156   *Interviewer: What changes do you suggest from the side of the company for the system to*

157   *work better?*

158   Mr. [S2]: To follow up to what, to keep a visit program, and give a better priority, a better

159   fulfillment, because sometimes, it does not fulfill to a high percentage, maybe 60, when it

160   could be maybe around an 85-90

161   *Interviewer: What do you consider it could be better inside the company?*

162   Mr. [S2]: Well inside of the company, basically help the student and give him trust so that

163   he can, come develop inside of the company.

164   *Interviewer: Do you think this system could work, o should continue to be implemented in*

165   *other careers?*

166   Mr. [S2]: I would say yes.

167 *Interviewer: Why?*

168 Mr. [S2]: because, for example in Mechatronics**, is a lot of advantages for the industry,**

169 **and not only the industry but also for the student** (Category: Experience in the

170 system), for example, also in another fields, it could happen the same that, the student

171 and the company benefit from it.

172 *Interviewer: And do you think more students, would like to study under this system?*

173 Mr. [S2]: Yes, I would say yes

174 *Interviewer: When you talked to your classmates from the traditional system, did they have*

175 *any inquiry, that they wanting to be in the dual, or did they feel comfortable with the*

176 *traditional?*

177 Mr. [S2]: They felt very comfortable with the traditional, they don't have to do as much, just

178 study and well practicing in the laboratories and all that, and compared to the dual system,

179 is completely different all this is really fast you could say, compared to the traditional one,

180 well that's what I would precise.

181 *Interviewer: How do we motivate them to enter into the dual?*

182 Mr. [S2]: How to motivate them with the dual, I would think it would not be that

183 complicated, because, at least with the situation in the country, you could say that anyone

184 could be motivated, at least what motivated me, to study in the dual system, is that I knew

185 that I would enter directly into the company, I mean it depended a lot on my skills and that

186 if the company have trust on me and all that, and knowing that at the end of the career I

187 was, going to be in the company. At least in my case, it happened.

188 *Interviewer: What was your hiring salary? Have you had any leveling?*

189 Mr. [S2]: Three Hundred and Fifty. In six month they are going to level it to Four Hundred

190 *Interviewer: Have the expectations of training and job opportunities been accomplished*

191 *after finishing the career?*

192 Mr. [S2]: **Maybe in the training part, not 100%, but yes in a good part** (Category: Job

193 opportunities).

194 *Interviewer: Did you expect to learn much more?*

195 Mr. [S2]: I expected to learn much more, yes it is like that. As I was saying, even for the

196 teachers it was a new experience, every time that there were problems because they

197 could not find, how to treat students, and for example sometimes there were some
198 breaches from their side.

199 *Interviewer: Have your study expectations been accomplished? Do you fill satisfied?*
200 Mr. [S2]: No, I expected more, I expected how to say it, better salary expectations, in the
201 development part, well in there I feel good about it, but yes salary expectations I was
202 hoping they would be better.

203 *Interviewer: Well until here with the interview; would you like to add something that, I could*
204 *have missed, and that could help the research.*
205 Mr. [S2]: **For example in the Academy it happened sometimes, that sometimes we**
206 **did not have, like the most specialized teacher, for example; some courses will**
207 **come to the morgue, then you could see the limited knowledge, because them, they**
208 **would teach us what they could and until there, comparing it to there when a special**
209 **person or course specialist, they would start teaching a little bit, to help us, and I**
210 **even feel that it motivates you to keep studying or to wanting to acquire higher**
211 **knowledge** (Category: Limitations).

212 *Interviewer: And about the technological resources that you had at your disposal?*
213 Mr. [S2]: **Yes I feel like we had deficiencies in that area, because sometimes we did**
214 **not have working equipment** (Category: Limitations)., they only taught us how it should
215 work, or how things should work, and nothing more.

216 *Interviewer: That is a difficulty for the ones that stayed in the traditional then, you could*
217 *see it in the company?*
218 Mr. [S2]: Yes, that.

219 *Interviewer: Well, Thank you so much.*
220 Mr. [S2]: Well you know it. Nothing else, if you need anything else, or another interview it
221 would be my pleasure.

Student Interview [S3]	
Interviewer	Reina Durán
Interviewees	Mr. [S3] – Student
Date of Interview recording	July, 14th 2011
Time duration	38.22 Minutes
Language	Spanish transcription. English translation
Italic	Ask reaction of interviewer
Standard	Answer and responses of interviewees
Bold	Special emphasis

Note: The transcription can vary lightly in respect to the recording due to the conditions of anonymity of the interviews

1   This interview was developed on July 14 2011, in the facilities of one of the participating
2   companies in the Dual Formation Program in the Mechatronics career. With the interview
3   we look to identify the opinion of the students from the Mechatronics career from the class
4   2008-2010 under the dual system, about their formation process. This information will be
5   utilized in the research called "Research on rising competences in technical education by
6   implementing dual system's elements under El Salvador conditions in the field of
7   Mechatronics".

8   *Interviewer: Good afternoon Mr. [S3], thank you so much for your time to the development*
9   *of this interview, as a part of the process of the research related to the implementation of*
10 *the Dual System in the Mechatronics Career of which you have been part as a student.*
11 *We are going to start with the interview. In your case, you were already working in the*
12 *company. Finishing the training process was it good for you? What is your new position?*
13 Mr. [S3]: **Next week I will start as the electric department manager, in the electric**
14 **generation plant** (Category: Work in the area where was formed).

15 *Interviewer: Is it related to the field of training?*

16   Mr. [S3]: Yes, actually yes.

17   *Interviewer: How was your experience in the dual system?*

18   Mr. [S3]: Well in first place in the electric and electronic part that I knew, I knew it with

19   anticipation, **update myself in some things, mostly in the system, of PLC**

20   **programming and PLC networks, and also in the mechanics area, have completely**

21   **new knowledge and the most outstanding in my case, to have learned how to utilize**

22   **lathes processors and also CNC systems, is what I feel it has served me the most**

23   (Category: Experience in the system).

24   *Interviewer: This system varies from the traditional and even though you already had the*

25   *experience of the job, your other classmates did not, of being in the Academy, they were*

26   *also incorporating to the job part, How do you see that difference between the traditional*

27   *system and the dual system?*

28   **Mr. [S3]: Yes well, is very interesting and profitable, I always looked at it like that,**

29   **from the beginning, and in general lines, I think that, is one of the most accurate**

30   **decisions, trying to implement these type of systems, because the is the situation**

31   **that you study and all the technical part and books and all that you can assimilate,**

32   **going to the company adapting once without previous, to say, without previous**

33   **instruction of what to do or knowing how is the structure of the company, that is**

34   **very difficult then from the technical side, we could say is very profitable really**

35   (Category: Experience in the system).

36   *Interviewer: What do you think of the formation process? How did you see it, since it was*

37   *developing in the beginning and as it went forward?*

38   Mr. [S3]: Well, really we all start, I mean everyone including me too, we started with great

39   expectations regarding to the system type there were many, ups and down really I,

40   personally have several observations for the people that in this case were running the

41   show in this career, because with my employment experience and having taken a career in

42   there too, in the Technological I could already make and evaluation of comparing what I

43   lived 10 years ago with what I was living 3 years ago, and then I made various

44   observation, because I was not the only one that could see that, but the expectations that

45   we started with**, I think when we were in the second year there were lots of ups and**

46   **downs, I think it was, maybe because for the lack of experience of everyone**

47   (Category: Experience in the system). Every one of us that were in there.

48   *Interviewer: And the observations, where were they oriented?*

49   Mr. [S3]: Of how was the system being implemented, for example the evaluation system,

50   the way the evaluation system was realized

51   *Interviewer: Did you find differences in the formation part, between you and the ones that*

52   *were in the traditional?*

53   Mr. [S3]: Well actually yes.

54   *Interviewer: What were those differences?*

55   Mr. [S3]: Well the difference, in the aspect of opportunities that we had of being able to

56   have practices and having laboratories available, basically whenever we wanted because

57   we dedicated a lot of time to practice, something that people, that were in the traditional

58   mode well missed a lot.

59   *Interviewer: When you say the laboratories, are inside the company or the laboratories*

60   *from the Academy?*

61   Mr. [S3]: From the Academy

62   *Interviewer: You had more access to the laboratories of the Academy than the ones from*

63   *the traditional?*

64   Mr. [S3]: Yes

65   *Interviewer: Why?*

66   Mr. [S3]: Well actually I do not know

67   *Interviewer: You were in the same system, being inside there it was the same for both*

68   *groups?*

69   Mr. [S3]: Yes correct, apparently it was not, at least of what we could see

70   *Interviewer: According of some of the opinions that I have from the traditional group, some*

71   *of them think that, their system was somewhat favorable, because they hay more time,*

72   *more access to their teachers, access to resources*

73   Mr. [S3]: Yes

74   *Interviewer: From what it is, the Academy itself, while you with all the Academic load that*

75   *you had, you had to present yourself and deliver to the expectations of the companies*

76   Mr. [S3]: Exactly

77 *Interviewer Could that situation have affected you, in your professional development? Or*
78 *did they have more advantages in that way?*
79 Mr. [S3]: Well in that way yes, because basically they did not go out, of the Academy, and
80 in the sense that the academic load that we had was big, we had to complete a program I
81 was one the critics of the heavy load, and the poor selectivity of subjects that we had to go
82 through academically; we did have benefits when we came for a month to the company,
83 because it even was useful to release stress a little, to forget the pain of that rush.

84 *Interviewer: Of the evaluations?*
85 Mr. [S3]: Correct.

86 *Interviewer: You mentioned that between the things that you made observations, it was the*
87 *evaluation mechanism How was the evaluation system that you had inside of the*
88 *Academy?*
89 Mr. [S3]: Well at least me, with another three people I commented this situation with about
90 the evaluation method. That type of evaluation is vulnerable to personal interests, I mean
91 personal interests that, for example if someone, I am going to say in traditional language, if
92 I don't like someone, if I have preferences with someone because he is a better student,
93 then you could see it reflected in the grades and that was evident in the whole career. I
94 talked to some people because, well actually I was a victim of that I would say, it was
95 something tremendous, not tremendous that the world was going to fall because of that,
96 but I was always critic of that to say that those type of evaluations, are vulnerable to
97 manipulations.

98 *Interviewer: What were the evaluations that they made to you? Were they exams? How*
99 *did they evaluate you?*
100 Mr. [S3]: **Written exam evaluations and laboratories** (Category: Evaluation method);
101 from those I don't have any complaint in fact, I thought they were very good because
102 sometimes you had to do them on time, I mean the competences evaluation.

103 *Interviewer: What did they do to evaluate those competences?*
104 **Mr. [S3]: Well, I never really know how about that, suddenly there was a grade in**
105 **there, of competences, they have many of competences, but I think that that was**
106 **more related to if the teacher had a good relationship with you or not, because there**
107 **was a grade assignation there, that if you wanted or not, affected in the global score**
108 **of the modules** (Category: Evaluation method).

109　*Interviewer: It caught my attention that you make a relation to the word competence, How*

110　*did you understand that about competences, what was it that they evaluated?*

111　Mr. [S3]: Well, **how capable we were of absorbing what we were being taught and**

112　**how easy it was for us to put it in practice and teach it to the rest** (Category:

113　Evaluation method).

114　*Interviewer: And can you give me an example of any evaluation that they have made you*

115　*for that competence?*

116　Mr. [S3]: For example in the use of machinery and tools lathe, and suddenly look you are

117　going to make this piece, probe me that you can actually use this machine or if I was able

118　to show someone else how to do it, if the classmate understood

119　*Interviewer: What percentage did it have in the grade, what impact did it have on the final*

120　*score?*

121　Mr. [S3]: I cannot remember, exactly.

122　*Interviewer: But it was part of the grade?*

123　Mr. [S3]: I understood that yes

124　*Interviewer: I understand that you yourself planned, how did you accomplish the goals, I*

125　*mean you knew what you had to learn in each modules, and yourselves could see if you*

126　*were accomplishing them and that you had a day, at the end of the week, where you*

127　*thought about it and if you did not reach a goal, you could like reprogram it. Did that work?*

128　Mr. [S3]: Not really, I'm talking about my group, I do not know if it worked in another group;

129　at the beginning of the career it was tried to implement that, that we had our own plan and

130　we assigned ourselves what assignments we were going to do, in fact when we did not do

131　it, the teacher would say, well for this date it has to be complete, with something and a

132　report, but it was only one teacher who tried to implement that system, only one, and the

133　others well, I dare to say no, because in reality it was not, and while time advanced there

134　were lots of ups and downs, I feel like that, in one occasion talking to the teachers they

135　themselves recognized that we and a heavy academic load, so much that sometimes even

136　themselves were careless, sometimes they did not even remember, and now what do we

137　do? Where were we? Or What were we supposed to do today?, then that and the planning

138　I can say that it was tried in the first 3 modules, with a certain teacher, and from there on,

139　even him desisted, you cannot do it and in the rest of the career we never did that.

140　*Interviewer: So then you went to the normal, the traditional?*

141　Mr. [S3]: Until certain point

142　*Interviewer: What did you think about the evaluation inside the company?*

143　Mr. [S3]: **Exactly, well there was a close follow up, the tutor here, the engineer,**

144　**sometimes he would forget that, we were going to come that month, but generally in**

145　**an 80%-90% he was worried to have a training plan for us** (Category: Evaluation

146　method).

147　*Interviewer: The binnacle was at your disposal too? Did you know what to do when you*

148　*came every month?*

149　Mr. [S3]: Correct, the first day that we came **we had a meeting with the tutor visualizing**

150　**what we had to do, and in our case that were already members of the company we**

151　**even proposed what we could do** (Category: Evaluation method).because in the case of

152　my classmate and myself; a classmate came with us and then in some parts I helped my

153　classmate to reach those goals, in most of the cases I did it and the tutor always facilitated

154　us so we could accomplish our program.

155　*Interviewer: This binnacle has a part that says, an evaluation of aptitudes*

156　Mr. [S3]: Yes

157　*Interviewer: What did you think of that aptitudes evaluation?*

158　Mr. [S3]: Is really good, because here inside of the company we had to move inside of the

159　companies, there were packaging areas, trituration and all that, so we were moving around

160　this areas, and tutor thought it was good to either assign the manager of that area or the

161　super intendant for the month as a tutor, and he took a step down until certain point, and

162　gave complete freedom to that person to evaluate us, **and for what I remember, from**

163　**two people that were tutoring us, besides the main tutor, they gave us good**

164　**feedback, in both cases of my classmate and myself he called us and interviewed**

165　**us, and when we finished the practice month and gave us good feedback and advice**

166　(Category: Evaluation method).

167　*Interviewer: About the attitude part*

168　Mr. [S3]: Exactly

169　*Interviewer: And inside of the Academy how did they evaluated the attitudes?*

170 **Mr. [S3]: Until today I do not have a clear understanding the system that they used,**
171 **at least in my case, they never called me to tell me how did they evaluate me**
172 (Category: Evaluation method).

173 *Interviewer: A feedback?*
174 **Mr. [S3]: No. Like seating with someone and follow up with them. If there was a**
175 **grade, I guess that the teachers did it their way** (Category: Evaluation method).

176 *Interviewer: To the teachers criteria?*
177 Mr. [S3]: Yes because, I don't think that, they seated to tell us something, I do not think so
178 because, if any of them had a way of doing it, well I perceived it like that, because
179 suddenly when you were in the practices they would come close to you, and change the
180 conversation, it was like, an interview than anything else, like trying to monitor us, I guess
181 all of them had a way of doing it.

182 *Interviewer: What difficulties were generated when you had to develop the study plan?*
183 Mr. [S3]: Maybe not related to the career, and that had an influence in the Academy is the
184 difficulty that some classmates had to assist to class, sometimes for the schedule and the
185 distance

186 *Interviewer: What difficulties did you had in the schedules?*
187 Mr. [S3]: In several of the modules, we had to start the class at 6:30 in the morning, and
188 then sometimes that 15 minute law and suddenly a classmate that came from far away,
189 other from a distant city, and they did not allow him to enter the class and there were a mix
190 of situations and the economical part too.

191 *Interviewer: What did you think of the way that the modules were taught every two*
192 *months?*
193 Mr. [S3]: I think it is good as long as you have a correct distribution of the academic load,
194 myself in the electric and electronic part, almost always was critical of that, because in
195 what have developed myself and even I did, to more than one **person I did the**
196 **suggestion of going deeper into some subjects, focus on this and that, some**
197 **teachers took the advice really good, but yes if maybe the correct distribution of the**
198 **academic load, for that in reality in two months, could be comprehensible, what you**
199 **are trying to learn** (Category: Limitations).

200 *Interviewer: How has this system allowed you better job opportunities?*

201 Mr. [S3]: I am close to two of my former classmates, and where the ones that I got along

202 with during the whole career, they have a good job and talking to them sometimes I was

203 worried about advising them of how the industry works and now they give me feedback

204 and mention me that it has worked for them the advice that I gave them but one thing I

205 saw during the two years and a half studying and the time that **they have been working,**

206 **is that they have matured quickly. Is like they have taken the responsibility, is easier**

207 **for them like, taking responsibilities in the company and not feeling so far away**

208 **from what the company does** (Category: Job opportunities).

209 *Interviewer: How had the ones from the Traditional had done?*

210 Mr. [S3]: No, with a couple of them I had a relation but no, it is only email contact and

211 nothing of that, even with my classmates is only with two that I keep communications with.

212 *Interviewer: From the experience that you have with this formation system, where there is*

213 *a shared responsibility of the formation in the Academy. Where the company keeps a*

214 *formation program (binnacle) What do you think it could limit the development for*

215 *expansion? To keep it growing, so that more people have access to this type of formation?*

216 Mr. [S3]: Is a little difficult, because almost always I think of my situation it was the time in

217 fact, that limited us to follow the engineering career, but for the moment I cannot visualize,

218 something that the company has certain social projection, and is my understanding that

219 there is a couple of young people that are studying but, really I could not tell you, I have

220 not thought of that.

221 *Interviewer: Have you seen more benefits, that the problems that have come?*

222 Mr. [S3]: Actually yes.

223 *Interviewer: What measures do you think should be implemented in the Academy, for this*

224 *program to be expanded?*

225 Mr. [S3]: Yes in first place, being really selective with the people that enter the program

226 *Interviewer: What do you mean by that?*

227 Mr. [S3]: With the selective I mean that, there were people in this program when they were

228 never really interested, so then I mean selective at the time to selecting the young people

229 that have economic problems and you could actually see the desire of overcome and not

230 necessarily the people that had the best grades in high school, not necessarily are those

231   people the ones that desire to overcome, because sometimes some people have it easy,

232   to have a scholarship, study and have a company give him an opportunity of, practicing

233   what they have learned but, I say this because, at least in our group, there were 3 or 4

234   cases of those, that the people were there, and I always said, this 3 or 4 spots could be

235   used by some people that I know.

236   *Interviewer: What did you observe in those two or three cases that were there?*

237   Mr. [S3]: I think that, some of them lost the interest because, they were not mature

238   enough to assume the responsibilities because it takes responsibilities of schedules of

239   being practically all day in the Academy, and suddenly they wanted to be home or in

240   another place playing, then I think that suddenly they got scared, of seeing the heavy

241   academic load.

242   *Interviewer: What could have happened at the end, if not staying there you had the*

243   *opportunity of developing your career?*

244   Mr. [S3]: There is a detail, that I would like to mention, that we even made fun of it, when

245   we all started studying they sold us an idea, and it was that, we were going to be

246   technicians class A, and that with respect of the salaries, they were going to be

247   competitive, earn much more than any other person, even I remember, when one of the

248   Germans came to give a speech, even him gave some figures to the classmates, then lots

249   of them had illusions, I finish as a technician and I'm going to earn fifteen hundred in here,

250   so then to some of them I tried to bring them back to reality but I feel like the way that the

251   career was sold to us, and when time went by we had such a short time to assimilate all

252   the knowledge and suddenly do the practices and suddenly we said, to give an example,

253   we are going to see the pneumatics module and this and reports here, going too little to

254   the laboratory, and suddenly we finished and we learned, and I did learn something but I

255   didn't feel that capable of going into a company and solving an issue, of course it was

256   complimentary in the company, but suddenly when we returned from the company

257   practice, some of them said yes this from the binnacle I didn't see anything, I was limited

258   to clean, and so they were getting disappointed most of them and there were lots of cases

259   of those, I guess it was carelessness from the tutor.

260   *Interviewer: Now let's say at the level of the company, what measures could be*

261   *implemented for the system to grow?*

262   Mr. [S3]: Yes that is the detail, but there are not spaces in the company, that is

263   problematic, my classmates that was with me thank God that he has two weeks of being

264   here; but in his case it was something that even bothered me because some things
265   happened, I guess how the situation was in the company in that moment, but is something
266   like if they give you a spot in the company, you try to visualize yourself working for the
267   company and it would be nice to work here, but really the program finishes, and that's it,
268   thank you have a good trip, and I hope you can find a good job, and I don't think he was
269   the only one, it happened to several of them, so then maybe more commitment from the
270   company, because I understand really good the thing about companies, of the social
271   projection, but social projection means a lot, not only trying to feel a space here or
272   requirements from the government side, but actually interested in doing something.

273   *Interviewer: At the industry level Do you think there is something that could be done for the*
274   *system to grow?*
275   Mr. [S3]: Yes, I think **as I was saying that the system is really good because inside of**
276   **the system there are people that are outstanding, that maybe this type of people**
277   **have more space inside of the company** (Category: Measures to expand the system),
278   so suddenly the situation that we are living in the company does not allow to open more
279   spots and tell them come lets work together, but in reality, if they gave good follow up
280   talking about tutoring of the people that are studying, I think that for the duration of the
281   career the company could actually project themselves to open a sport for the person.

282   *Interviewer: And do you see any role from the government in this?*
283   Mr. [S3]: I think that yes, in the aspect that, is over valuated the capacity that people have
284   and I return to the case that there are very outstanding people and it is my understanding
285   that the government in a way follow up outstanding students, some time ago there was a
286   person there talking, that they plan to take the top 100 students of the country and send
287   them to study to another country **but I, think that I think that this system that is being**
288   **implemented if the government sponsored it in its totality we could say, they would**
289   **be in charge of, selling the country image by presenting this type of technician with**
290   **higher capacities than the others and give some space, I don't know in the case of**
291   **the government of selling the idea and bring companies that can generate a lot of**
292   **employment** (Category: Measures to expand the system).

293   *Interviewer: And the international cooperation what do you think? The system has been*
294   *implemented with a little of international support*
295   Mr. [S3]: Correct

296   *Interviewer: How do you think the participation should be for the expansion process?*

297   Mr. [S3]: **Well basically establish more laboratories** (Category: Measures to expand the

298   system)**,** because suddenly the difficulty, that we had was that we were in a practice and

299   suddenly you guys have to go because there is another group coming, and if not, maybe

300   limit the quantity of participants in the program in the aspect of being more selective to

301   give a more personalized teaching.

302   *Interviewer: According to the results in both groups, the traditional and the dual had similar*

303   *results, what do you think it could have happened, if it was expected that you had to have*

304   *a better level in the evaluations, because of the experience that you were developing in*

305   *the companies?*

306   Mr. [S3]: Well it is very peculiar, but basically we had the same instructors, we all had the

307   same instructors. I talked to the coordinator and I was very close to him, because I felt

308   good talking to him, he even took some notes about what we discussed, and we agreed

309   with m in something, that actually the people that were going to teach the career were not

310   completely prepared, to realize the project, I mean it was all of the sudden, like it happen

311   in some places, I think that this influenced it a lot, now that you mention that, it really

312   caught my attention and well really, we all practically received the same from the same

313   people.

314   *Interviewer: But you were supposed to be in equal conditions both groups in respect to*

315   *having the same modules, and the same teachers?*

316   Mr. [S3]: Yes of course.

317   *Interviewer: So then, Why can't you see the difference? If you also had the chance to*

318   *come to the companies and practice*

319   Mr. [S3]: Yes

320   *Interviewer: How does it work in real practice? Why does the evaluation come similar?*

321   Mr. [S3]: **It is because that is the detail, not all the tutors gave the same follow up, I**

322   **mean always the same complaint, and this program is not complete and then**

323   **carelessness from the tutor and then if we are going to talk about the company part**

324   **I feel that, it was a rare thing that people, that had the privilege of accomplishing it**

325   (Category: Limitations).

326 *Interviewer: About the evaluation time, When you came to the company, in the practice*

327 *month you had to see, the hydraulics practice, before you had already done the evaluation*

328 *in the Academy, Is it like that?*

329 Mr. [S3]: Correct.

330 ***Interviewer: So then I mean that, at the time that you were evaluated, You still***

331 ***haven't done or completed to that practice inside of the company?***

332 **Mr. [S3]: Yes, in most of the case it was like that.**

333 ***Interviewer: So then you still have not experimented. Maybe it would have been***

334 ***different if the evaluation would have been after you came back from the practice in***

335 ***the company?***

336 **Mr. [S3]: Yes in fact it could have influenced it a lot. In fact specifically talking about**

337 **the hydraulics and pneumatics module, we personally did not have contact with**

338 **machinery like that.**

339 *Interviewer: Do you consider that you developed a better competence level that the other*

340 *group?*

341 Mr. [S3]: I think yes.

342 *Interviewer: Why?*

343 Mr. [S3]: I think yes; I think we showed it in the practices, the same teachers agreed with

344 that, that there was similarities in grades and everything, there should be an investigation

345 actually because it is a very peculiar situation, but even some people said that we had

346 favoritism, you spend more time in the laboratories and this and that.

347 *Interviewer: Dear participant from the Dual system, until here with the interview. Thank you*

348 *so much for your time and the information provided*

1

Student Interview [S4]	
Interviewer	Reina Durán
Interviewees	Mr. [S4] - Student
Date of Interview recording	July, 26th 2011
Time duration	28:02 minutes
Language	Spanish transcription. English translation
Italic	Ask reaction of interviewer
Standard	Answer and responses of interviewees
Bold	Special emphasis

Note: The transcription can vary lightly in respect to the recording due to the conditions of anonymity of the interviews

1 This interview was developed on July 2011, in the facilities of one of the participating
2 companies in the Dual Formation Program in the Mechatronics career. With the interview
3 we look to identify the opinion of the students from the Mechatronics career from the class
4 2008-2010 under the dual system, about their formation process. This information will be
5 utilized in the research called "Research on rising competences in technical education by
6 implementing dual system's elements under El Salvador conditions in the field of
7 Mechatronics".

8 *Interviewer: Good afternoon Mr. [S4], thank you so much for your time to the development*
9 *of this interview, as a part of the process of the research related to the implementation of*
10 *the Dual System in the Mechatronics Career of which you have been part as a student.*
11 *We are going to start with the interview. Your actual contract is related to your formation*
12 *area?*
13 Mr. [S4]: **Yes, I work in the customer support area, and I am a support technician,**
14 **and I have to go look installations of new equipment and also follow up failures that**
15 **were reported, according to what my manager programs for me** (Category: Work in
16 the area where was formed).

17   *Interviewer: How was your experience in the dual system?*

18   Mr. [S4]: **Yes it was good, because I have learned, when I started I did not know**

19   **anything about the career, and there is so much knowledge, like the mechanics, the**

20   **mechatronics laboratory where I have learned a lot** (Category: Experience in the

21   system).

22   *Interviewer: What do you think of your experience in the company?*

23   Mr. [S4]: Well, it has been really good, because I have learned to look at different types of

24   machines. **At the beginning very tiring, because with my classmate we had to be**

25   **since early looking at the machines problems and we could not abandon the job**

26   **until it was fixed, it had to be functioning, that's what the customer demanded**

27   (Category: Experience in the system). We got help from the tutor, but it was not easy,

28   because of the assignments that we had to hand in or the exams.

29   *Interviewer: And this experience has helped you to have more security in your job?*

30   Mr. [S4]: Yes at the beginning I did not know, **but now I know more and I know better**

31   **my co-workers, and I know what the customer wants and the manager says how we**

32   **have to be with them. Is not difficult for me anymore to solve those issues, and**

33   **when I do not know I ask my partner or he helps m**e (Category: Experience in the

34   system).

35   *Interviewer: Do you consider that you had any advantage in relation to your classmates*

36   *that studied in the traditional group?*

37   Mr. [S4]: Well, I think sometimes they had less pressure and they could do really good with

38   all their assignments and all their homework from their teacher, that they could go more to

39   the laboratories and the preferences from the teachers, that helped them, that's why it was

40   difficult for us **because we did not have vacation, but we had to go to the company**

41   **and work and do the binnacle and review it with the tutor. Yes, but in reality that**

42   **helped me to have more experience in the job and for me to understand better what**

43   **I was learning in the Academy** (Category: Experience in the system), although we could

44   not practice everything because not all the equipment was available at the company, but

45   others were. And now I work were I did my practice.

46   *Interviewer: How was the evaluation system that you had inside the Academy?*

47   Mr. [S4]: The evaluations in the Academy?

48   *Interviewer: Yes*

49 Mr. [S4**]: Well, they had us take tests and homework and many laboratories, and with**
50 **that they gave us a grade. Sometimes they gave us an exercise that we had to**
51 **resolve and find like finding the failure in a piece of a machine** (Category: Evaluation
52 method).

53 *Interviewer: And in the company how did they evaluate you?*
54 Mr. [S4**]: It was with the binnacle, but we did not always follow it because we had to**
55 **go and look at the problems from the customers. But we always checked at the end**
56 **of the month what was it that I have done and what I could do, it also was reviewed**
57 **by the coordinator** (Category: Evaluation method and limitations), in case there was
58 something missing and needed to be completed.

59 *Interviewer: They evaluated your attitude, your responsibility?*
60 Mr. [S4]: Yes, there were meeting to see how I was doing and they told me what to do
61 better**. It also was in the binnacle, if I was performing and what things I needed to do**
62 **better** (Category: Evaluation method).

63 *Interviewer: And inside of the Academy how did they evaluate your attitudes?*
64 Mr. [S4]: I am not sure, because **they were exams and homework with practices**
65 (Category: Evaluation method). But I think the teacher did them.

66 *Interviewer: Did you have meetings with the teachers about how was your evaluation and*
67 *your attitudes?*
68 Mr. [S4]: No. No, we had those meeting in the company; **but sometimes the coordinator**
69 **meet with us to talk about what we had to do about attitude, and the responsibility**
70 (Category: Evaluation method).

71 *Interviewer: What difficulties were generated during the development of the study plan?*
72 Mr. [S4]: Well, **not always we finished the subjects, because we had to do so much in**
73 **two months, and also we could not find classrooms when we came back from the**
74 **company, because they were using them** (Category: Limitations), although they
75 resolved that later.

76 *Interviewer: What did you think about the way it was developed the modules that were*
77 *instructed every two months?*

78 Mr. [S4]: That was what sometimes was completed and sometimes it was not, but it was

79 good because after I could practice in the company, or where the clients were, although

80 there were some others I could not practice because there is not machinery like that in

81 here, but we also went to other companies to complete that practice.

82 *Interviewer: How did this system allowed you to have better job opportunities?*

83 Mr. [S4]: **Now I have a job, some other classmates don't. I think that the ones that**

84 **were in the system have obtained a job** (Category: Job opportunities). Not everyone is

85 in the company were they did their practice because I think there is an economical

86 problem and there are no jobs, **but some got jobs in other companies and they have a**

87 **good job because they make more money** (Category: Job opportunities).

88 *Interviewer: From the experience that you had in the formation, What do you think could*

89 *limit the development for it to expand? For it to keep growing, so that more people have*

90 *more access to this formation?*

91 Mr. [S4]: Well, what happens is that it may affect that the company doesn't have any more

92 space, in here there are no students anymore because there is not a lot of work. **There**

93 **has to be more companies and help for students** (Category: Measures to expand the

94 system).

95 *Interviewer: What measures you think should be implemented in the Academy, for this*

96 *system to be expanded?*

97 Mr. [S4]: **I think the career should be reviewed if it is too much and we cannot finish**

98 (Category: Limitations and measures to expand the system), but I learned a lot. **The**

99 **teachers should know better about the company, because sometimes there was a**

100 **lot of theory and in the job the problems are different** (Category: Limitations and

101 measures to expand the system).

102 *Interviewer: At the industry level, Do you think there is something that could be done for*

103 *the system to grow?*

104 Mr. [S4]: I do not know.

105 *Interviewer: And the government and international cooperation, like the help from*

106 *Germany how could they help so that there are more students in this study system?*

107   Mr. [S4]: Well, maybe with **some scholarships for other classmates or with more**
108   **laboratories** (Category: Measures to expand the system) like the one from mechatronics,
109   yes maybe with that.

110   *Interviewer: According to the results of the evaluation to both groups, the traditional and*
111   *the dual had similar results, What do you think it could have happened, if it was expected*
112   *that you would have a better outcome at the evaluations, because of the experience that*
113   *you were developing in the companies?*
114   Mr. [S4]: Well, I think they had more time to study, or that the teacher helped them more.

115   *Interviewer: Do you think you developed a better competence level than the other group?*
116   Mr. [S4]: We, **besides what we did in the Academy, we did the company work and**
117   **now we have more experience, I know resolve customer issues and I'm working**
118   (Category: Experience in the system).
119   *Interviewer: Do you feel satisfied with what you accomplished in your study program?*
120   *Why?*
121   Mr. [S4]: Yes, I have learned in this career and in the dual system I have accomplished the
122   company practice, even though with the salary we don't make that much. But I think it was
123   better for us than for my other classmates from the other group (traditional system).

124   *Interviewer: Dear participant of the Dual system, until here with the interview. Thank you*
125   *so much for your time and the information given.*

Student Interview [S5]	
Interviewer	Reina Durán
Interviewees	Mr. [S5] - Student
Date of Interview recording	July, 30th 2011
Time duration	21:06 minutes
Language	Spanish transcription. English translation
Italic	Ask reaction of interviewer
Standard	Answer and responses of interviewees
Bold	Special emphasis

Note: The transcription can vary lightly in respect to the recording due to the conditions of anonymity of the interviews.

1 This interview was developed on July 30 2011, in the facilities of one of the participating
2 companies in the Dual Formation Program in the Mechatronics career. With the interview
3 we look to identify the opinion of the students from the Mechatronics career from the class
4 2008-2010 under the dual system, about their formation process. This information will be
5 utilized in the research called "Research on rising competences in technical education by
6 implementing dual system's elements under El Salvador conditions in the field of
7 Mechatronics".

8 *Interviewer: Good afternoon Mr. [S5], thank you so much for your time to the development*
9 *of this interview, as a part of the process of the research related to the implementation of*
10 *the Dual System in the Mechatronics Career of which you have been part as a student.*
11 *We are going to start with the interview. According to my conversation with the tutor you*
12 *had assigned, you are working in your area of formation, Is it like that? What is your job?*
13 Mr. [S5]: Well yes, **I am working in the maintenance department, and my job is**
14 **maintenance technician and I have to attend the failures and when, they have**
15 **programmed preventive maintenances or sometimes you have to install new**
16 **machines. That is my job here** (Category: Work in the area where was formed).
17 *Interviewer: What was your study experience in the dual system?*

424

18 Mr. [S5]: Good, in this career I have learned about machines and electronic and how to fix

19 failures. And also many things I did not know like pneumatics, there has been a lot that I

20 have learned.

21 *Interviewer: What do you think about your experience in the company?*

22 Mr. [S5]: I think we had that advantage compared to the other classmates that did not go

23 to the company. **For me my tutor has helped because he meets with and tells me**

24 **what we are going to do in the practice month and we review at the end. And, one of**

25 **my advantages is that they also included me to train myself in the courses that they**

26 **gave to the other coworkers** (Category: Experience in the system), in there I have

27 learned other things that I did not learn in the Academy. In here I had to work in different

28 shifts of different schedules and more when there is maintenance in the plant.

29 *Interviewer: Was there any difficulty in your practice in the company?*

30 Mr. [S5]: Well, **when I started I did not know what to do and I was nervous of being in**

31 **a production plant and see that things had to be resolved quickly, and that the**

32 **coworkers had a lot of pressure; the tutor helped me, although sometimes he did**

33 **not have time to see me, but he assigned me a manager to help me, but first I just**

34 **observed and they were telling me what to do** (Category: Experience in the system),

35 yes, because sometimes I was just an assistant to see the tools that we were going to use,

36 but after they gave me tasks for me to do by myself. **Yes it was difficult at the beginning**

37 (Category: Limitations), but after I got used to it. Although I think, that yes, that we have to

38 work more and also what you have to do in the Academy.

39 *Interviewer: Do you think that experience serves you in your job?*

40 Mr. [S5]: Well, **I think yes, now I can do the tasks by myself or help others that are**

41 **learning too, because there are some that come to practice from schools or from**

42 **other careers** (Category: Experience in the system). **The good thing is that now I have**

43 **a job with a contract, and that I stayed working ever since I graduated** (Category: Job

44 opportunities).

45 *Interviewer: Do you consider you had any advantage compared to your classmates that*

46 *were in the traditional system?*

47 Mr. [S5]: I really did not get to know them, because we did not have time, but I think they

48 rested more and they had more time to do assignments from the teachers, but sometimes

49 we talked with my other classmates, **that they did not get to go to the company and**

50   **that we did, that with time was an advantage, because it was worth it not to have**

51   **vacation time and go to the company** (Category: Experience in the system).

52   *Interviewer: How were the evaluations inside the company?*

53   Mr. [S5]: **They (the teachers) had us write exams and took us to the labs to make our**

54   **practice in which they evaluated us. We had to do projects and defend them**

55   (Category: Evaluation method), because they said that we had to apply what we have

56   learned in the theory with practice, and also we had to show that we could find the failures

57   in the equipment and resolve them by ourselves.

58   *Interviewer: How did they evaluate you in the Company?*

59   Mr. [S5]: With the engineer **I reviewed at the beginning of the month what it said I had**

60   **to do in the binnacle, then he asked me to plan the activities because later he was**

61   **going to review them. And also the Academy coordinator came and I had to show**

62   **him what I have done and how advanced I was** (Category: Evaluation method).

63   *Interviewer: Did you completed the whole binnacle?*

64   Mr. [S5]: **No, not all of it, but I did a lot, and when I could not they sent me to another**

65   **company to do it, because in here we did not have CNC machines**

66   (Category:Limitations).

67   *Interviewer: In the binnacle there was a part to evaluate attitudes, how did they do it?*

68   Mr. [S5]: Well, it was a meeting with the engineer and he told what I had to do better.

69   *Interviewer: Can you give me an example?*

70   Mr. [S5]: Well, at the beginning when I was late or I was not accomplishing, **he called me**

71   **and told me that part of my evaluation was responsibility and that I had to do things**

72   **in a good way. And he made me think why I was not accomplishing and that I had to**

73   **take advantage of the opportunity of having a company that was helping me in my**

74   **education**(Category: Evaluation method).

75   *Interviewer: Did you have similar meetings in the Academy?*

76   Mr. [S5]: No. It was only class and labs. But when we came back they gathered us as a

77   group to see how we were doing and what we had to improve, but it was not the teacher it

78   was the coordinator, that also came to the company to see how it was going.

79   *Interviewer: What difficulties were generated during the development of the study plan?*

80   Mr. [S5]: I would say, that it was good that I could come to the company, but there were
81   **some problems that there was too much work in class, and that we did not always**
82   **finish, so several of us complained about that** (Category: Limitations). But sometimes
83   also that the teacher was instructing, but he did not really know about what happened in
84   the company.

85   *Interviewer: How did this system allow you to have better job opportunities?*
86   Mr. [S5]: **For me it has been that I have a job, because I have some friends that can't**
87   **find a job, because there are no openings in the companies. But I did my practice**
88   **here, and here they gave me a job** (Category: Job opportunities).

89   *Interviewer: What do you think it could limit the development for the expansion of this Dual*
90   *system?*
91   Mr. [S5]: Well, I am not sure but I think in **the company they have to help us do the**
92   **practices, because not everyone can go to the company** (Category: Measures to
93   expand the system).

94   *Interviewer: Do you feel satisfied of studying in this system? Why?*
95   Mr. [S5]: Yes, I think yes, it was better than the other classmates, because **I had the**
96   **company experience and my tutor has helped me, and because I also received other**
97   **training, well I have learned more** (Category: Experience in the system).

98   *Interviewer: What recommendations would you like to give for this system to be better?*
99   *They could be recommendations for the academy, the company or the government.*
100   Mr. [S5]: Well I think the career is good, **but they have to check that everything is**
101   **applied with the company, because lots of time we saw lots of things that we did not**
102   **use in the company** (Category: Measures to expand the system).

103   *Interviewer: And for the company?*
104   Mr. [S5]: I think they **could help with more openings so that more classmates can do**
105   **their practice**.

106   *Interviewer: Thank you so much for your time and the information given.*

Annex 22. Tutor Interview's transcripts

Tutor Interview [T1]	
Interviewer	Reina Durán
Interviewees	Mr. [T1] - Tutor
Date of Interview recording	July, 22th 2011
Time duration	32.17 minutes
Language	Spanish transcription. English translation
Italic	Ask reaction of interviewer
Standard	Answer and responses of interviewees
Bold	Special emphasis

Note: The transcription can vary lightly in respect to the recording due to the conditions of anonymity of the interviews

1   This interview was developed on July 22 2011, in the facilities of one of the participating
2   companies in the Dual Formation Program in the Mechatronics career. With the interview
3   we look to identify the opinion of the tutors from the Mechatronics career from the class
4   2008-2010 under the dual system, about their formation process. This information will be
5   utilized in the research called "Research on rising competences in technical education by
6   implementing dual system's elements under El Salvador conditions in the field of
7   Mechatronics".

8   *Interviewer: Good afternoon Mr. [T1], thank you so much for your time to the development*
9   *of this interview, as a part of the process of the research related to the implementation of*
10   *the Dual System in the Mechatronics Career of which you have been part as a tutor. How*
11   *was your experience with the first class that was developed in the Dual system?*
12   Mr. [T1]: **It has been a good experience, it was interesting, the Academy prepared the**
13   **process with the binnacles, procedures** (Category: Experience in the system). Now is
14   good to say that it consumes a lot of time, in my case, I had to be absent several times, so
15   that, you lose a little the relationship with the student so this, there is a stage that you
16   detach for a moment, and then you want to take rhythm again, the binnacle is advanced,
17   and you have to follow up so then , you kind of enter some slumps.

18   *Interviewer: And in that case, the binnacle was not completed when those spaces were*
19   *given?*
20   Mr. [T1]: Me, honestly I had to be over others, but in some case, I disconnected
21   sometimes and then I had to re-enter. Well, **actually the binnacles were accomplished,**
22   **things that were not completed from the binnacle was because, it did not apply to**
23   **us, well lathe they did outside, because we don't have a lathe** (Category: Limitations),
24   that part was a little weak, they are only with what they learned in the Academy, but for
25   everything else it was completed, a little disorganized, but the binnacle was completed,
26   because we don't have shops, school, we don't have maintenance. Really maintenance
27   we almost do not have, in the mechatronics area I mean, we have a repair area, that I can
28   distinguish, maintenance was that if in two weeks they are going to give us a machine, we
29   are going to come and do this, this and this, **but in reality we are like firefighters, I mean**
30   **if the machine stops working you have to go, the customer maybe, it stopped early**
31   **in the morning, he already lost several hours of production, and that's when it**
32   **becomes complicated, that you have to be explaining and repairing with the**
33   **customer in front of you all over you sometimes** (Category: Experience in the system),
34   and sometimes when is not you, when is not a self-maintenance plant, I mean when you
35   are already repairing, when the other is learning, that's what absorbed time, it complicated
36   or tend to complicate a little the training.

37   *Interviewer: And those emergency situations to resolve real problems, How was the*
38   *reaction from the student?*
39   Mr. [T1]: **At the beginning, honestly the students were babies, and suddenly they**
40   **said, they are not used to working, and the rules of behavior at work** (Category:
41   Experience in the system), when they had to go outside, but they learned and participated
42   to say, **second maybe the third year, the last one, you could see that they could**
43   **participate in the diagnose, they submitting ideas, looking, searching, analyzing a**
44   **little more in that sense** (Category: Experience in the system), we went with what we
45   thought, and we did it like that, we were aware that, because of the different types of
46   machines, different times, we had machines of 25, 20 years, and machines of today so,
47   they are very different machines, we know that it takes us, two years with someone with
48   experience, someone without experience are, talking openly about 4 years for them to
49   start being secures of themselves.
50   *Interviewer: To dominate the technology?*

51 Mr. [T1]: For them to dominate, for them to face, things that are not, necessarily have seen
52 or not too often, **they could face, analyze and resolve the problems** (Category:
53 Experience in the system), but as years go by more and less you have seen this and
54 inside of all of that, with the training we are inside everything we expected.

55 *Interviewer: You had the opportunity, to see how they developed, the students that were in*
56 *the other group, how did the two groups started forming?*
57 Mr. [T1]: No, directly, that is only when we had them or when we outside see people that
58 have finished as technicians.

59 *Interviewer: Have you observed, differences between the ones from the Dual system and*
60 *the traditional?*
61 Mr. [T1]: **It takes time for them to acquire experience. They acquire but, I say it is**
62 **hard for them** (Category: Experience in the system). They take a little while. They take
63 and they go but I always say, it is difficult for them to take the screwdrivers, they can't
64 calculate taking the levers. They know the strength, they know the theory, but you tell them
65 take out this cover and they stall, this is the part that is missing when they finish only as a
66 study technician, and they don't have, by own experience or during the study, any job
67 experience that, have nurtured them that part, that is the day to day technician. The thing
68 is, that I could observe, that, between the first two students, that their high school, was not
69 an industrial one.

70 *Interviewer: He was from general high school?*
71 Mr. [T1]: So then, him yes, you could see from the beginning the use of tools, I mean that
72 part, so then you even have to start good because of that, to teach them how to apply, to
73 make levers, and things like that because sure, to unscrew a tern, that was so tight you
74 have to know how to place the tool, so then those are my observations, **and in my**
75 **opinion is that really teaching mechatronics they should be industrial high school**
76 **graduates for them to assimilate in less time, they would have to be from industrial**
77 **high school** (Category: Limitations).
78 That was from the first group, actually both of them were from general high school, and
79 learning from what we did, they definitely, to our criteria, would have to be from industrial
80 high school, it would be much faster, but at the beginning more practical, because of the
81 previous knowledge that they bring from one way or another. In that part from the second

82   groups they are from industrial high school, I can't remember what specialty, but is

83   industrial you could see it.

84   *Interviewer: How do you evaluate the formation process?*

85   Mr. [T1]: I think that **this process helps to the better formation of students, but you**

86   **have to check the time that it takes and the work load** (Category: Limitations). For

87   example, we could not complete the binnacle, and it should be evaluated with the

88   pressure that is generated from the companies.

89   *Interviewer: Part of the research, was to determine if the dual group developed better*

90   *competences than the traditional group. Between the elements that have been measured*

91   *are the academic performance through evaluations.*

92   *According to the results both groups possess similar competence levels.*

93   *From your point of view, what was the reason, there are not present any differences in the*

94   *evaluations? How was the evaluation system in the company?*

95   Mr. [T1]: This could be because, **one has all the time to prepare for exams, to know**

96   **what to do, to study, more like a student** (Category: Evaluation method), it could be

97   very beautiful, the other one really is one month I here and then, they keep them two

98   months, they don't have a break, in that part, is not that is bad, but is very demanding, is

99   demanding but maybe not all of the ones that were selected for the dual system brought

100   the best conditions, yes if I'm thinking of being a technician, I don't want to work so hard in

101   a difficult university, in an engineering, if we are going to go from that, **the one that**

102   **entered to the dual, had a different experience, to what it was thought because, yes**

103   **the material was the same, but the time they had to learn it was, in class was**

104   **probably why the academic performance was lower from the duals** (Category:

105   Evaluation method).

106   *Interviewer: It was not lower, they were similar results.*

107   Mr. [T1]: Is possible, not lower, but maybe superior. **The fact that is the same,**

108   **establishes a difference, it makes sense the fact that the pressure, that one month**

109   **they had to be totally focused on practice part, but I still think that, the hours that we**

110   **had to study were very restricted and they could not complete it, probably** (Category:

111   Evaluation method). Then, the result really had to be like that, against the others that were

112   without the pressure of absenting for a month, but they were all the time, inside of the

113   facilities in their practices and everything.

114 In a part, I considered that they were the same, that the dual did good, because of the type
115 of load. I mean the fact that the outcome was, equal, is already an accomplishment for the
116 ones from the dual, they did not have vacation the whole year, either in Easter, they don't
117 many things in the weekend, the ones from the week I remember they were tight because,
118 many of them were from other cities. For example, one that had come, that lives in a city
119 not too close, well the other one stayed to live with him all the time but at the beginning he
120 still had to make time to go to his town, but it took him two months of not going home,
121 because on Sunday he had to study so why go there, that kind of load, is heavier, and
122 more than finishing equal, is more an accomplishment. Because if we take the average
123 student with that load, only with the load, let's leave the practice side for a moment, they
124 give them the same study pan as the dual, for them to finish in a year and a half, they
125 would not give that requirement.

126 *Interviewer: Do you believe that, outside of the evaluation system that they were submitted*
127 *to, the dual system student accomplished higher competences that the student from the*
128 *traditional system?*
129 Mr. [T1]: **Yes definitely, because they finish with the practice, they end up with**
130 **theory and practice, they know what they are going to more, definitely they are, at**
131 **the time of graduation, superior to them** (Category: Experience in the system), the
132 other one is going to catch up, the one that studied only theory, after two years of working
133 or one year of working, maybe he will catch up, but they start as soon as they graduate,
134 the dual with higher competences that they need for they, day to day.

135 *Interviewer: How did the binnacle evaluation worked?*
136 Mr. [T1]: The binnacle is pretty tight, yes very demanding, yes for it to be only two years
137 and a half, two or three years, three years, is a lot.

138 *Interviewer: I understand that it was not necessary to complete it to a 100%*
139 Mr. [T1]: **It was not necessary to complete to a 100%, but for us it was a little hard to**
140 **complete it, complete because we don't select what jobs do we have** (Category:
141 Limitations), sometimes we have to sophisticated job for the level that the students have,
142 and really the job that you have to cover, and that part to us, it created a little difficulty, to
143 be able to cover in that sense, but the thing is that our job is not continuing.

144 *Interviewer: How can these students have better job opportunities?*

145   Mr. [T1]: For the company is important that **they really get trained on what the company**

146   **really needs. In the dual system they already know there is no time to try because it**

147   **does not exist** (Category: Experience in the system). I mean not even for the employer,

148   also, where **they find a job the ones that did not stay with the company or other**

149   **companies that participated in the dual, or with x companies that, not belonging to**

150   **the dual** (Category: Job opportunities), because it's that, I feel that sometimes when you

151   start explaining someone about the dual and strange things and I stay with what I know. I

152   mean the people from outside, let's say the companies have to start to know, than start to

153   believe, especially the ones that are not in the system, in that type of student, in knowing

154   them and make positive experiences, is something that even though you already take

155   three and a half years in this, for the companies is something recent, and there are people

156   that stay out.

157   **In the company there has to be more space for student and they have to incentive**

158   **them to be in the Dual system** (Category: Measures to expand the system).

159   *Interviewer: Now what do you consider it could be limiting , the development of this system*

160   *on a country level?*

161   Mr. [T1]: That the companies don't create the spaces for the students, because they might

162   think they are wasting time. **Also you have to incentive the companies to participate**

163   **and that in the Academy works to have better communication with the companies,**

164   **showing the benefits from the system and taking care of proper formation of**

165   **students** (Category: Measures to expand the system).

166   *Interviewer: What is the role, which you think the government should exercise to keep*

167   *advancing in this system?*

168   Mr. [T1]: **I do not see a government role in this, unless they support the students and**

169   **the companies with incentives** (Category: Measures to expand the system). You have to

170   take care that not anyone enters the system, if a Academy enters they have to truly

171   comply with the Dual system. Yes sadly, now the companies feel they are trapped

172   because of the economic situation, that the country does not offer economic solvency, for

173   the companies to absorb, that means costs, that **if there are associations, they have to**

174   **be committed, on all of this well, give a little money, the formation of all of the**

175   **students, that they have supported the students, during their formation, and that**

176   **means a serious commitment from the company** (Category: Measures to expand the

177   system), if you want to extend it well let's have a country with a lot of technicians, people

178   trained to work, on what this country needs in the industrial part. I think the company has

179   an important task that is to support the student.

180   *Interviewer: Until here with the interview. Thank you so much for your time and enters for*

181   *the development of this research*

Tutor Interview [T2]	
Interviewer	Reina Durán
Interviewees	Mr. [T2] – Tutor
Date of Interview recording	July, 11th 2011
Time duration	37:03 minutes
Language	Spanish transcription. English translation
Italic	Ask reaction of interviewer
Standard	Answer and responses of interviewees
Bold	Special emphasis

Note: The transcription can vary lightly in respect to the recording due to the conditions of anonymity of the interviews

1 This interview was developed on July 11 2011, in the facilities of one of the participating
2 companies in the Dual Formation Program in the Mechatronics career. With the interview
3 we look to identify the opinion of the tutors from the Mechatronics career from the class
4 2008-2010 under the dual system, about their formation process. This information will be
5 utilized in the research called "Research on rising competences in technical education by
6 implementing dual system's elements under El Salvador conditions in the field of
7 Mechatronics".

8 *Interviewer: Good afternoon Mr. [T2], thank you so much for your time to the development*
9 *of this interview, as a part of the process of the research related to the implementation of*
10 *the Dual System in the Mechatronics Career of which you have been part as a tutor. How*
11 *do you evaluate the formation that the student received, in this system?*
12 Mr. [T2]: Look, **in general, the formation that was given was very complete, even**
13 **though we went through various subjects** (Category: Experience in the system).
14 Pneumatics, electronic, mechanic and all that part, of the plan was very complete, but it
15 the end it comes a little short, because, the practices that are developed in our case, is like
16 the company stays behind, because we have activities to accomplish day to day, that we
17 have to advance with the production, or with the preventive maintenance plans and we
18 could not accomplish to the student to a 100%, their study binnacle, to say something,

19 when they came with electro mechanic circuit maintenance, **I could not revise it in a**
20 **complete way, because we had another type of equipment and machinery**
21 **maintenance, and I could not go with it again, so then, to start putting attention to a**
22 **student in that moment, made us go low in our performance** (Category: Limitations). It
23 cannot be accomplished exactly, although they have received it in theory, but maybe in the
24 practice they do not develop.

25 *Interviewer: This situation generated difficulties for you at the moment of the binnacle*
26 *evaluation?*
27 Mr. [T2]: **It is difficult to evaluate the binnacle because there is no developed**
28 **practice, but the student received only the theory, but not the practice** (Category:
29 Limitations and evaluation method).

30 *Interviewer: And how did you resolve that, because you had to present the evaluations to*
31 *the Academy?*
32 Mr. [T2]: Well I talked to the teacher, that was following up this, and I told him look
33 engineer, this I cannot accomplish but we are going to do this and this part or I dedicated it
34 to a student to one or two days that he was here, to make research assignments, or a little
35 more of that was programmed in the final week that they were here; its programmed to
36 make at least one entry into the binnacle accomplishment; not develop it completely,
37 because you cannot do it, but make an entry, know the elements, for them to see what
38 does the machine have, and what maybe you cannot touch, but yes **you give an**
39 **introduction to what the machine has because they have to repair or because the**
40 **production space does not give space to maintenance services, of that kind**
41 (Category: Limitations).

42 *Interviewer: What percentage of the binnacle was accomplished?*
43 Mr. [T2]: Maybe a 65% to 70%. There was a follow up by the instructor and I told him, look
44 engineer, I cannot do this but I will be able to do this, so then I imagine they did their
45 report, and they reached an agreement.

46 *Interviewer: What difficulties did you observe in the Academy formation?*
47 Mr. [T2]: Look, because I was invited to some of the assignments presentation, I had the
48 opportunity to be with them in some of the presentations, **what I looked is that they**
49 **evaluated more the form they presented their assignment, how did they scheme it,**
50 **an introduction, the glossary; the technical part or the practice development,**

51 **because he is presenting a written component and the student unwrapped himself,**
52 **but technically stayed short** (Category: Evaluation method). The technical component
53 was weak and the evaluation, was missing a little more technicality at the time of
54 presenting. With my students, they left me a copy of the assignment, to a cutting machine
55 was performed a maintenance, technicians from another country came, and while they
56 were there the students presented an assignment focused on what it was done; thank God
57 we were in that subject, and they gave a presentation an everything, but the technical
58 part, I wanted them to have it very present, to a way that they could understand what was
59 done, to develop parts, like servomotors. I think that other assignments, that were
60 important I did not see, it could have been that they made a mistake of presenting it in nice
61 paper but with weak technical characteristics.

62 *Interviewer: How did you observe the application of the knowledge that they were*
63 *acquiring during their formation process?*
64 Mr. [T2]: Very good, but, it was because I choose a technician that already graduated from
65 electronics, the other one was a high school graduate, in general mechanic, so then the
66 knowledge that the student was receiving in the electric and pneumatic part, you could
67 start seeing that the student had a big learning capacity, learning capacity and likes the
68 career that he studied, I think it is doing it by calling, when done by calling I think they put a
69 lot more effort and looking for the development of the career, gradually evolved, because
70 he did not know of a contactor relay, because he came from the mechanical, then it
71 became gradually electrical knowledge, in the case of the other student, he knew of these
72 electronic things, was initially unimpressed, but I had to tell the instructors, but then grew.
73 **At the time of recruitment it was chosen the one that was better and more capably**
74 **available. The process was a nice experience because they were learning module by**
75 **module, were two months, and that month that one came, you asked what did you**
76 **learn, then they came with emotion, that they had learned something new and you**
77 **could see it in them**(Category: Experience in the system, job opportunities), started by
78 the part of pneumatics, and I was very interested to know, the subject, then it developed
79 better the practice.

80 *Interviewer: Now with relation with the practice and the participation of the companies in*
81 *the system, what do you think facilitated the most the formation of the student?*
82 Mr. [T2]: **What facilitated me the most was that we have many applications, that the**
83 **career provides** (Category: Experience in the system), example PLC programming, the

84   pneumatics part, electrical, we have enough motors, variable frequency drives. We now
85   have a soft starter devices, energy savings systems, then the mechatronics technical
86   career, much adheres to industry requirements, that we handle, because they process
87   controls and tied with temperature, pressure, and this type of graphics that are occurring,
88   when we do our dairy processes, and the students understood much easier what the
89   machine is doing, but cannot make cheese or cream, but if you understand how to repair
90   the control process, such as scheduling an engine speed, and all that kind of stuff, so I
91   was easy to understand, what the career needed to develop fully in the company

92   *Interviewer: What difficulties did you find in this formation process?*
93   Mr. [T2]: **The stronger difficulty is the production itself, that does not allow us, like I**
94   **said at the beginning to develop to a 100% the study program** (Category: Limitations),
95   but you have, you have a production limit that we have to accomplish and not being able to
96   accomplish with the student to a 100%.

97   *Interviewer: How was the students attitude during their formation process?*
98   Mr. [T2]: What happens is that one of the students already knew, perhaps for the same
99   technical training he had, already knew the first stages, which was electricity in the career
100   of mechatronics taught him electricity, electronics and all that, for him it was obvious and
101   came with a half apathetic attitude to develop these subjects, because he did not see
102   much interest, instead of the other students that had an interest in learning because he
103   was coming from a school of general mechanics, lathe, mill and all, was something new
104   coming to know and grow then when he came and saw, frequency, temperature controls
105   the boy had been more lively. One of the students had trouble a bit, perhaps to socialize to
106   some extent, because first it looked very obvious, but as progressed, the subject was
107   changing the program, I think that one of the students was discovering other things. There
108   was also tracking the Academy to motivate them to have a positive attitude. Something
109   they did in their program of study, with one of the students, or gave a talk and the boy was
110   changing. In the meetings we've had tutors at the Academy we had work tables where we
111   said that the professional, academics, which formed the Academy**. We as tutors have to**
112   **teach them responsibility because here we work to meet production and technical**
113   **things that have to be repaired from time to time and have to fix this** (Category:
114   Experience in the system), not like in the classroom, if you fixed it in the four hours you
115   came to study, leave it for tomorrow and we'll see what happens. Here we have to build
116   character, responsibility and, above all, discipline to work now, because you cannot be

117 avoiding responsibilities, from the maintenance department, but we have to take
118 responsibility.

Interviewer: How were they acquiring responsibility and work discipline?

120 Mr. [T2]: Look for being young, they are playful there was one that spotted a lathe in a
121 company where we send him and we had to get him out, it was punished, the other was
122 more responsible and did the practices around that same company , thankfully they
123 received him, but behaved differently, **then they were maturing, as the career of the**
124 **two and a half years that was, were maturing and gradually seeing here with the**
125 **people who had first-hand as chief workshop, helped me a lot with this type of**
126 **training to maintain their work schedule** (Category: Experience in the system). With
127 one of the students had to get his attention, because every time he came he left was a
128 week, because he always got sick, then as the boy said I feel free and I'm not going to
129 school, I will say at work I got sick , until I said you come every month sick so that went
130 away, but were those things that appeared on the road. One of the students respected
131 their schedules, always came to work, and asked to study English on Saturdays I cannot
132 come, fix the amount of hours, they are going to cover a week, then the responsibility of
133 the boy was different. In contrast with the other student never came to an agreement, we
134 showed him the days he had missed on disability or other reason and see how they
135 managed because they are hours that you did not meet, and so we were leading then
136 were problems attitude of each and you can understand it because they are young, and
137 they had no responsibility with the company although I felt I was committed to them to
138 develop them the attitude of responsibility, to the extent that the student that we did not
139 hire, we talked with a friend and we place it in another company and thanks to God he
140 gave him work.

Interviewer: How do you see the job opportunities for them?

142 Mr. [T2]: **There are job opportunities, they could be better because, the country has**
143 **lots of professionals but, in some way, doctors, lawyers and all that, the technical**
144 **part is being abandoned until certain point, but there is always people that need that**
145 **someone fix their machine, this and that, so then I think that is a market for**
146 **technicians** (Category: Job opportunities). Sadly we already had a fleet of technicians, so
147 we could not give an opportunity to the two that we had in that moment, and we had to
148 look for another option for one of them, but job opportunities, there are lots.

149 *Interviewer: And in the salary condition level?*

150 Mr. [T2]: Well in our case here we have a leveled wage system, then one of the students

151 came in, as it's an example, technician 1, technician 2, then the technician 1 for his years

152 of experience, working time, this already has a higher salary than the technician 2, then

153 one of the students was at technician salary 2. On the first level, because experience has

154 happened despite two and a half years with us, studying and that we met but came a

155 month, but the responsibility that I said, that was not all of them, is not to have all the

156 experience to work, but if you know the characteristics that the student that had arrived

157 and we could develop a good line technician. Then this opportunity is given to pay people

158 according to their work experience, academic certificates, these issues make one, can do

159 a better job negotiating, but here come the boys working at the minimum wage. Although

160 is not the lowest of the country, is a little above the minimum, and right now is going to do

161 the leveling, salary adjustment that was promised at six months, and it will fulfill.

162 *Interviewer: If you had a new position to hire, with the option of one graduated from the*

163 *Dual system and the other one from the traditional system, which one would you select?*

164 *Why?*

165 Mr. [T2]: **I had the opportunity to be with a boy from the traditional. Then one of the**

166 **students brought me, because he had to meet with his social hours, and the boy**

167 **came to be with us for a couple of days, this I think he was missing a little bit of**

168 **initiative, when receiving directions, he was a little nervous and unsure of decision**

169 **making, then from my point of view I rather hire someone who has been in a dual**

170 **system because it will remove the fear of talking with other technicians, with the**

171 **internal customers or suppliers see, because these attitudes also develop within the**

172 **company** (Category: Experience in the system and job opportunities); takes time and as in

173 life everything is learned, and only had access to talk to teachers, of course you are going

174 to remove the fear of talk to the teacher, look I did not do the task, or look at this is the task

175 I missed anything or explain to me. But is not the same, being under the pressure of

176 production where it was delegated to mechatronics for our case in the dairy plant, I

177 delegated the job to them, and gave him his tools, look walks with him and see this

178 machine, then they are taking away the fear of talking to the person in charge of the team,

179 with his co-worker and other people, so for me, if I had to choose between hiring someone

180 who was in the dual and traditional, I prefer the dual.

181 *Interviewer: How do you consider the companies could support this system?*

182 Mr. [T2]: **Look this like a social responsibility, which must have within the company,**
183 **then I feel that corporate social responsibility must exist, and investors or**
184 **shareholders of the same company, should support such programs, because the**
185 **future will be like this win – win** (Category: Measures to expand the system), I win
186 supporting you because you're going to work for me, and I'll make you technical, I agree
187 that having a mechanic is not much of a fashion because both technical knowledge, now
188 requiring the equipment with technology, so if you need technicians come with a higher
189 technical level, with no more than high school. The professional who stops studying, stops
190 being more professional. So for us as a company we believe in education and social
191 responsibility. **Also no government incentives departs for doing this, or no tax**
192 **reduction I guess, cannot be declared as a tax, which may not leave the budget of**
193 **the state, but with a tax cut that may have that the state also support companies**
194 **that provide this social support to students** (Category: Measures to expand the
195 system), I feel that the investor may have a little more motivation for supporting the
196 system, but if there is not even a government support government or promotion, to tell the
197 entrepreneur look back me this career because I'll help with incentives for municipal taxes
198 or fees, or pay issues in finance, then it could be a deductible, maybe a fraction 25% or
199 30%.

200 *Interviewer: What actions do you consider should be done from the Academy side?*
201 Mr. [T2]: On the side of the school, I think that also make alliances, between the company,
202 and not only by the INSAFORP, but give it a little more time with this company, and say
203 look I want a course of preventive maintenance, I'll give it to you they are 40 hours, 5
204 Saturdays, then come to my site or go to your site, and do a promotion, I mean I support
205 your career, as the employer of this company, **you can agree I'm looking to support the**
206 **mechatronics career, yes, but we are also helping to train your employees**
207 (Category: Measures to expand the system), in the 5 S, there are many programs that are
208 available through educational institutions. At the Academy, there are both nice program, as
209 some classes of Excel, Word, Power Point, automotive electricity, then we are talking of
210 the same branch, maintenance, technicians are preparing for maintenance technicians
211 that can support internal and say look it will be 50% of the cost, the course, then, I'm going
212 to provide such things, you put the implements and time, and I give you your certificate
213 that you went to training.

214 *Interviewer: Why did you enter to participate in the Dual System?*

215   Mr. [T2]: For us, we entered the program and caught our attention because, well my boss
216   is an agricultural engineer, and my boss also has a master's from Costa Rica, then I think
217   him, because he is from Costa Rica, their education level is beyond than in El Salvador,
218   then I think over time, has learned to see that things are done through education. Then
219   there are expensive machines, expensive that because of not having no prior knowledge,
220   they are spoiled, then I think he thought that train people that could stay with us working,
221   and give better take care of that investment, because what is done is investing in
222   expensive machine, to produce below cost, have better performance, but someone had to
223   give their maintenance, and I think that motivated much, that we entered the program,
224   when they said look you are willing to support these mechatronics , teach them; to us in
225   our time someone taught us to work, and today we return the favor to the young.

226   *Interviewer: Do you consider this system could be successful to the country level?*
227   Mr. [T2]: **Yes, it could be successful, one because the employer knows from first**
228   **hand their employee and how they are going to behave, does it in a slow form and**
229   **develops the attitudes, and the responsibilities that they want from the new**
230   **employee** (Category: Experience in the system), so then you have young employees, that
231   grow day by day with their technical knowledge, and yes for me it would be good if it was
232   implemented in every career.

233   *Interviewer: What actions you consider should be implemented to improve job*
234   *opportunities for the graduates?*
235   Mr. [T2]: **The promotion that must have** (Category: Measures to expand the system), or
236   seek to develop trade shows or ask the work ministry to develop job fairs to send the
237   resume and identities, or the same, the same companies that support, maybe some way
238   to promote the quality of technician who is leaving to the working life, for some reason
239   many people do not know this, I'm attending some lectures of cleaner production in the
240   Ministry of Agriculture, and have talked with other companies who are there, who do not
241   know the program still then lack of career promotion, a little more marketing perhaps could
242   support this system, and this country's investment in preparing economic activities then,
243   because it has lost a lot in the industry has lost support to the Salvadoran industry. So I
244   think that as long as agreements with the Salvadoran Association of Industrialists,
245   agreements with the Chamber of Commerce, so if we focus on first hand education and
246   you will have the outcome, you have a technician, working that makes it easier give
247   indications, that understands because he is one step of a university career. So I'm not

248 saying that high school graduates do not work but the maturity of a technician knowledge
249 is different, then the high school graduate is also wanting to do this, also at promoting to
250 the education ministry level to young people in schools , look there is this career, promote
251 differently because sometimes you grab, well I was one, instead of going to a technician, I
252 first went to college, then I think it would have been more advantageous for me to get to a
253 technician who had, other capacities as well and then get me to college, **I think that lack**
254 **of promotion of the institution within the Ministry of Education to these young**
255 **people, to give them a better chance of employment, because they will open up a**
256 **gap different accordance with the academic skills to be acquired** (Category:
257 Measures to expand the system).

258 *Interviewer: Until here with the interview. If you wish to add anything useful for the*
259 *research.*
260 Mr. [T2]: Well maybe, say that the program could improve with a little more support, from
261 other technology companies, because if it is true, the program is very extensive, but also
262 stays with some limits, there are things that if you were explaining right now in class, but I
263 need to go deeper now, go deeper in the class and tell me what we are going to see later
264 or you are going to see it at work what we do not have here, sore **there are things from**
265 **the study plan that must be reviewed, and set the priorities it need, I feel like the**
266 **academic programs, not only have to be done from the authorities from the**
267 **institution, but ask the industry on what are they interested in, that the young ones**
268 **get to know** (Category: Measures to expand the system) , for example, that instead of
269 having electromagnetism and astral things, have things more focused in the industry, not
270 only because this career is mechatronics and we are going to teach you robotics and all
271 that, yes you have to show them robotics but they have to start looking at, what the
272 country needs, relate to technicians.

273 *Interviewer: Thank you so much for your contributions.*

Tutor Interview [T3]	
Interviewer	Reina Durán
Interviewees	Mr. [T3] – Tutor
Date of Interview recording	July, 6th 2011
Time duration	18:13 Minutes
Language	Spanish transcription. English translation
Italic	Ask reaction of interviewer
Standard	Answer and responses of interviewees
Bold	Special emphasis

Note: The transcription can vary lightly in respect to the recording due to the conditions of anonymity of the interviews

1 This interview was developed on July 6 2011, in the facilities of one of the participating
2 companies in the Dual Formation Program in the Mechatronics career. With the interview
3 we look to identify the opinion of the tutors from the Mechatronics career from the class
4 2008-2010 under the dual system, about their formation process. This information will be
5 utilized in the research called "Research on rising competences in technical education by
6 implementing dual system's elements under El Salvador conditions in the field of
7 Mechatronics".

8 *Interviewer: Good afternoon Mr. [T3], thank you so much for your time to the development*
9 *of this interview, as a part of the process of the research related to the implementation of*
10 *the Dual System in the Mechatronics Career of which you have been part as a tutor. How*
11 *was your experience as a tutor in the Dual system?*
12 Mr. [T3] Well, yes us, like tutors inside, I could say that the profession and the practice at
13 the beginning of the dual system, we found out when we already had the student over us
14 and who was going to be a tutor. **In this process you look to take a person to create**
15 **the bases in every level, and generational transfer, that gradually could, make the**
16 **company work in the long run and you could educate by competence principally,**

17   **with the workers acquired** (Category: Experiences in the system), and that there is a

18   natural internal level, that now it has happened with someone from outside as a student,

19   but that the internal starts educating this person to take to that level of development, so

20   that they can take levels, like a post generational transfer of what we have acquired.

21   *Interviewer: How do you consider it has been the formation process?*

22   Mr. [T3]: What happens at the level of human resources as I said, this coordination is

23   sometimes seen with field work and turns of the company, the work to which I see my

24   point of view because we as a company are well engaged sometimes to perform. research

25   of our work and feel an additional burden, not as others are administered and the results

26   we have to do, the result and the way such research is vital for us that the manager must

27   carry, then that is an additional burden, perhaps many times, and see it as a burden, to

28   coordinate with another company about something. Additional work is the first place

29   because there you can see the work being done. **Say the coordination with teachers,**

30   **the feedback is practiced, for what the students manifest there, look they did not**

31   **teach me this, I was taught so far, this is new then there is feedback situations that**

32   **should always have to be your content and what to emphasize, to structure the field,**

33   **and structure what should teach them to go renew it, one thing is in theory and**

34   **another thing is practical leve**l **acquired** (Category: Limitations).

35   I see it quite well because in that sense, I've always thought, or as I say, that one takes his

36   main job because with faith continue training and acquire skills to solve problems, deal

37   with the problem, before the research system continuous improvement and the power lead

38   and hire a technician, as we used to say before it took us a little longer, because it came to

39   him out of a state, first get him used to the labor, which is quite complicated get used to a

40   level of demand for example in this case has been so gradual what we have met acquired,

41   for example try to take it to a section group all their knowledge, because that level is

42   mechatronics, the section where he is right now, which applies both, from what you've

43   learned then say the time we have to insert him is less, because we explain less

44   theoretical level that he already knows, and what you have on hand, is at the time, while

45   after coming off a career, many people enter, in different situations, to get used to the job.

46   *Interviewer:* How the evaluation system has been in the company?

47   Mr. [T3]: I say that the assessment at the Academy, by my appreciation from the outside is

48   **that if given theoretical level, the evaluation is based on nothing more than what**

49   **they are taught, and they say if you subscribe within a study plan, or the skill that**

50 **can be acquired there, but there are other situations that are not assessed, such as**
51 **the student to see a real problem acquired** (Category: Evaluation method), which is
52 quite different, some students scavenge to give to that issue, some prior knowledge can
53 be up to that, perhaps studied, the advantage that one can have in electronics, that study
54 was different from his high school study, theoretically, they both might acquire the same
55 skills, **but in real practice the problem is not assessed, I do not know if they**
56 **assessed it, but faced with a real problem, where the student is paralyzed, I have all**
57 **the knowledge and practice all they have taught me but, I cannot solve this problem,**
58 **then I don't know if it is a competence level acquired** (Category: Evaluation method),
59 whether or not assessed because at, as I said at the theoretical level is rather easy for a
60 person or practice at the laboratory and will receive the same number of practice, some
61 may even read more or work harder, that sometimes students that are, from the traditional
62 system.

63 *Interviewer: Inside of this process, you also had a part of the evaluation, through the*
64 *binnacle. What did you think, of this evaluation process?*
65 Mr. [T3]: **I think is really good but, there were, were the teacher should have get**
66 **involved more, enter en evaluate them inside, we were a relationship I do not know**
67 **if the teacher saw this, the binnacle and follow up, practically we had to do it in this**
68 **case with the coordinator** (Category: Evaluation method). Then I see that is really good
69 to give follow up to make sure that the road is followed, to what it was set as an objective
70 at the beginning, with him we reviewed what objective was the unit that he was going to
71 enter and then he suggested a working plan and to the binnacle the result to what the
72 student wrote according to the base plan that we have established.

73 *Interviewer: What do you consider it could limit the development of the Dual system?*
74 Mr. [T3]: Just on the **political willingness from a company of deciding and supporting**
75 **or not a system like this acquired** (Category: Limitations).

76 *Interviewer. What measures do you consider should be implemented for the Dual system*
77 *to expand nationwide?*
78 Mr. [T3] **Let everyone know the experience that we had and that they can see the**
79 **gain, because when a company sees, what their gain is, because the objective of the**
80 **company is that, to gain** (Category: Measures to expand the system).So as long as we

81   sell the idea that the company is going to win, and the student and the country wins, by
82   having a secured job for someone that is finishing, that is studying.

83   *Interviewer: What measures do you think should be implemented in the Industry for the*
84   *Dual system to expand nationwide?*
85   Mr. [T3]: Yes, I think let's say, in finding as an industry, say that every time, that the
86   specialty is searched by level, as you said in the difference between engineer and
87   technician, from the technician is expected more technical expertise, and is expected to for
88   example; our industry, then one would expect to be offered careers like that, developing
89   that, because they also promote in a country level. Although remember the industry is
90   limited based that if there is a basis for which to produce, ours here in El Salvador, the
91   textile is a part, there are at least about six companies, which can be bearable for a long
92   time, but if this is sustainable will depend on the development of this, and this basis should
93   be provided for people trained for that, and that to the extent that it seeks either trained
94   with very specific knowledge.

95   *Interviewer: Do you visualize, for the expansion of this system should the Government play*
96   *a role?*
97   Mr. [T3]: Yes. **The support towards incentives for the company to hire, to make a**
98   **national plan, there should be a base** (Category: Measures to expand the system), let's
99   say that here for example, we still do not have in the technology part, that is the most
100 deficient part, there is no technological platform that governs for facilities to implement, to
101 attract companies or investments with a technology level much more, and also that would
102 generate more revenue, because they are more specialized jobs and they should provide
103 more education for those students to the technical levels, on the education level and they
104 do not support.

105 *Interviewer: When you mention incentive, what types of incentives do you mean?*
106 Mr. [T3]: It could be some kind of incentive, maybe tax or maybe the support of market
107 research or counseling.

108 *Interviewer: Do you consider that international cooperation could support the development*
109 *of the Dual system?*
110 Mr. [T3]: Yes, but there enters the government, because is the only one able to manage an
111 structure to manage international support, money in a bigger scale because, a little

112   institution that one would want, could help but the scale is very small and their reach is

113   also very delimited.

114   *Interviewer: What actions do you think should be taken to improve the level of employment*

115   *of the students?*

116   Mr. [T3]: The situation is that we sometimes get a "little silly", sometimes we are missing

117   here in the country, **support not only in knowledge, but there are other things like**

118   **leadership, self-esteem, to take the level of students that they generate so the**

119   **company see them as people that are going to be from a higher level** (Category: Job

120   opportunities), to give and follow up because someone could be an expert in something,

121   but it could be that in the "emotional" level, in the people selection, for this system is very

122   important the support that it must give too, the other help should come from the teacher,

123   for the student to know, because one of the things that has brought them apart, some of

124   the things that they teach them in the practices. There are more specific problems, one

125   thing is the general and the other thing is to enter in specifics, they are a little apart in the

126   sense that they could teach them or very limited practices, but new anticipations like

127   responding to procedures of unknown problems of a situation in the practice.

128   *Interviewer: Thank you so much for your collaboration and inputs to this research.*

Tutor Interview [T4]	
Interviewer	Reina Durán
Interviewees	Mr. [T4]: – Tutor
Date of Interview recording	July, 27th 2011
Time duration	21:06 Minutes
Language	Spanish transcription. English translation
Italic	Ask reaction of interviewer
Standard	Answer and responses of interviewees
Bold	Special emphasis

Note: The transcription can vary lightly in respect to the recording due to the conditions of anonymity of the interviews

1 This interview was developed on July 27 2011, in the facilities of one of the participating
2 companies in the Dual Formation Program in the Mechatronics career. With the interview
3 we look to identify the opinion of the tutors from the Mechatronics career from the class
4 2008-2010 under the dual system, about their formation process. This information will be
5 utilized in the research called "Research on rising competences in technical education by
6 implementing dual system's elements under El Salvador conditions in the field of
7 Mechatronics".

8 *Interviewer: Good afternoon Mr. [T4], thank you so much for your time to the development*
9 *of this interview, as a part of the process of the research related to the implementation of*
10 *the Dual System in the Mechatronics Career of which you have been part as a tutor. How*
11 *was your experience as a tutor from the dual system?*
12 Mr. [T4]: We started in 2008, when **we were informed that we would participate in a**
13 **German program , this because the company's investors from Germany, and we had**
14 **to support two students, as we had no experience, but we got the training at the**
15 **Academy and explained how they would work acquired** (Category: Experience in the
16 system). It was not easy because we did not know what it was and how was the study plan

17 of the career. It was a new way to train technicians. I thought we did not have much to do

18 because it was their responsibility (the Academy). **It was a new experience for me as a**

19 **tutor, I have my responsibilities also on the plant, and also for the company. After**

20 **these years, I've learned a lot as a tutor, here and in the workshops that were made,**

21 **which we shared with other tutors from other companies** (Category: Experience in the

22 system). Now I understand better the training system, and I think there are many things

23 that need improvement.

24 *Interviewer: How do you consider was the experience for the students?*

25 Mr. [T4]: **They had to adapt to the rules of the company, I remember the first month,**

26 **when they did not know industrial security and we demanded them to follow the**

27 **rules, and they did not understand how important for a company to accomplish for**

28 **the security of the people and the process** (Category: Experience in the system). We

29 had two students, that had to incorporate to the production process, and work with the

30 problems and pressure of reaching the goals, where they had to resolve the issues

31 immediately. **They accomplished to have job site experience and learn how to work**

32 **with other co-workers. We always demanded them to comply with the rules and**

33 **their responsibilities, and that was not something they could negotiate, like they**

34 **could with an assignment with a teacher** (Category: Experience in the system).

35 *Interviewer: What difficulties or limits have you encountered during the formation process?*

36 Mr. [T4]: I could say that **what could sometimes affect could be the economic**

37 **situation of the companies, when there are no contracts and you have to decide**

38 **between two students that you have to hire. That also could affect for the**

39 **companies to open more spots for the students to come and practice** (Category:

40 Limitations). I know companies that now have few contracts and instead of hiring they are

41 firing, there are difficulties there for this to work.

42 *Interviewer: How do you evaluate this formation process?*

43 Mr. [T4]: **The process seems really good, and the system is very new, that you really**

44 **need in the country, and we need in the companies** (Category: Experience in the

45 system), but is important that the owners support it, because in the end they decide if we

46 are going to continue.

47 *Interviewer: How has the evaluation system been in the company?*

48   Mr. [T4]: Well, with the evaluation, is also something I had to get used to, and sometimes I
49   asked for help to other people, because I had to attend my obligations inside of the
50   company. **Here we have to be very aware to resolve any issue and accomplish the**
51   **goals, and attending the students also takes time. But I had to do the evaluation**
52   **always at the end of the month, but it was good to have the binnacle, because with**
53   **that we made a plan and that also served us to evaluate what had to be presented in**
54   **the Academy** (Category: Evaluation method).

55   *Interviewer: Did you complete the binnacle?*
56   Mr. [T4]: Well, **not always was completed each month, because there were**
57   **emergencies to cover and sometimes we programmed maintenance that were not**
58   **planned for that month** (Category: Limitations). One month is small time to be able to
59   complete everything that was established in the binnacle.

60   *Interviewer: How was the feedback for the students?*
61   Mr. [T4]: **The feedback was at the end of the month, when we had to do the**
62   **evaluation/ In that moment we checked the results, with the difficulties. That took**
63   **the opportunity to point out problems of incompletions and some behavior that was**
64   **not right** (Category: Evaluation method), because sometimes that might not comply with
65   our standards. Sometimes I helped with human resources and other were also guided by
66   the heads of the plant. Yes, here is not allowed to neglect or incomplete process is to
67   resolve a failure, or the failure report, and that was something that we should insist. Nor
68   could they be asking permission that did not have a real reason or justification, we had to
69   work with these situations. When we called to meetings, they had to comply with the times
70   and their contributions should be specific, that was also demanded.
71   **I do not know how they were evaluated at the Academy, I attended only to see the**
72   **presentation of some projects, but as they commented they had to prepare many**
73   **labs and exams** (Category: Evaluation method).

74   *Interviewer: Do you consider that the system brought better job opportunities for the*
75   *students?*
76   Mr. [T4]: **One advantage that you have with students who are studying in the dual**
77   **system is that they are practicing in the company, and for us, the company supports**
78   **them thinking they are going to work with us, so you can see that they are able to**
79   **have a chance to work within the same company** (Category: Job opportunities). **The**

80   **problem is when there are few contracts and economic difficulties in the company**
81   (Category: Limitations), but if students have a good chance to learn about many things in
82   the business, practice in a real environment, with real machines, and actual production
83   processes. **These students were solving real problems, which in the beginning they**
84   **needed help to solve them, but then they had to find their own failures and then**
85   **resolve them** (Category: Experience in the system). When we receive a request for a
86   technician who has not practiced before or without experience, it is always best to select
87   one of the dual system.

88   *Interviewer: What measures do you think should be implemented for this system to be*
89   *expanded to a nation-wide level, the dual system?*
90   Mr. [T4]: Well, this system has almost four years, although is still new because just
91   recently the first technicians have graduated, even though the results are good, because
92   for us it has worked with the students we have attended; we have to think how did we start
93   and how did we enter to support, and for us it was a new career that was going to solve
94   the necessities in our company, **so we have to make careers that serve to fill**
95   **necessities in the companies** (Category: Measures to expand the system). One of the
96   problems is that there are many careers that have no job opportunities, and in those
97   careers you can't offer dual formation. You cannot be studying careers in which there are
98   no job opportunities. So as I was saying, we must have careers that the companies need.

99   *Interviewer: What measures do you consider should be implemented by the companies?*
100 Mr. [T4]: Yes, well, **the companies are going to participate as long as there is a**
101 **benefit for them, like support to improve the production, or reducing costs, or**
102 **increasing sales**. **Careers according to the companies necessities are important. In**
103 **the company there must be more space for students and use the social company**
104 **responsibility mechanisms, to help new students** (Category: Measures to expand the
105 system).

106 *Interviewer: And from the Government side, what measures do you think should be*
107 *implemented?*
108 Mr. [T4]: Well, **with the government they could support with diverse incentives to**
109 **support the companies that participate in the system, and for the students the**
110 **scholarships. They also must facilitate the technical assistance process or**
111 **laboratories with national and international cooperation. Is important that they**

112	**facilitates the processes where they share the good things about the system, and**
113	**also the difficulties and good practices to reduce difficulties** (Category: Measures to
114	expand the system). When someone thinks in the experience of the Academy, of how in
115	each visit that they made to prepare for the system, the meetings with the tutors and
116	others, that have helped to understand better how does it work and the important work that
117	we the tutors are doing. And I hope that with this many students have an opportunity to
118	form and have a job; you know that young people are the most affected by criminals and
119	you have to try to change that; with these type of careers you can improve.
120	*Interviewer: Finally thank you for your time and your disposal to support this research.*

Tutor Interview [T5]	
Interviewer	Reina Durán
Interviewees	Mr. [T5]: – Tutor
Date of Interview recording	July, 14th 2011
Time duration	20:01 Minutes
Language	Spanish transcription. English translation
Italic	Ask reaction of interviewer
Standard	Answer and responses of interviewees
Bold	Special emphasis

Note: The transcription can vary lightly in respect to the recording due to the conditions of anonymity of the interviews.

1 This interview was developed on July 14 2011, in the facilities of one of the participating

2 companies in the Dual Formation Program in the Mechatronics career. With the interview

3 we look to identify the opinion of the tutors from the Mechatronics career from the class

4 2008-2010 under the dual system, about their formation process. This information will be

5 utilized in the research called "Research on rising competences in technical education by

6 implementing dual system's elements under El Salvador conditions in the field of

7 Mechatronics".

8 *Interviewer: Good afternoon Mr. [T5], thank you so much for your time to the development*

9 *of this interview, as a part of the process of the research related to the implementation of*

10 *the Dual System in the Mechatronics Career of which you have been part as a tutor. How*

11 *was your experience as a tutor in the Dual system?*

12 Mr. [T5]: Well, **in the company we have always worked supporting students in their**

13 **practices in here we receive students from the Industrial High School that come and**

14 **make their social practices, and helped us in the shops** (Category: Experience in the

15 system); they are young people of 15 to 16 years old. We also receive students from other

16   careers that study other Technical like industrial or electronic, and also from engineering.

17   Because we sell the equipment, they help us with the installations in the shops.

18   *Interviewer: Has your experience been similar as tutor in the Dual System?*

19   Mr. [T5]: In that case, although they are always students in practice, **it is a different**

20   **system, because of the fact that students are two and a half years between the**

21   **company and the Academy, allowed to develop a better relationship between**

22   **students and we in the company. They almost become employees of the company**

23   (Category: Experience in the system), but always need two months to go to the academy,

24   but we understand that it is necessary for the completion of training and to graduate

25   technicians. In this case I had to go every year to the training workshops for tutors and

26   learn how the career works and how should I apply the binnacles and support throughout

27   the process of the student, if it is a different system, which is more complete, is a better

28   opportunity for the students, because they are always monitored. Here we work with the

29   Academy for the student to manage to have good training.

30   *Interviewer: Why is the reason that you work with so many students?*

31   Mr. [T5]: Is because the students help us, but is also part of the support that we always

32   give to the community, mostly for young people, we also look to support young girls, **the**

33   **company as a social responsibility helps the students of different educational**

34   **institutions** (Category: Experience in the system),.

35   *Interviewer: What do you consider could limit the development of the Dual system?*

36   Mr. [T5]: The system is very good, we are helped by having these students and we are

37   excited when we see how they have grown over time, then rather than limiting I see

38   benefits, **but perhaps sometimes it becomes difficult to be serving students while we**

39   **should just do our work plan, and also there are always unforeseen issues**

40   (Category: Limitations). Initially students don't support too much, but after a year, you can

41   feel the difference. In my case I have many responsibilities, and I cannot stop doing them.

42   *Interviewer: How do you balance the job that the company demands to you with the job*

43   *that you must develop as a tutor?*

44   Mr. [T5]: With time I have organized myself, to make my job easier. The beginning was

45   difficult because you had to do many evaluations and understand how the system works,

46   but now is less complex.

47   **There is also something else that affects for the Dual system to expand, and is that**

48   **there are not many spaces in the company for the students in the practice** (Category:

49   Measures to expand the system). Because you are looking to help the ones that could

50   incorporate to the company, **well those spaces are according to the possible job**

51   **opportunity** (Category: Job opportunities).

52   *Interviewer: How do you consider that the evaluation process has developed?*

53   Mr. [T5]: **Well, evaluation are partly in those made at the Academy that are exams,**

54   **labs and projects. In some projects, the tutors were invited to participate in the**

55   **evaluation, in those projects we had some that were used to solve problems within**

56   **the company** (Category: Evaluation method), it was a good experience for students. We

57   always wanted to apply knowledge of theory. Although sometimes it seemed that some

58   modules were developed very theoretical, but in others even we learned, updating our

59   knowledge so that students came and we talked and we applied.

60   *Interviewer: How was the experience with the binnacle?*

61   Mr. [T5]: **With the binnacle we had everything that we had to develop in a month**

62   **when we received the students. Even though we could not complete it to a 100%, it**

63   **served me to plan the work at the beginning of the month that the student came to**

64   **the company; and also to evaluate how was the student being developed** (Category:

65   Evaluation method), if it accomplished the competence that was detailed in there. With that

66   binnacle we had to give the evaluations inside of the company to the Academy.

67   *Interviewer: Did you make evaluations of the attitudes of the students?*

68   Mr. [T5]: Yes, every month, that's how they defined it, so then **at the end of the practice**

69   **month you made the attitude evaluation of the student according to a list of areas**

70   **that appear in the binnacle** (Category: Evaluation method), and I remember that a

71   workshop that we had with other tutors, it was consulted to us those areas to evaluate. I

72   always had to evaluate the attitudes, and **this were discussed with the student to give**

73   **feedback and assure that the process of the student was evolving** (Category:

74   Evaluation method).

75   *Interviewer: Studying with the Dual system, has allowed to improve job opportunities for*

76   *the young people?*

77   Mr. [T5]: **Yes of course we hired the two that initiated the process and now we have**

78   **other students that we hope that stay here working for the company; but I always**

79 **think that if we don't hire them here, now they have more real life experience, they**

80 **know how to resolve work issues, and can get a good job according to their**

81 **formation** (Category: Job opportunities). According to what I understand from other tutors

82 in other companies, not all of them have been able to hire the students that made their

83 practice with them, because of economic issues, and in some cases, because the student

84 did not adapt to their style of work. But then they found a job in other companies.

85 *Interviewer: What measures do you consider are important to implement for the Dual*

86 *system to expand by the Academy, the company and from the government?*

87 Mr. [T5]: Well for the measures to expand the system **it would be good to implement it**

88 **in other careers and more companies** (Category: Measures to expand the system). But

89 this means that like Mechatronics, which is very new, and was a new technology; so the

90 new careers must motivate and assure that they have a space with the company, the

91 government and the Academy.

92 *Interviewer: How do you evaluate the incorporation of incentives?*

93 Mr. [T5]: From the government side?

94 *Interviewer: Yes.*

95 Mr. [T5]: Yes of course, **the incentives for the companies and the tutors that support**

96 **this model of formation. They also have to assure that more companies support this**

97 **system** (Category: Measures to expand the system). I think there are experiences in other

98 countries and it would be very important to revise how they work and the impact they have.

99 **They have to let know all the benefits from the Dual system** (Category: Measures to

100 expand the system).

101 *Interviewer: Thank you so much for your help and inputs for this research.*

Annex 23. Industrialist /Decision Maker Interview's transcripts

Decision maker Interview [D1]	
Interviewer	Reina Durán
Interviewees	Mr. [D1] - Decision maker
Date of Interview recording	July, 27th 2011
Time duration	23.32 minutes
Language	Spanish transcription. English translation
Italic	Ask reaction of interviewer
Standard	Answer and responses of interviewees
Bold	Special emphasis

Note: The transcription can vary lightly in respect to the recording due to the conditions of anonymity of the interviews.

1 This interview was developed on July 27 2011, in the facilities of one of the participating
2 companies in the Dual Formation Program in the Mechatronics career. With the interview
3 we look to identify the reasons that motivate the entrepreneurs and decision makers inside
4 of the company to participate in the formation process of the students enrolled in the
5 Mechatronics career from the class 2008-2010 under the dual system, about their
6 formation process. This information will be utilized in the research called "Research on
7 rising competences in technical education by implementing dual system's elements under
8 El Salvador conditions in the field of Mechatronics".

9 *Interviewer: Good afternoon Mr. [D1], thank you so much for your time to the development*
10 *of this interview, as a part of the process of the research related to the implementation of*
11 *the Dual System in the Mechatronics Career of which your company has been part of the*
12 *learning process. With respect to the participation from your company in the Dual system,*
13 *could you explain the reasons why it was decided to participate?*
14 Mr. [D1]: **Innovation** (Category: Motivations to be in Dual system).

15 *Interviewer: Innovation? What do you mean?*

16 Mr. [D1]: To do something different, from what we were doing

17 *Interviewer: What is it that you saw different in the program?*

18 Mr. [D1]: That it incorporates the three disciplines, that with more frequency are present in

19 the industry like electronic, hydraulic and pneumatic.

20 *Interviewer: It means that, what you saw, was a different study program, is it like that?*

21 Mr. [D1]: **A different program, that carried, three disciplines of an engineering in on,**

22 **without the necessity of being specializing** (Category: Motivations to be in Dual

23 system), **in the case of the other engineer of the plant, that was in Germany**

24 (Category: Motivations to be in Dual system), studying one year hydraulics, one year

25 pneumatic and another electronic; nothing, well he is really good in those specialties but

26 does not have electricity, so in mechatronics he does not have experience. I am an

27 electrician, so I have learned hydraulic mechanics, but by my own means, and my

28 experience but what if I had been taught the three of them in university. I go by that.

29 *Interviewer: Now, if the program had not been dual, I mean, combining the theory with the*

30 *practice in the company, Would you wanted to participate anyways?*

31 Mr. [D1]: **The dual. That is the benefit for a student because, they have the**

32 **opportunity to work and develop experience** (Category: Actions to improve

33 employability), like if I sent someone to training. I had time in the program, I finished a

34 diploma of maintenance with the Academy, I took 20 courses for two years and I was

35 sending them Saturday, Sunday, Friday it did not matter, is a matter of training.

36 *Interviewer: It means that the Dual factor for you, did not have any relevance?*

37 Mr. [D1]: No, because I can give him permission to study the engineering and, don't have

38 it here for some time.

39 *Interviewer: That opinion is because your students from the Dual program, were*

40 *employees from the company, right?*

41 Mr. [D1]: Not necessarily, because when I decided that we were participating, I was also

42 president of the employee cooperative, and then I selected two other young people, but to

43 help, because what I see for the country, is something that benefits independently of who

44 studies, is like teaching them to improve and fish, for people to be more successful.

45 *Interviewer: What is the reason for you to continue in the program with new students?*

46 Mr. [D1]: **Because it is really good. Is successful, the reason why is, I'm training my**

47 **people, and the people, are giving me good results, so the program is successful**

48 (Category: Motivations to be in Dual system), and I wish they continue studying the

49 engineering, but is up to them.

50 *Interviewer: If the program was developed in another type of career would you see it the*

51 *same way?*

52 Mr. [D1]: Chemistry, Physic, it could be, **anything that could come and improve our**

53 **performance, is welcome** (Category: Motivations to be in Dual system).

54 *Interviewer: Do you think that this program, helps you bring down training costs?*

55 Mr. [D1]: No

56 *Interviewer: Why?*

57 Mr. [D1]: **Not reducing costs, optimizes them** (Category: Motivations to be in Dual

58 system), I mean optimization is not reduction, because I can send him, I can choose for

59 example to train someone in pneumatics in the Academy, maybe it will be cheaper,

60 individually, just because it is electric, so then I send him to train in pneumatics, then

61 hydraulics, but is cheaper in here. The time that I have to let him go, that I won't have the

62 employee; but I don't see it as cheap or expensive; I see the benefit that I will have in the

63 future, I tell everyone to be patient. Now, I selected from the best ones, of course those

64 talented ones are missing in the fabric, but they wait to see a result, **because the**

65 **benefitted ones are going to be us later, when they come and start inputting**

66 (Category: Motivations to be in Dual system), and it has been like that.

67 *Interviewer: What benefits from being in the program could you mention?*

68 Mr. [D1]: **One of the benefits, is the availability. We manage ourselves around**

69 **indicators, availability, the time that the equipment is available** (Category: Motivations

70 to be in Dual system). The hours of maintenance, between the hours of equipment work,

71 gives you a result. Anything that is above 90, is world class, 90 per cent of availability,

72 either in Europe, in Germany. So then, it has increased, it means that the hours because

73 of maintenance to the failures; all this has decreased, because there is a new application

74 in the sector where we are that the graduates from the Dual system develop.

75 *Interviewer: It means, that they have developed better competences, generating results?*

76   Mr. [D1]: Correct, **because they are applying what they learned** (Category: Motivations
77   to be in Dual system) because, in the zone that the machine is like a robot, they are little
78   pneumatic hoses, there is hydraulic and electronic and all that, so there they are, **in the**
79   **area and we were touching the indicator, but now they have passed beyond that, so**
80   **you can tell, that they are applying good their knowledge** (Category: Motivations to be
81   in Dual system).

82   *Interviewer: To the system level, the company-university formation, considering that is*
83   *applied not only in this company, but with the whole sector, What do you think it could limit,*
84   *the development of the system in this country?*
85   Mr. [D1]: **Managing scarcity, the mental scarcity from managers, who see only the**
86   **focus of money at the time, they do not see beyond their company** (Category: Factors
87   that limit Dual system), the issue of maintenance, here in the country, fortunately I've been
88   good, good God has sent me to three major national companies. In one I started my job for
89   8 years, then an energy company and then to a production one as maintenance manager
90   for seven years, and then switch to another production company, where I spent two years.
91   I went to Sweden to study a course of preventive maintenance, there I found that the basis
92   of all productivity is maintenance, but here the owners do not invest in maintenance, they
93   all go to failure. All they see is a maintenance expense, and here in this company we have
94   shown the opposite, that the success of this company, because maintenance is given the
95   availability of all its machinery, up to production standards will remove most of it, then have
96   higher profits, lower inventories, less lost time, excellent production, lower costs, then it is
97   paid. It is the only way, because the machines are machines, buildings are buildings but
98   we have excellent people we work within this; all assets fall, men are what make the
99   difference, with higher training. Well, God is more concerned of people that are prepared,
100   then of course all of this, training is without taking into account the cost but the result. So
101   for me the issue is that managers must have to visualize and project

102   *Interviewer: In that sense, if we wanted to expand the system, What measures do you*
103   *consider could be applied, to have more companies enter in this?*
104   Mr. [D1]: **A presentation, to the Salvadoran Association of Industrials (ASI), there so**
105   **that all of their members, start to change their thoughts** (Category: Measures to be
106   implemented), this is from up to down.

107   *Interviewer: For them to know the system?*

108   Mr. [D1]: For them to know and you can see, fortunately there are members of ASI in the
109   company and of course, they always had it clear, that's way they are where they are.

110   *Interviewer: And the level of the Academy as a formation center, What do you think it*
111   *should be done, for the system to keep expanding?*
112   Mr. [D1]: **Show it, what do you have, what are you going to teach the personnel, and**
113   **what is the result that employers are going to get, and all the result is going to**
114   **improve the performance, improve the efficiency and improve in the machinery with**
115   **more maintenance** (Category: Measures to be implemented).

116   *Interviewer: Do you see any role from the Government?*
117   Mr. [D1]: Depends of Which

118   *Interviewer: What do you mean?*
119   Mr. [D1]: No, I meant which government.

120   *Interviewer: The actual one.*
121   Mr. [D1]: The actual, well the thing about the actual, it has a lot of problems of execution,
122   in they are more focused in some programs, than others. They have allowed the
123   coordinator to work, but in everything else I do not know, but the Academy I know that they
124   have it clear, that why they are supporting it. With that, **I have always believed that,**
125   **Caesar's to Caesar what, and God's to God. Better with private companies, is**
126   **showing what is the best thing they can do, make them work, only with the help**
127   **from the industrials, you can grow and get stronger** (Category: Measures to be
128   implemented),, that is, the vision of the Academy.

129   *Interviewer: So now, now you would see it more like a program between Company –*
130   *Private Company, and little intervention from the Ministry of Education, is that right?*
131   Mr. [D1]: Yes to follow the purpose of education.

132   *Interviewer: Well, in the case of Germany, is a very regulated system, where, the*
133   *companies by law have to give students space for their practices.*
134   Mr. [D1]: Yes, the thing about Germany – Europe, they can have many luxury, they always
135   say what was first, the chicken or the egg, first you have to be wealthy and then you have
136   social responsibility, or social responsibility takes you to be wealthy, you do not know; but

137   the truth is that Germany can take any road, because they already built the path, we barely

138   are working in one.

139   *Interviewer: Do you consider that, in some moment, like it is happening in Germany, if it*

140   *was told in here that in the companies must be generating spaces to attend students from*

141   *the Dual system, could it be feasible?*

142   Mr. [D1]: As a law? But what is that good for?

143   *Interviewer: Like this type of interventions, they are like for public institutions?*

144   Mr. [D1]: It could happen 2 things, if you cannot manage it, everything by force brings a

145   bad result, **when it comes by law or imposition, if you don't talk or create consensus,**

146   **then is not going to work** (Category: Factors that limit Dual system).

147   *Interviewer: So then today, you prefer agreements?*

148   Mr. [D1]: **Yes agreements. It's about management** (Category: Measures to be

149   implemented). Like the task of going and look for companies and they open the doors, and

150   then when it was presented to me, he was talking with me for half an hour and in 15

151   minutes I said, Do it I support you.

152   *Interviewer: So then, you see more that Academy – Company relation?*

153   Mr. [D1]: **Private companies directly with conversation, although yes, the initiative**

154   **comes from the government, if they give scholarships its good** (Category: Measures

155   to be implemented), you want it or not man has paradigms, and we cannot all say, yes we

156   are going to support this government or no we are no. It is a thing of uncertainty in the

157   private sector. In Germany, because in Germany you know that they take 40% or even

158   50% of taxes, but you see them, but they take 30% in here and sometimes I look them and

159   sometimes I do not; well sometimes when I am going back to San Salvador, when I see all

160   the garbage that we have in the streets, so I really do not agree with it.

161   *Interviewer: Now to a level, this is a program that has been impulse a lot with German*

162   *cooperation?*

163   Mr. [D1]: That is correct.

164   *Interviewer: Do you think, that this type of support from the cooperation should continue?*

165   Mr. [D1]: Yes that is excellent, unless that the German government, starts putting

166   conditions then there is no other way. You can take into consideration that we in here, for

167   example, have experiences with successful programs. We have institutionalized a program

168   to support schools with more than two thousand kids, and in all the schools, we sponsor

169   the use of a special software in the department. And this is a successful program, and they

170   finish Microsoft, programming, they finish good.

171   *Interviewer: They finish Certified?*

172   Mr. [D1]: Certified, and it has not, has not been given, has not been touched by the

173   government, and they better not touch it, the education is better.

174   *Interviewer: The dual system, this dual system, is oriented to the subject of integrity*

175   *formation, Do you think that was accomplished? Because of that, it links it directly, with the*

176   *company. According to your point of view, what actions are important, that should be*

177   *implemented in the formation process, to improve the job opportunity level of these young*

178   *people?*

179   Mr. [D1]: I think it has a lot do with poverty, sadly, because it is related, **a young person**

180   **that wants to study Mechatronics, but the parents cannot support him in this crisis,**

181   **so that, as you can see, is a key factor. You have to give scholarships to talent**

182   (Category: Measures to be implemented), but with exams, they have to select the best

183   ones and put them to study, that would be fabulous, because there are lots of young

184   people, that is very talented but, because of situations of life, the cannot study.

185   *Interviewer: And to what level, this group of young people receive a scholarship but to*

186   *guarantee them a job?*

187   Mr. [D1]: Here is limited**, El Salvador is now without workers, if we are the workers of**

188   **the United States, and sadly the good working force goes and works there**

189   (Category: Actions to improve employability). They are good janitors, shoe polishers,

190   sadly, but also, they are used by shops, and they have them "illegal", paying them low

191   salaries, and utilizing a good working force, this is the great country of the United States

192   too.

193   *Interviewer: About this approach, you are telling me that we in here, we are running out of*

194   *qualified personnel.*

195   Mr. [D1]: Yes

196   *Interviewer: How do you see the fact that we are with high indexes of unemployment?*

197   Mr. [D1]: Because, the few that we have we cannot give away, or sometimes there is bad

198   people, but well what is worst, than not having anyone, so do half a job then, you say, if

199   the dual system exists well, you have the right to train, all the right, but no, if he does not

200 improve his performance, for example, I'm projecting myself for the Maya plant, I have to
201 start it again on 2014, I have invested around 20 million, **and I need qualified people, but**
202 **when I see what comes to me, with the professional level, they are from another**
203 **university** (Category: Actions to improve employability). There was this great Salvadoran
204 entrepreneur, he was my boss for a long time and he told me, because I was already
205 Maintenance Manager and they were 12 plants I told him lets buy modern machinery, but
206 **we are not prepared to have computerized technology because we are not going to**
207 **have anyone to repair it, and just like that, our challenges with the new division was**
208 **that, concerning of how to prepare them** (Category: Actions to improve employability).
209 And now I'm worried about the future, I am finished with talent, they are managers now,
210 they are the highest levels, I do not have any replacements for the next 10 years and that
211 is what I'm looking at. With the human resources director seeing what we are going to
212 execute, when we retire or I retire, who is going to stay in charge.

213 *Interviewer: Let me thank you for your time and inputs to strengthen this research. Have a*
214 *nice day.*

Decision maker Interview [D2]	
Interviewer	Reina Durán
Interviewees	Mr. [D2] - Decision maker
Date of Interview recording	July, 11th 2011
Time duration	21:52 minutes
Language	Spanish transcription. English translation
Italic	Ask reaction of interviewer
Standard	Answer and responses of interviewees
Bold	Special emphasis

Note: The transcription can vary lightly in respect to the recording due to the conditions of anonymity of the interviews.

1　This interview was developed on July 11 2011, in the facilities of one of the participating
2　companies in the Dual Formation Program in the Mechatronics career. With the interview
3　we look to identify the reasons that motivate the entrepreneurs and decision makers inside
4　of the company to participate in the formation process of the students enrolled in the
5　Mechatronics career from the class 2008-2010 under the dual system, about their
6　formation process. This information will be utilized in the research called "Research on
7　rising competences in technical education by implementing dual system's elements under
8　El Salvador conditions in the field of Mechatronics".

9　*Interviewer. Good afternoon Mr. [D2], thank you so much for your time to the development*
10　*of this interview, as a part of the process of the research related to the implementation of*
11　*the Dual System in the Mechatronics Career of which your company has been part of the*
12　*learning process.*
13　*With respect to the participation of your company in the Dual System, could you explain*
14　*the reasons why you decided to contribute?*
15　Mr. [D2]: **The training of the personnel according to the proper activities of the**
16　**company, guaranteeing an adequate participation in the discipline, work focus,**
17　**work mechanic and respect to the internal code of the company** (Category:
18　Motivations to be in Dual system).

19 *Interviewer. Now what do you consider it could be limiting the development of the system?*

20 Mr. [D2]: Cost minimization. **Well the economic situation, is a part from the companies**

21 **because, not having so many positions to offer** (Category: Factors that limit Dual

22 system), obviously has to reduce the system.

23 *Interviewer. Of these, Which ones do you think could be the factors, that could be limiting?*

24 Mr. [D2]: T**he costs of maintaining a student. Lack of resources, sometimes, some**

25 **attitudes with the people, with the students, lack of resources from the company**

26 (Category: Factors that limit Dual system).

27 *Interviewer. In respect of measures, what do you think could be implemented, to expand*

28 *the system, in the Academy, the company, the industry, the government, and the*

29 *international cooperation? What measures should they be, for it to expand?*

30 Mr. [D2]: **First there should be, tax incentives, to be able to create through the tax**

31 **breaks, the ability to create more opportunities to hire this type of persons, and it**

32 **has to do now, with a growth from the company, so they can generate jobs**

33 (Category: Measures to be implemented and actions to improve employability).

34 *Interviewer. And the international cooperation?*

35 Mr. [D2]: In the international cooperation, in the private company level, it looks a little

36 difficult because, the international cooperation goes directly to non-profit organizations, not

37 the private sector, and that is a deficiency, because it does not motivate.

38 *Interviewer. But, international cooperation from the point of view that could strengthen the*

39 *formation programs?*

40 Mr. [D2]: Well, in that case yes, because that is the part that I was saying, that you can

41 participate as company that has an incentive to participate in the international cooperation,

42 it means in the company qualifies it could have a warranty of participating there, it's

43 contrast as a company is going to be the disposition of all the resources to shape them.

44 *Interviewer. What do you think, should be done to improve this formation process? For the*

45 *ones that study have better job opportunity level.*

46 Mr. [D2]: **For the students, first to design what we saw in the companies, in the**

47 **practices, and they should be practices that are attached the most to the real**

48 **environment in the company, and to be feedback with the students, because**

49 **sometimes they could have better qualifications, but if they don't have good**

50   **responsibility attitudes, schedule fulfillment, even hygiene standards, that fails**
51   (Category: Measures to be implemented).

52   *Interviewer. Those programs that you were mentioning me, could they be through tax*
53   *reforms?*
54   Mr. [D2]: Yes, **those programs, are linked to the Work Ministry and Finance Ministry,**
55   **and they should be to promote the job with students** (Category: Actions to improve
56   employability), and there is no way that the company opens the door to students, the only
57   way **here in El Salvador for the company to open the doors is to have tax incentives,**
58   **which means to reduce in some way taxes, they you are talking about a flexible**
59   **scheme, regarding to what they are going to pay in insurance, pensions and all the**
60   **expenses that the company makes to pay the student should be taxable, as long as**
61   **they guarantee that the student complies with some conditions, and the**
62   **qualification** (Category: Measures to be implemented), it should be given by the work
63   ministry, because right now the ministry, is signing, or making notes with companies, to
64   help the insert students, of different universities, to us came one from the University of El
65   Salvador, inviting us in the work ministry. Right now that is the path they are taking. Now,
66   to a country level, **the risk is, because the company is very jealous of who they open**
67   **their door to, because of crime, of lack of ethics that exists** (Category: Factors that
68   limit Dual system), you cannot guarantee that a person that is in the university is really an
69   honest person.

70   *Interviewer. Until here with the questions, Thank you for your time.*

Decision maker Interview [D3]	
Interviewer	Reina Durán
Interviewees	Mrs. [D3] - Decision maker
Date of Interview recording	July, 11th 2011
Time duration	25.32 minutes
Language	Spanish transcription. English translation
Italic	Ask reaction of interviewer
Standard	Answer and responses of interviewees
Bold	Special emphasis

Note: The transcription can vary lightly in respect to the recording due to the conditions of anonymity of the interviews.

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2   companies in the Dual Formation Program in the Mechatronics career. With the interview
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6   formation process. This information will be utilized in the research called "Research on
7   rising competences in technical education by implementing dual system's elements under
8   El Salvador conditions in the field of Mechatronics".

9   *Interviewer. Good afternoon Mrs. [D3], thank you so much for your time to the*
10 *development of this interview, as a part of the process of the research related to the*
11 *implementation of the Dual System in the Mechatronics Career of which your company*
12 *has been part of the learning process. From your point view, which have been the factors*
13 *that have motivated you to be in the system? You started in 2008 and you are still in the*
14 *system.*

15 Mrs. [D3]: Right, the proposal was aimed directly at me, I remember I looked, and perhaps

16 **what motivated me was not so much for business philosophy, but on the way I**

17 **studied, I studied in a similar system, having a dual system, learning by doing and**

18 **is the same slogan used by the Academy, then it worked for myself very well, my**

19 **generation was placed much faster** (Category: Motivations to be in Dual system), we

20 brought a resume, and we came with learning either in field or in college, but already had

21 it, when I had something similar, even with the same slogan was, ¨learning by doing"

22 practically said 'this works', because I lived it and I went through the same learning

23 process. So my immediate superiors, I showed it to the director of the company because it

24 was the way I worked, so he said yes agree, support, because it brings certain knowledge

25 already learned in the field with us, and we know a person of these inserts faster because,

26 you know, other than that **we were forming them here without any commitment, there**

27 **was no formal to be paid, was an apprentice** (Category: Motivations to be in Dual

28 system), and often you hire and you happen to work to be learning with people, then it's

29 like I pay and still you do not perform, then this system allowed me that, I work a part, but

30 you're giving me, I'm paying something similar to what I'm giving to learn, then that's why

31 we decided to take it.

32 *Interviewer. I have here a list, of some of the factors that have been identified, that*

33 *sometimes are considered important to be in the system, of which I have mentioned some.*

34 *Could you indicate which do you consider more important to participate in the dual*

35 *system? Main ones? To be inside, of what the dual system?*

36 Mrs. [D3**]: It reduces costs, of training and hiring. From the beginning, it reduces the**

37 **record of hiring the wrong people, it gives us time to know them** (Category:

38 Motivations to be in Dual system), it does not matter how well they are prepared. But is a

39 whole one series of competences, and sometimes, I see the second option similar, training

40 costs and hiring costs. **Also having people that have better competences, according**

41 **to the necessities of the company** (Category: Motivations to be in Dual system).

42 *Interviewer. What factors do you consider could limit the development of the dual system?*

43 Mrs. [D3]: **To continue to us the Dual system is working really good** (Category:

44 Motivations to be in Dual system), but that is the particular case of the company, that you

45 are interviewing right now, **what is happening to me is that the employee does not last**

46 **in here, and is logic because their salary level is higher, and I can pay only until**

47 **certain level, but they come out too prepared to what we cannot hire** (Category:

48   Factor that limit Dual system), in this moment it does not mean that the company where I

49   am, cannot handle the salary levels, and we are seeing it, but simply the resource that we

50   have been training, we hire them and then they can get a better job, at the moment, **if they**

51   **ask me if it was successful for the company, not at this time; it does not mean that**

52   **the system is bad, but for the company is not working because the resource stays**

53   (Category: Factor that limit Dual system), I do not want to say extremely trained as I

54   require, I require it in that level but I still cannot afford it, that is the reality.

55   *Interviewer. Of the following factors which ones do you consider could affect the*

56   *development of the dual system?*

57   Mrs. [D3]: I do not think any of them could affect.

58   *Interviewer. What measures do you think should be implemented, to be able to enlarge the*

59   *coverage of this type of system from the Academy side? What should be done in the*

60   *Academy, to generate more programs of this type?*

61   Mrs. [D3]: Of this type? Or from other careers?

62   *Interviewer. Yes other careers or other institutions.*

63   Mrs. [D3]: hey! **have to do them good feedback they have to be checking and they do**

64   **it, the boys are constantly learning, in the workplace** (Category: Measures to be

65   implemented), I'll say not only in my company, it may be that in another one, they are not

66   learning, they may be as we say just the body, but they really are not learning, then follow

67   up with them so much in fact, they are learning and reviewing, in the company if the

68   company has not only the machines that will be but the people in charge of tutor them, yes

69   that should be rather frequent and fairly constant, it is useless to be a whole year in one

70   place, if only used it to stop a ladder, or like being just an assistant, then seek support from

71   reports of what they are learning and review site out there, I think it is essential, first they

72   have to see the organization, if you have the right people, to understand these issues, you

73   yourself have said, in my office where I am I have to assure you that if you receive that

74   learning by doing, but we are not doing anything for me to have to walk around to any

75   other technician who wants to bring the same way.

76   *Interviewer. And in the company, what measures could be implemented to have more*

77   *coverage?*

78   Mrs. [D3]: For the company…

79   *Interviewer. For the company to be able to receive more students or that more complaining*
80   *enter the system.*
81   Mrs. [D3]: Look always enter like you have done it, **assign a person in charge to be the**
82   **tutor of that person, and communicate with them, and assure that that tutor spends**
83   **time, but you can assign them** (Category: Measures to be implemented), but they don't
84   spend time, and if we are going to do it with another one, education which is precisely
85   what we do not have right now, follow the same pattern, that there a manager, a chief in
86   charge of the young people coming to work, and tell them you are going to work with this
87   person and teach them the objectives because the student is there, in your part it would be
88   for any other.

89   *Interviewer. If we see it from the industry level, what measures do you think should be*
90   *implemented, from the whole sector?*
91   Mrs. [D3]: **Maybe calling the companies, they presented me this form in an individual**
92   **way, to the institution part of this company groups, maybe a breakfast conference,**
93   **show them the advantages, the study plan of what you are looking for, so you could**
94   **capture a higher number of clients in this subject** (Category: Measures to be
95   implemented), because someone presented it to me in an individual matter, suddenly you
96   could have several meetings, for this type and explaining the objective.

97   *Interviewer. So, you see benefits to the system, that could interest to the industry?*
98   Mrs. [D3]: Yes of course, **the students are inserted quicker into a job, because they**
99   **almost go with a secure job** (Category: Actions to improve employability).

100 *Interviewer. With relation to the government, what do you consider should be developed to*
101 *expand the dual system?*
102 Mrs. [D3]: **With the government; I see it difficult there, also this is a private company**
103 **projects** (Category: Measures to be implemented), because I say this, with this situation
104 that we change from one party to another, and we support them or not, they are going to
105 throw away platforms of entire years if another party enters the government. In there, I
106 don't see any security.

107 *Interviewer. And from the international cooperation, do you think they could be supporting*
108 *this kind of effort?*
109 Mrs. [D3]: I would think yes, because is not only about incentivizing the students, to get a
110 Technical degree, but to insert them to a job, and at my pace and I say this from own

111 experience, my scholarship was from the GTZ first and then, the other one was from the
112 Agricultural Development Bank[96] and this bank told me: "I'll give you the scholarship if you
113 come and work for me" and when I was ready to work, they did not have a sport for me, so
114 then they threw away a resource that could have served them, I had to ask for an
115 exoneration letter, for them to release me so I could work because I needed to work, I
116 could not be waiting, so I think yes, **but with the agreements to seek companies and**
117 **assure that the young person I going to get a job, if not what is the point of**
118 **preparing them, if they are going to be sitting unemployed** (Category: Actions to
119 improve employability). The other is the correct, that's the way everyone should do it, I
120 think.

121 *Interviewer. What do you consider should be improved in the formation process to improve*
122 *employment for the young people?*
123 Mrs. [D3]: To elevate the employment level, really they are very looked for, it catches my
124 attention the question, because I reinforce it with a question you made, a person left from
125 here, I mean regarding to studies I think they are good, what for example helps us decide
126 to stay with a student or another one, was their attitude, their character but that is very
127 personal that an institution cannot, **arrange or you have to tell them, how to behave**
128 **inside of a company, but that almost comes from the personality of each of them**
129 (Category: Actions to improve employability), but regarding employment level, in reality of
130 the contraire, they have it high because they took him away from here. It could be,
131 because they are so young, it happens to all of us and we learn from our first jobs. **With**
132 **the dual system they know the rules of the company, what you do not study in the**
133 **universities** (Category: Actions to improve employability).

134 *Interviewer. Finally, thank you for your time and inputs to the good development of this*
135 *research.*

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[96] In Spanish Banco de Fomento Agropecuario

Decision maker Interview [D4]	
Interviewer	Reina Durán
Interviewees	Mr. [D4] - Decision maker
Date of Interview recording	July, 22th 2011
Time duration	32:04 minutes
Language	Spanish transcription. English translation
Italic	Ask reaction of interviewer
Standard	Answer and responses of interviewees
Bold	Special emphasis

Note: The transcription can vary lightly in respect to the recording due to the conditions of anonymity of the interviews

1 This interview was developed on July 22 2011, in the facilities of one of the participating
2 companies in the Dual Formation Program in the Mechatronics career. With the interview
3 we look to identify the reasons that motivate the entrepreneurs and decision makers inside
4 of the company to participate in the formation process of the students enrolled in the
5 Mechatronics career from the class 2008-2010 under the dual system, about their
6 formation process. This information will be utilized in the research called "Research on
7 rising competences in technical education by implementing dual system's elements under
8 El Salvador conditions in the field of Mechatronics".

9 *Interviewer. Good afternoon Mr. [D4], thank you so much for your time to the development*
10 *of this interview, as a part of the process of the research related to the implementation of*
11 *the Dual System in the Mechatronics Career of which your company has been part of the*
12 *learning process. With respect to the participation of your company in the Dual System,*
13 *could you explain the reasons why you decided to participate?*
14 Mr. [D4]: Yes**, in fact, because of the relation or German roots we know that concept,**
15 **so then it looked good, and we decided from the beginning to start with two**
16 **technicians** (Category: Motivations to be in Dual system).

17 *Interviewer. Now, you have more technicians?*

18   Mr. [D4]: After we took one, and then we did not take anyone for reasons of technical need
19   for us to absorb, because if, for the type of work we do **we want to have well-trained**
20   **people with what we need** (Category: Motivations to be in Dual system), but also not to
21   be forming, technicians that go outside because being a purely service agency, it would be
22   like educating the competition, then we have certain part where we cannot continue as
23   other companies involved in the sale of more than one, technical product or a product end
24   and grab technicians to be helping in the day to day maintenance and if they succeeded
25   they absorb them and if not well and go to maintenance, in any other place, but in ours is
26   well specified, then end up stopping where customers, which would be good for students,
27   but we would be closing more market too.

28   *Interviewer. With the quantity you have received have you covered your demand>*
29   Mr. [D4]: **For the time being yes, because of the shrinkage of the market, we cannot**
30   **be thinking in more technical support people but to fight to keep them busy the**
31   **ones that we have, se then we are limited a little** (Category: Factors that limit Dual
32   system).

33   *Interviewer. If the operations were enlarged, would you enter again in the Dual system?*
34   Mr. [D4]: If we start having more equipment, more movement in the services, if our clients
35   work more, they are going to need more service, the we would enter again, we have left
36   for a reason, of the need of a technician ourselves, and not because of a problem,
37   fundamentally of the system, **yes we believe in the system, which is good, we are sure**
38   **it is good, and that is going to wok but right now for our necessity we are not going**
39   **like that** (Category: Motivations to be in Dual system).

40   *Interviewer. How has your experience been in the first class that the Dual System was*
41   *developed?*
42   Mr. [D4]: Experience, it was interesting, we can say it was good, the Academy prepared
43   enough, the process implements or what will be needed for all these deep organizing and
44   all this generated, binnacles, procedures for the study plan, all that was very good. At first,
45   students honestly quite like babies, and suddenly said, are not used to what is working,
46   and rules of behavior at work, when you go out, but that they were holding and then to say
47   they participated as well second and third year I would say, is the last, and so you could
48   see that they were able to participate in the diagnosis, giving them ideas, looking, looking,
49   analyzing a little more in that direction, we went with what we thought, that this was going

50   to be like this, we were aware that, because of the amount of different equipment, different

51   times, we have 25 20 years old machines, and then machines right now, are very different

52   machines, we know it takes us two years with someone as experienced someone without

53   experience are openly talking about four years for them to start.

54   *Interviewer. To dominate the technology?*

55   Mr. [D4]: For them to dominate, for them to confront, to things they haven't necessarily

56   seen or that are not that often, they can face and analyze and resolve them, with time we

57   have more or less this and, with training we are where we expected.

58   *Interviewer. The ones that study in the traditional system also develop the same*

59   *knowledge and abilities. What differences do you observe at the moment of hiring a*

60   *person formed in the dual system in respect to one formed in the traditional system?*

61   Mr. [D4]: I would say it is hard for them, they take a while. They take and they go, but I

62   always say, it is hard for them to take a screw driver, they do not know how to calculate

63   the lever (refers to the traditional system). **They know all the theory, but you tell them,**

64   **take out that cover and they don't know what to do, that is the part that is missing**

65   **when they finish only as a study technician, and they don't have previous**

66   **experience or during the studies, any labor experience** (Category: Factor that limits

67   the system), that has nurtured that part, that is the day to day technician.

68   *Interviewer. How much time does it take to a person that graduated as a technician and*

69   *that was not in the dual system, adapt to work?*

70   Mr. [D4]: Well it takes from 6 months to 2 years, depending on the abilities.

71   *Interviewer. Practically the formation process.*

72   Mr. [D4]: Yes, I consider that from a technician level, there should not be other way than

73   the Dual, in a technician level, mechanic, the technician is essential to have young

74   technicians, that are still fresh because suddenly when they go with 25 years to start

75   working now, for a technician level is a little late. We had good experiences with good

76   students, but in the practice it takes time to adapt, although they are intelligent it takes time

77   take practice.

78   **In the dual formation they bring a lot of experience, in reality the dual, in my opinion,**

79   **for me is an excellent opportunity for students, to train, to someone that haves all**

80   **the theory knowledge that they acquire in the normal technician, they acquire the**

81   **labor experience, of work environment** (Category: Motivations to be in Dual system).

82 That was incorporated, that helped, that learned so then he acquired rhythm, and all that
83 good, and then not all the companies are going to take everyone, and I think is the right
84 thing, to not take everyone, is better to take another student and then they can make a
85 decision the one that stays is also going to serve, to encourage the dual training project,
86 when he looks for a job somewhere else, maybe a company that was not in the dual, him
87 just because of the title of technician, not because they understand this dual training and
88 then they realize, that this young person can do more, and is more independent, and that
89 encourages the national concept, that there are good people with good abilities
90 graduating..

91 I mean not for the employer, also, where the ones that did not stay get a job with the
92 company or other companies that participated in the dual, or with x companies that, rare to
93 the dual, because is that, I feel sometimes that when you start explaining to someone of
94 the dual and weird things, I stay with what I know.

95 **I mean the people from outside, let's say that the companies need to start knowing,**
96 **to start believing, above all the ones that are not in the system, in that type of**
97 **student** (Category: Measures to be implemented), in knowing them and making good
98 experiences for them, that is something that even though it has been 3 and a half years in
99 this, for companies is something recent, there is people that stays outside.

100 *Interviewer. What was it that motivated you, to participate in the system? Besides form the*
101 *previous experience, of a link with a company that knows the German system?*
102 Mr. [D4]: The thing is that, **the boss knows. I know it, because yes some years ago**
103 **came here, a quantity of Germans with the purpose of working in a formation**
104 **system similar in the training** (Category: Motivations to be in Dual system); the Work
105 Ministry created, a national learning department, and in that time, the instruction was from
106 Germans and there were three years receiving classes, and the advantage was that some
107 of the participants had already a job. It was years ago. One of the shareholders of the
108 company commented, how many of them studied Dual in Germany because he lived there
109 and the other in Guatemala, they did dual, from there they worked. And like it usually
110 happens here in the country, the good programs do not last very long, that is why it was
111 disconnected. Only it was in the 60s and then in six months not anymore.

112 For us it was not something new in El Salvador that someone offers, but not the concept, it
113 was not a thought of "it's going to work", not going to work maybe adapts to El Salvador
114 this system, I mean for the benefit.

115 So then, with the German it was that, that theory and practice teaching, let's see if it is only
116 done like this, because in here it was first you do, and then the theory, I mean in one way
117 or another, they obtained a non-formal dual training, but with people that taught theory
118 then that dual concept, in one way or another, you knew and you understood, that the
119 difference of learning something having them washing nuts and you better be good, if you
120 want to stop washing nuts.
121 If not it stays as learning **then that concept, in one way or another, it was very know**
122 **by many in here, so there was no doubt, not much to analyze** (Category: Motivations
123 to be in Dual system),, we saw it as good they are starting this.

124 *Interviewer. Now what do you consider could be limiting, the development of the system*
125 *nationwide?*
126 Mr. [D4]: **It requires a high commitment from the institution, that is doing it, a high**
127 **commitment from the company** (Category: Factors that limit Dual system), I mean for
128 example I have seen, because they have asked me how would it be for me and then
129 taking someone from the dual, and one thing is that there is people, that could support to
130 the tutor part, or that could take that practical knowledge line, in those companies,
131 because sometimes they want them, and that is the risk with the dual training, that people
132 take them as cheap help.

133 *Interviewer. Do you consider that is a risk?*
134 Mr. [D4]: That is a risk because, well around there was a publisher, that asked me we want
135 to take one if not its ok, take one if you sponsor and pay everything, only that if you want
136 him to learn don't have him here in the publisher, send him inside the group of companies
137 that have more maintenance for everything, send him so he can take that part because,
138 there is no one here that could teach him, I mean they don't have even one technician,
139 and they want to take a student.
140 Who's going to teach them, take him and send him to corporate maintenance, that's how
141 they call it and in there they can train them and when he graduates or when he has a year
142 and a half, then come here to get to know the machines, so he can dock with your things,
143 because, **we need companies that have maintenance personnel and have**
144 **maintenance department established, so they can be a real gain** (Category: Factors
145 that limit Dual system).

146 *Interviewer. But it could work for other careers, is it like that?*

147   Mr. [D4]: They have to be in a very formed area I mean I say maintenance because

148   mechatronics if I was a mechanic, an electric I mean, it would be the same if it was

149   something else from the office, because **I can't take a student to manage commerce,**

150   **administration, accounting if I don't have an established department, so then he**

151   **won't be able to carry it. There always has to be someone that has to be well formed**

152   **and that's where the risk of taking them as cheap help, I mean or casuals well that's**

153   **not that difficult** (Category: Factors that limit Dual system). And then the teaching from

154   the company fails, that is vital to give a good result of that, and then the institution that

155   right now the academy is started with a lot of support right, and everything, that some

156   other institute comes offering money, let's put the same, I don't know because if it is a little

157   more commitment it's a lot of work well, in relation to institution, company the relationship

158   with the student and all that has to be in one way or another more personal I mean, it can

159   be like many people wants to manage it.

160   *Interviewer. What factors do you consider important for the development of the dual*

161   *system?*

162   Mr. [D4]: Yes, **the train personnel according to the demands of the company young**

163   **people develop labor experience and there is less risk to hire inappropriate people**

164   **for the company** (Category: Measures to be implemented).

165   *Interviewer. What is the role, that you consider the government should exercise to keep*

166   *moving forward in this system?*

167   Mr. [D4]: It's **better that they stay out, because no. They have to be a controlling part,**

168   **but instead of the government, it should be, I feel that the one that should be in the**

169   **head of this are companies associations** (Category: Measures to be implemented).

170   *Interviewer. The Salvadorian industrial association? Are these the groups, that should be*

171   *in the head?*

172   Mr. [D4]: The government, **more should be involved like having an obligation of giving**

173   **training, with an education** (Category: Measures to be implemented)., but it doesn't end

174   with public schools, in that matter, the government should be there to regulate, so we

175   won't finish up with 15 universities, like we did in the eighties, in **that matter the**

176   **government, controls and puts rules but in the head they should be the companies**

177   **associations, next to the institutions, is something that should not end up**

178   **developing, right now is the academy** (Category: Measures to be implemented),

179　eventually someone else will end up offering this, and that's going to take us to say I'm

180　going to do it like this, and the other one is going to do it completely different and because

181　that only hurts the name of the dual training, and the credibility of the project, in a medium

182　or large time, that's what I see.

183　*Interviewer. What do you consider should be worth in the level of that formation process,*

184　*to improve employment levels of the young people?*

185　Mr. [D4]: I see that **one of the limitations for technicians, in employment, is the**

186　**excess of university graduates, there is simply to many graduates of engineering, of**

187　**bachelors,, year by year, that with the need of a job and everything** (Category:

188　Factors that limit Dual system), they apply to technician jobs, they have apparently,

189　superior training, that definitely is a superior training the university graduates then the

190　technicians, but they are competing with many people, I have even seen it here,

191　sometimes many people want to hire the same engineer with the same three hundred

192　dollars, hire a technician right, the engineer studied more to a hiring level, to put it in

193　practice level, in the end you finish with the people that, it's not the ones that you need for

194　those positions, but for me the people just to get a job they enter and study engineering

195　and they end up opting for technician jobs, It's not the best path but that is a national

196　conscience to have good technicians get what we need, not to take because well this is

197　what is exceeding right now, that is the part why they end up competing with engineers.

198　We all want to be engineers and it's understandable, because engineers get a job, a little

199　better apparently when you start studying, but when you see the reality, I had a engineer

200　that earned $150, but there are engineers that are for more, but with that situation it's what

201　limits the technicians and people to start valuing, and to dignify the job in a matter that, it's

202　not an engineer it's the technicians but he does what I need, he deserves a payment and

203　with that people are going to study more technicians, the technicians are going to be more

204　employed, they are going to be better and at the end everyone wins, well when I see, I get

205　scared when they tell me they are going to hire for me en electric engineer. For them to

206　hire me, I get scared.

207　*Interviewer. Why?*

208　Mr. [D4]: Because it already happened to me. We have to go and repair a machine,

209　suddenly the tool box is closed and what happened, no we have to take out that cover and

210　it's too big, we have to bring a mechanic. I have encountered others, that's why I study

211　engineering to not get dirty. And it's good that the one that studies engineering doesn't

212   want to get dirty well, then we need the people to study a technician, and I see that in the

213   same thing in many places, that they prefer to hire an engineer that supposedly is better

214   prepared, although not necessarily you're going to need, so then really is, **to encourage**

215   **that the students do good, in the companies that stay, when they are hired by**

216   **companies outside, and really when they study they should be taught, to show**

217   **outside that we are from the dual** (Category: Actions to improve employability).

218   *Interviewer. I thank you so much for your availability and information for the good*

219   *development of this research. Thank you so much.*

Decision maker Interview [D5]	
Interviewer	Reina Durán
Interviewees	Mr. [D5] - Decision maker
Date of Interview recording	July, 22th 2011
Time duration	20.12 minutes
Language	Spanish transcription. English translation
Italic	Ask reaction of interviewer
Standard	Answer and responses of interviewees
Bold	Special emphasis

Note: The transcription can vary lightly in respect to the recording due to the conditions of anonymity of the interviews

1 This interview was developed on July 22 2011, in the facilities of one of the participating
2 companies in the Dual Formation Program in the Mechatronics career. With the interview
3 we look to identify the reasons that motivate the entrepreneurs and decision makers inside
4 of the company to participate in the formation process of the students enrolled in the
5 Mechatronics career from the class 2008-2010 under the dual system, about their
6 formation process. This information will be utilized in the research called "Research on
7 rising competences in technical education by implementing dual system's elements under
8 El Salvador conditions in the field of Mechatronics".

9 *Interviewer. Good afternoon Mr. [D5], thank you so much for your time to the development*
10 *of this interview, as a part of the process of the research related to the implementation of*
11 *the Dual System in the Mechatronics Career of which your company has been part of the*
12 *learning process. In respect with the participation of your company in the Dual System,*
13 *could you explain the reasons why you decided to participate? What motivated you?*
14 Mr. [D5]: The company's policy to include new people to the production process and in that
15 sense, **the system gives the opportunity of taking on new youth to the company,**
16 **according to the needs you have** (Category: Motivations to be in Dual system). This is a

17 career that is needed in the training process. **That students know how to solve the real**
18 **problems that we show. This is part of our company culture. Among the main**
19 **factors involved are the people who have to have the technical skills, they know**
20 **how to do things and solve real problems** (Category: Motivations to be in Dual system).
21 The economic factor is not a problem, because what goes into the student is not shocking
22 in the results, but yes having the staff trained. **This is also part of corporate social**
23 **responsibility. Such systems are already known by investors, because it applies in**
24 **their countries** (Category: Motivations to be in Dual system).

25 *Interviewer. From the following factors, that I'm going to show you, which ones do you*
26 *consider generate higher motivation to participate in the Dual System?*
27 Mr. [D5]: For me, maybe from the principals it **could be that reduces the risks of hiring**
28 **the wrong people, and also reduces cost of training** (Category: Motivations to be in
29 Dual system).

30 *Interviewer. Why do you think it reduces the cost of training?*
31 Mr. [D5]: Because to get to be a technician through the textile and laundry industry, we try
32 to, not only have the technical leads, either directly knowledge but keep a level of
33 knowledge, the applicability, technical textiles and, properly then it takes several years,
34 passed for a worker saying that one would like to carry to that level that they will go to
35 work, at least we're talking about, 7 or 8 years of process, then in **that case it is reduced**
36 **because they carry alongside technical knowledge and teach them the application**
37 **and perhaps that level we generate people. For me the cost is reduced, and the time**
38 **to train and willing to employ him** (Category: Motivations to be in Dual system).

39 *Interviewer. What are the factors that could limit to continue developing this system?*
40 Mr. [D5]: **Well the limitations, could be from a decision, so, it would be a decision of**
41 **the authorities** (Category: Factors that limit Dual system). Maybe, according to the role, of
42 the job many can see it as an additional burden or something outside of their job so, you
43 have to occupy a person instructor, a follow-up one, others to addition the daily jobs that
44 they do.

45 *Interviewer. What factors do you consider could limit the development of the Dual system?*
46 Mr. [D5]: **Is necessary to work in careers that are actually needed in the industry and**
47 **formed how they are needed** (Category: Factors that limit Dual system, measures to be
48 implemented and actions to improve employability). There are lots of technician in careers

49   where there is no employment and that many times you have to hire because there are no

50   other alternatives. You also have to give all the resources for an adequate formation.

51   *Interviewer. Could you perceive, any lack of resource from the Academy?*

52   Mr. [D5]: **Let's say, maybe in some practices, some, well they manifested that many**

53   **of the practices were not done, that would be very limited** (Category: Factors that limit

54   Dual system), the resource could be infrastructure, the laboratory, or maybe the quantity of

55   instructors, that they could have. **The coordination could be better, although there is**

56   **good communication. What is missing is the feedback with the teachers** (Category:

57   Factors that limit Dual system).

58   *Interviewer. What measures do you consider should be implemented to enlarge the dual*

59   *system to other careers and other institutions; measures to apply in the company?*

60   Mr. [D5]: In the companies is important that they know the benefits of the system, that is to

61   have capable people, that could help improve production. No company is going to invest

62   efforts, resources and money if it is not demonstrated that is going to serve them to

63   produce more and better. I think there should be approach to the associations to impulse

64   this system in the other companies.

65   *Interviewer. What associations do you refer to?*

66   Mr. [D5]: To the Salvadoran Association of Industrials.

67   *Interviewer. What measures do you consider should be implemented to enlarge the dual*

68   *system to other careers and other institutions; measures to apply in the Academy?*

69   Mr. [D5]: For the Academy, **I consider that the important could be that the careers,**

70   **that your technicians are the ones that we really need in the company** (Category:

71   Measures to be implemented). We have many experiences of people that apply for jobs in

72   low labor levels, **for example some people with university level of engineering and**

73   **bachelors to work as administrative assistants, that is not good, but what is**

74   **happening is that they are not prepared enough to develop in the industry or their**

75   **job field, because they do not have experience** (Category: Measures to be

76   implemented). So we have to prepare what we really need and that they have experience.

77   With this system they are taking experience while they are formed in the Academy. Also,

78   for them to get used to the rules and norms of the company.

79 *Interviewer. And from the government side, what actions do you consider should be*
80 *implemented?*
81 Mr. [D5]: From the government I'm not sure, right now we have done it only agreeing with
82 the Academy, but maybe it would be good that **they supported with scholarships and**
83 **help to communicate or promote the goods of the system** (Category: Measures to be
84 implemented). Until now we do not have any incentives for the ones that are supporting
85 this formation type, and it would be good to think of some kind of retribution so that more
86 companies help the students to do their practices and develop their labor experience. The
87 problem is that if the government does not follow up or does not take care of the
88 education.

89 *Interviewer. This program has been supported by German cooperation in technical*
90 *assistance, formation and equipment. Do you consider that is required to continue with this*
91 *type of support?*
92 Mr. [D5]: Yes definitely. **They have a lot of experience and they give trust to the**
93 **system could be working good; we are a country with few resources and we have to**
94 **take advantage of the different help that we have; but we also have to try learning to**
95 **do the things ourselves** (Category: Measures to be implemented).

96 *Interviewer. How do you think the formation process could be better, to improve*
97 *employment levels of the young population?*
98 Mr. [D5]: **We have many problems of employment, especially for the difficult**
99 **economic situation of companies, now everything is limited and restricted, there is**
100 **much competition, you know that crime has affected us much** (Category: Factors that
101 limit Dual system and actions to improve employability), and we cannot hire anyone for the
102 problems that we have with gangs, here is very difficult area and employees are doing
103 many tests to avoid problems later. In the training they should try to work well and be
104 technically proficient, but **we're much interested in the values of people, and respect**
105 **and responsibility. But this should also be resolved with counter crime that now**
106 **exists. The truth is that we are in a difficult situation in the country, but we have to**
107 **continue our efforts to educate our young people and companies should support**
108 (Category: Actions to improve employability).

109 *Interviewer. I thank you for your time and inputs for the development of this interview.*

Decision maker Interview [D6]	
Interviewer	Reina Durán
Interviewees	Mr. [D6] - Decision maker
Date of Interview recording	July, 25th 2011
Time duration	22.06 minutes
Language	Spanish transcription. English translation
Italic	Ask reaction of interviewer
Standard	Answer and responses of interviewees
Bold	Special emphasis

Note: The transcription can vary lightly in respect to the recording due to the conditions of anonymity of the interviews

1 This interview was developed on July 25 2011, in the facilities of one of the participating

2 companies in the Dual Formation Program in the Mechatronics career. With the interview

3 we look to identify the reasons that motivate the entrepreneurs and decision makers inside

4 of the company to participate in the formation process of the students enrolled in the

5 Mechatronics career from the class 2008-2010 under the dual system, about their

6 formation process. This information will be utilized in the research called "Research on

7 rising competences in technical education by implementing dual system's elements under

8 El Salvador conditions in the field of Mechatronics".

9 *Interviewer. Good day Mr. [D6], thank you so much for your time to the development of this*

10 *interview, as a part of the process of the research related to the implementation of the*

11 *Dual System in the Mechatronics Career of which your company has been part of the*

12 *learning process. In respect with the participation of your company in the Dual System,*

13 *could you explain the reasons why you decided to participate?*

14 Mr. [D6]: **The formation of the staff according to the proper activities of the company,**

15 **guaranteeing, an adequate participation in the discipline, work focus, work**

16 **mechanic and respect of the internal regulations of the company** (Category:

17 Motivations to be in Dual system).

18 *Interviewer. From this factors that you see in here, select three that you consider are the*

19 *most important, that could be important to participate in the system.*

20 Mr. [D6]: **I consider that one of the factors is to minimize costs and that they actually**

21 **help with production** (Category: Motivations to be in Dual system). Now you receive

22 many employees graduated with no experience and you have to spend in training, wait for

23 them to learn the job and there is no immediate productivity, that generates costs to the

24 company.

25 *Interviewer. From your point of view as an entrepreneur, what do you consider could be*

26 *limiting the development of the system?*

27 Mr. [D6**]: Well the economic situation, is part of the companies because, not many**

28 **places have to offer, obviously have to reduce the space for this system. This**

29 **generates maintenance costs of students who may not always be supported by**

30 **companies** (Category: Factors that limit Dual system). Although if the student is going to

31 give better performance and as I said, will improve productivity**, the cost can become an**

32 **investment to have the right people for what we need in business** (Category:

33 Motivations to be in Dual system). Also, many times by the economic situation, there is a

34 lack of resources in companies.

35 *Interviewer. What measures do you think could be implemented, to expand the system, in*

36 *the academy, the company, the industry, the government, and in international*

37 *cooperation?*

38 Mr. [D6]: First **there should be tax incentives right** (Category: Measures to be

39 implemented), so that you can through tax incentives, be able to create, more

40 opportunities of, hiring this type of people, and it has to do right now with, there has to be

41 a grow in the companies, increase in earnings levels, so you can generate employment.

42 *Interviewer. And in the international cooperation?*

43 Mr. [D6]: In the international cooperation, to the private company level, it looks a little

44 difficult because, international cooperation goes directly to non-profit organizations, not to

45 the private company, and that is a deficiency because there is no motivation.

46 *Interviewer. But, international cooperation, from a point of view that it could strengthen the*

47 *formation process?*

48 Mr. [D6]: Well in that case they could, because it could, as I was telling you, you could

49 participate as a company, as company have an incentive to participate in the international

50 cooperation, it means that if the company qualifies, you could have a warranty of

51 participation there, and its counterpart is going to be the disposition of all the resources to

52 give them form.

53 *Interviewer. What do you think, it should be done to improve the formation process, for the*

54 *young people to have better employment levels?*

55 Mr. [D6]: The ones that study, first to design, what we saw in the companies, in the

56 practices, to be practices, **more according to the real environment of the company,**

57 **and that there is feedback with the students, because sometimes they might have**

58 **better grades, but if they don't have good qualities of responsibility, of schedule**

59 **follow, even hygiene regulations, that fails** (Category: Actions to improve

60 employability).   Is good to impulse programs like "My First Job"; these programs are linked

61 to the Ministry of Labor and Ministry of Finance, as we want to promote, the first job with

62 the students. There is no way the company open its doors to students, the only way here

63 in El Salvador so that the company is opening its doors, **is having a tax incentive, which**

64 **reduces somehow the tax, then it is talking about a flexible approach as to what**

65 **they will pay, the costs that the company carries on paying the student income that**

66 **is deductible, provided ensure that the student meets certain conditions** (Category:

67 Actions to improve employability).

68 Now, to the country level, right now the risk is that the company is very jealous of who they

69 open their doors to, because of crime, right, because of lack of ethics, you cannot

70 guarantee that a person in university, really is a honest person. That is what I could say

71 about this subject.

72 Interviewer. Thank you so much for your inputs.

Annex 24. Key persons Interview's transcripts

Key person Interview [K1]	
Interviewer	Reina Durán
Interviewees	Mrs. [K1] – Key person – Sandra de Barraza
Date of Interview recording	December, 14th 2011
Time duration	51:21Minutes
Language	Spanish transcription. English translation
Italic	Ask reaction of interviewer
Standard	Answer and responses of interviewees
Bold	Special emphasis

Note: The transcription can vary lightly in respect to the recording due to the conditions of anonymity of the interviews

1 This interview was developed on July 22 2011, in the offices of Sandra de Barraza, who
2 was the Vice-President of the study center where the Dual System was implemented, and
3 also has developed studies and evaluations about the education system and the industrial
4 sector of El Salvador. With the interview I look to identify the point of view of experts in
5 education subjects and employment of the conditions in which the system could be
6 enlarged in El Salvador as a part of the research called "Research on rising competences
7 in technical education by implementing dual system's elements under El Salvador
8 conditions in the field of Mechatronics".

9 *Interviewer. Good afternoon Mr. [K1], in first place thank you for the space of time you*
10 *have dedicated me to talk a little about the implementation of the dual system that has*
11 *happened in El Salvador in technical formation.*

12 Mrs. [K1]: With pleasure.

13 *Interviewer. Thank you so much, like we talked before, and taking advantage of the*
14 *experience you possess working for years in the development of technical education in El*

15 *Salvador, the link to the company sector, and the implementation of politics in the area of*

16 *Education, I considered it important to know the point of view of how this system could be*

17 *implemented in El Salvador. I will comment on the results of research and then discuss the*

18 *feasibility of the dual system in the country.*

19 *The dual system that was implemented at the Academy, considers two months of study at*

20 *the Academy and one month in the company during the whole process of training for two*

21 *years. Began in 2008, and in 2010 graduated the first student court. In the research I've*

22 *tracking the study since it began until young people are placed within the industry six*

23 *months later.*

24 *The research measured the level of skills and employability of graduates compared to a*

25 *traditional system group. The first was to determine if those in the dual system achieved a*

26 *higher level of competition compared to the traditional system, also measure the level of*

27 *perception of two main actors in the system, they were students and tutors from the same*

28 *company both level of acceptance was having the system over time, with measurements*

29 *in its first year, in its second year and already inserted measurements in the workplace,*

30 *when the process is over; additionally identifies motivates entrepreneurs participate in this*

31 *system.*

32 *The results are that level competencies through assessments (grades) both groups are*

33 *similar. On perception, the traditional system say they strongly agreed not to recommend*

34 *your study system, at the end of the study period although they are satisfied with the*

35 *traditional system, they would not recommend the traditional system. Meanwhile, in the*

36 *evaluation of tutors maintains a favorable view similar during the entire period.*

37 *With tutors was measured the level of acceptance in the program they were participating*

38 *from different variables, one of the variables was that they felt the training they were*

39 *receiving were students mentee and the other opinion was that they thought about training*

40 *student within the company, the other component being assessed was that they felt the*

41 *dual system in general, if they evaluated them if they saw or not if the system could be*

42 *implemented in the country and another component was whether they would recommend*

43 *this system to others . All variables were assessed at the level of perception in the first*

44 *year of study in the second and at the end. The company tutors, and close the program*

45 *saying the system is functional. Those who changed their opinion are the students in the*

46 *traditional way, not to be told that they do not agree with their training, but not the system*

47 *they recommend. Another aspect that worked is to measure the level of employment and*

48 *salary six months after graduation, resulting in better conditions for the dual group*

49 *compared with the traditional. Currently the system has grown in number of students and*

50 *careers of a group of 39 students, now has 196 students, with three new careers and next*

51 *year with the fourth career. Companies participating in the program have also increased.*

52 *Knowing these results, and the needs identified in El Salvador, in the different studies*

53 *linking low Academy with industry and youth unemployment and the low quality of higher*

54 *education, what conditions would you consider should be given for the dual system to be*

55 *viable?*

56 Mrs. [K1]: What conditions, more I think of what you have told me, I highlight a subject that

57 the entrepreneurs said, of a new career that elevates productivity, I take that as truth**, an**

58 **enterprise is going to open a productive space if an only they are going to win; what**

59 **I mean with this is that an academic offer should be designed that answer a very**

60 **specific productivity process that's what is important for the entrepreneur, if you**

61 **don't have that, is not possible to implement the system, because they are not**

62 **academies, or asylums, so then make a job of how can I give human resource that**

63 **increments productivity** (Category: Conditions for Dual system).

64 *Interviewer. Of the evaluated from your interviews with entrepreneurs, What are the areas*

65 *you identify could develop in the dual system?*

66 Mr. [K1] Areas of training, well what I perceive of business is in the case of industrial policy

67 making process where the Mystery of Economics was involved, **the little specialization**

68 **of technical people, one should find an offer that meets the no such gap in food, the**

69 **whole chain, from purchasing materials, process control, control results,**

70 **certifications, standards and all that kind of stuff, that kind of thing is what the**

71 **company wants both foods, as in textiles, laboratories, pharmaceutical chemistry**

72 (Category: Areas for Dual system), the big problem I feel that a little one thing is easy to

73 do, with 39 students is easy to do, with 196 students is tiny, 4 careers, is irrelevant, what is

74 the point where they are willing to pay $ 300 per kid, that requires having as a research

75 approach with those sectors that are priorities, this would be one of the secrets of the dual

76 training, **I do not wonder you have more employability at all does not surprise me, to**

77 **me no wonder you have a good level of retention, that a good percentage to stay**

78 **working, because employers have an opportunity to have someone and evaluate the**

79 **exercise, he comes cheap, very cheap** (Advantages of Dual system), the theme is the

80 designers of that career, these 4, they have materials to design business based

81 educational provision for the years.

82 *Interviewer. What areas of formation or careers do you consider could have an space*
83 *inside of the company?*
84 Mr. [K1] For that I would try to do is check the priorities defined by the government,
85 because there are priorities, obviously is a lot easier when you have dual education sector
86 policy, when you know where you want to move the production base, and I think there is
87 enough information to say that the best companies exporting products and will be willing to
88 make the best products in the world could come, not 50, are 8 companies that can do that,
89 I would take items, there would be a research , there would be designed with the human
90 resources, with production managers, the gaps in regard to human resources, all
91 entrepreneurs complaining about the educational system, all, none has told me that good
92 guys come out. The problem is that they cannot verbalize, puts a student and sit in a
93 production, quality supervisor and the human resources manager and design specialized
94 careers for important items, is not the same chemical pharmaceutical, veterinary
95 production like amounts of dog shampoo, dog vaccines, which require equipment,
96 equipment maintenance procedures, controls, rather than doing textiles, that would be my
97 guiding line, which moves towards industrial production, there would not be another way to
98 think of it that way . **The problem is that academic institutions are forming young**
99 **people coming out and cannot find a job because they have never set foot in a**
100 **production area and this is the advantage of a dual approach in technical careers, I**
101 **do not think that can be done in all of them, in technical you can do it** (Category:
102 Advantages of Dual system)..

103 *Interviewer. Why it cannot be done in other careers?*
104 Mrs. [K1]: I think **it is easier to start in technical careers, because for an entrepreneur**
105 **is much more simper to see practical things than operating** (Category: Measures to
106 expand Dual system), for example I go to a company and ask Do you have an innovation
107 and development department? Because no engineer is formed for that, none, we have
108 tried several times to establish a department of technological innovation, those are big
109 leagues, a stronger job, I think that in two year careers that respond to specific things you
110 can.

111 *Interviewer. Do you consider that to enlarge this dual system, the government should take*
112 *a role? Example Ministry of Education, Ministry of Economy to articulate that the careers*
113 *go according to a sector.*

114   Mrs. [K1]: Yes, they make believe that the production of wealth is what is going to make us
115   grow, the answer is yes, as long as they really believe that the production of wealth is what
116   moves the country.

117   *Interviewer. Some of the entrepreneurs that I talked too, I asked how did they see the role*
118   *of the government in this and their answer was that it was better if they did not interfere,*
119   *that they should only keep a relationship between them and the Academy.*
120   Mrs. [K1]: I'll say it's a very short-sighted on the part of the entrepreneur, I understand that
121   maybe not a request to be made by the employer, how much the Ministry of Education
122   spends on research? Four millions?, Two millions? But is money, for me they should make
123   a defined agenda together, how much does the Department of Statistics and Censuses
124   spends in the polls that makes quarterly based business to a business that makes 2,500;
125   2,700 businesses, but they spend it; There are other units that make investigations, of
126   course what they can do is tiny, yes, **but if you want to take as a state policy have to**
127   **ensure that the Ministry of Finance between the Ministry of Education that enters**
128   **the system and ends count, as a little experience you do not need the State, but**
129   **experience is betting big that form the human resources required for production,**
130   **innovation you need government, the Constitution of the Republic says that**
131   (Category: Measures to expand Dual system).

132   *Interviewer. Do you consider that an internship system of students in the companies could*
133   *also be an alternative?*
134   Mrs. [K1]: **For me the internship system is something else, a dual training system is**
135   **to secure a contract between an institute of higher education with a company or**
136   **group of companies, where we agree that minimum competencies are those that I**
137   **want to be formed** (Category: Advantages of Dual system), considering that the kid
138   knows about punctuality, knows how to read and right, is good at following directions and
139   having basic English, I'm going to say what competence I want, you do the theory and I do
140   get the supervisory practice space, that is the contract; I have the investment, the
141   entrepreneur, making socks, underwear, shirts whatever you want, so I would take sector
142   clusters, if I want to get to that you could do a strategy to address the concerns of
143   business, I have to do cluster, betting concentrate on those with the most potential in
144   foreign markets, that can change the management logic, so I say this is easy to do with
145   196 people and 110 businesses.

146 Another thing is that I identify as it grows the dual system if you cannot do or have labor
147 costs, for example I cannot get to hold 500 students. It is a dynamic economy. It is
148 oriented towards offering the company of course, dynamic economy, selling more
149 responsibilities here or in Central America or in the world, if you have a limitation in your
150 sales, you hardly open spaces. Therefore it is important to take the those edge activities,
151 those successful activities.
152 What I wanted to add is the problem that now generates academic institutions in the case
153 of demand, although I get 500 I cannot get 500. That's why the job requires planning, is
154 the flexibility that the system needs to have, it requires 500 and then they are closed,
155 because I will have a dual education but I won't have the main laboratory which is the
156 private contribution, there you can plan supply, no more than that, without saying you are
157 planning.

158 *Interviewer. Why did you say no to the internships?*
159 Mrs. [K1]: **Internships are usually something that colleges use, they are not**
160 **structured, the company structures not the institution, is a single agreement open**
161 **my space for you to come here and will rely heavily on the skill that you have to take**
162 **advantage of human resource if used or not, or if you give added value to the boy or**
163 **the girl, dual education is something else, is a curriculum designed as shared**
164 (Category: Advantages of Dual system), the internship is to arrive, pass and check if you
165 like it or not. In a University you use internships for young people to find their vocation and
166 ensure you put them in different companies and they discover that they are not good and
167 what is that they like, has another meaning.

168 *Interviewer. What recommendation would you do to an adequate enlargement of the dual*
169 *system?*
170 Mrs. [K1]: The recommendation that **I would do is to sit down with the industry, first**
171 **select on the basis of studies done** (Category: Recommendation to expand Dual
172 system), I think there are enough studies in the Ministry of Economy, in PROESA; enough
173 research so you can say you're going **to concentrate on three sectors 6 things and sit**
174 **there to discuss with employers, because there are sometimes contracts of the style**
175 **of providers of different sizes of company, by the formation of human resources**
176 **that they have, for an engineer or technician, How to solve that problem? Cannot do**
177 **in all sectors, focus on those** (Category: Recommendation to expand Dual system); I do
178 believe that the offer must be very flexible, obviously evolves according to the

179   opportunities out there. That means flexibility at the ministry to test skills. I do not know

180   much about the German system, but what you know about Germany is that they have

181   clearly defined the line which is the technical line and technical line to work a company and

182   if you do not have certain competences, don't think about going to college, you have the

183   state policy on that, which is nothing more than 5 entrepreneurs tell you something, you do

184   not have to be a lawyer but wants to leave the court to have the best salaries to be a

185   judge, not for that; in Germany you are being directed in your vocation, Your talent, they

186   restrict you wanting to go to college, here everyone wants to go to college, they restrict

187   you, **but you know what the role is, technical training by dual method people are**

188   **going to produce more wealth that is why us valid because I enter, because when I**

189   **start generating productivity and that means bills, you need pragmatism here**

190   (Category: Recommendation to expand Dual system).

191   *Interviewer. There are some experiences of Dual system implementation, where in the*

192   *academy there are few laboratory infrastructures, and what they do is to take advantage of*

193   *the companies to strengthen the formation of students. What do you think of that situation?*

194   Mrs. [K1]: This justifies the dual education, you will not find a mechatronic thing in all

195   institutes. But you also have laboratories in the companies. I'll tell you one thing, I do not

196   think a Ministry of Education can do all things, that is capable of making all investments, if I

197   start thinking as an educational system, not as an exceptional institution like the Academy

198   and one must be rational about this, who invests in technology, or should invest in

199   technology, businessman, not investing is not productive and that is noticeable right now

200   with what I've seen with co-financing instruments, everything goes to the technological and

201   is not that the education system does not take responsibility for education, is to be

202   pragmatic, what is the challenge of technical education? Responding to demand, I demand

203   as candy company or chocolates or what you will want in a contract of mutual benefit,

204   you're going to investigate and explain how I make the best chocolate in the world, I'm

205   going to put the plant to make the best chocolate in the world, today we will niche markets,

206   to the world economy that is going to find niches that is already moving companies; then it

207   is not taking responsibility, it is too expensive.

208   **It requires investment in people to learn to understand, the big problem is that the**

209   **Academy does not know understand the productive subject, they do not**

210   **understand, that when the employer says do one, two and three, they should make**

211   **one, two and three; follow instructions for operating the machine**.

212 *Interviewer. To the instructor level?*

213 Mrs. [K1]: That is what I mean, the wealth is done outside and it is done with people;

214 **teachers do not have productive experience** (Category: Limitations to expand Dual

215 system), in the technical case it is impossible not having agreements with the production

216 sector, because you are not educating me to design products, you are educating me to

217 operate production processes, you are not hiring me to imagine how could this company

218 be better and me to tell you lets paint it yellow, you are not hiring me for that, so we have

219 to understand for what are we educating.

220 *Interviewer. Do you consider that the Dual system could be implemented in university*

221 *career of engineering levels?*

222 Mrs. [K1]: That is another thing, It should, I had my daughter 30 years ago, and I had to try

223 the most modern as a mother, with my grandsons 30 years ago I did not imagine what

224 they would have, designing new products means to start thinking what you as a mom or

225 consumer of anything want; and there are always possibilities of designing better products

226 and is better if you understand what a company does. If there could be a model of this that

227 are in an engineering career. What should be understood? Imagine Japan, the production

228 experience of Japan of one thing make 50 things, you must understand what are the

229 properties of that little element, that's why you can make innovation and development, you

230 should take to some entrepreneurs, graduates do not have mental logic to invent things,

231 here everyone know how to follow instructions, designing a new product is the one that is

232 not going to be putted in a box.

233 *Interviewer. Well, until here with the interview. Thank you for your time and your valuable*

234 *inputs for this research.*

235 Mrs. [K1]: Very well.

Key person Interview [K2]	
Interviewer	Reina Durán
Interviewees	Mr.[K2] – Key person – Vice Minister of Education Eduardo Badía Serra
Date of Interview recording	November, 9th 2011
Time duration	49:46 Minutes
Language	Spanish transcription. English translation
Italic	Ask reaction of interviewer
Standard	Answer and responses of interviewees
Bold	Special emphasis

Note: The transcription can vary lightly in respect to the recording due to the conditions of anonymity of the interviews

1 This interview was developed on July 22 2011, in the offices of the Vice Minister of

2 Education Eduardo Badía Serra. With the interview I look to identify the point of view of

3 experts in education subjects and employment of the conditions in which the system could

4 be enlarged in El Salvador as a part of the research called "Research on rising

5 competences in technical education by implementing dual system's elements under El

6 Salvador conditions in the field of Mechatronics".

7 *Interviewer. Good afternoon Mr. [K2], in first place thank you for the space of time you*

8 *have dedicated me to talk a little about the implementation of the dual system that has*

9 *happened in El Salvador in technical formation.*

10 *The purpose of the interview is to learn from your perspective as a person who knows the*

11 *field of education, how the "Implementation of the dual system" might work here in El*

12 *Salvador? This is part of the research I am developing with the Technical University of*

13 *Dresden in Germany. First, I will present the results of the investigation, that the basis of*

14 *the results, which you can see what the picture and contextualize their contributions. This*

15 *research is basically associated with the theme of "As you can raise the level of student*

16 *competence in technical education through the implementation of the Dual System" and is*

17 *targeted to the group of students who were in the career of mechatronics, which is the first*

18 *career in which the system is implemented at the level of higher education.*

19 *The investigation basically starts from conditions, the situation presented here in El*

20 *Salvador, and that is always present in the same context as soon as it starts to run the*

21 *model and one of the points that are stated on employability issues especially in young*

22 *people, that are identified in different studies.*

23 *The research was developed at this level is in the technical area of the mechatronics*

24 *career. The dual system was implemented at the Academy considers two months of study*

25 *at the Academy and one month in the company during the whole process of training for*

26 *two years. Began in 2008, and in 2010 they graduated the first student court. In the*

27 *research I've given since it began tracking the study until the young people are placed*

28 *within the industry six months later.*

29 *The research measured the level of skills and employability of graduates compared to a*

30 *traditional system group. The first was to determine if those in the dual system achieved a*

31 *higher level of competition compared to the traditional system, also measure the level of*

32 *perception of two main actors in the system, that were students and tutors from the same*

33 *company both, the level of acceptance that was having the system over time, with*

34 *measurements in its first year, in its second year and already inserted measurements in*

35 *the workplace, when the process is over; additionally identifies motivates entrepreneurs to*

36 *participate in this system.*

37 *The results are that level competencies through assessments (grades) in both groups are*

38 *similar. On perception, the traditional system say they strongly agreed not to recommend*

39 *your study system, at the end of the study period although they are satisfied with the*

40 *traditional system, they would not recommend the traditional system. Meanwhile,*

41 *evaluating tutors they maintain a favorable view during the entire period.*

42 *On the issue of employability is worked by measuring two variables: the placement rate*

43 *after six months and here you can notice a difference, that is the dual after six months*

44 *eighty-five percent was employed and the traditional fifty-three percent were employed,*

45 *which means the placement level was much faster and give a time tracking how fast they*

46 *are located and where the difference really lies and the difference lies in the level*

47 *retention, forty-one percent of them managed to get a contract.*

48 *Comparing averages in the technical area and against what is minimum wage, minimum*

49 *wage two hundred nineteen, the average of the technicians that came out in that*

promotion because they graduated in October two thousand and ten, this was the

traditional average and this was the average of the dual, means that if achieved a level

slightly higher salary.

After the evaluation from the company side because I interviewed entrepreneurs, what is

that motivated them to be in the system, why did they come into the system, many of them

were already working on similar experiences, for others the system was evaluated in the

sense that they eliminate risks concerning hiring, which means, they get to know for a

period of time the student and may make a decision if they stay or not to a contract, and

the reduction of the training are the issues that they value.

Another important fact that I wanted to show you is how the dual system has been

expanding, I do not know if you know already, but here I have 2008-2010 when the system

starts with thirty-nine students are now one hundred ninety-four according to figures I have

reported, twenty eight tutors, tutors are people hired in companies, which are the ones that

are in the practices are one hundred thirty, twenty two companies and now are one

hundred and ten, and the system has entered four new careers, plus the mechatronics,

logistics and customs, industrial engineering and computer numerical control.

Under this context, considering your experience in the education sector and company

sector, under what conditions do you consider that this system could be implemented in El

Salvador?

Mr. [K2]: Well I do not know, I think I little seeing the experiences that I have in the system, the Academy, some relations that we had with the GTZ or GIZ, and I think that there are still some things that could not permit a conclusive evaluation, first the system is being executed, in a, let's say, it is an universe very, very reduced, in student number as in specialty numbers, and also the objectives, **I mean, the system works in function to that develops very specific competences that suit it very focally to the company where they go, from that point of view I think the system has advantages** (Category: Advantages of Dual system) if it can be very advantageous and provide more competences to those who study under the system, there are some considerations, I told you for example I cannot remember the name of the person who came from GIZ and we talked a little of this, they start from the beginning, it means that the system starts from the very start of the student's curriculum, I see that, I have my doubts there, a student who begins his studies, and from the very beginning when you just, say some bases very, very close to what will be his career, practice starts, I think that six months after the first six

83   months, or after the first two months, but those are issues with the same design of the
84   system, but not the concept, I do believe it is a system, which can enhance good with him,
85   with the traditional, but if this issue that will focus very specifically to a company looking for
86   some very specific skills and competences, well what about these guys if later by "X" or
87   "Y" reason cannot be in that kind of company, and they have no other skills that may
88   others require, that's one of my doubts, here is all the structure, industry or national trade
89   sector, which is too small or too narrow and does not have to say something a good use of
90   technology or appropriate technology, the agricultural is worse, I would say is that the test
91   should be followed and should try running extending, should try to expand on the career of
92   mechatronics, for example, I have my doubts always , that a career which have a range
93   like mechatronics has can be developed over such a small period of time as to have in
94   their study plan, no, I do not see it and watching the training curriculum that it is, that
95   academically occurs too superficial, I mean you run too much, is going very fast, I mean to
96   expand it to other areas and route some sectors, you could have elements for a better
97   grade, for example, say, targeting specific processes that are important in the country,
98   which form much of the national product, such as sugar, such as coffee, such as textiles,
99   anyways, because the industries, not processes, but of pure raw materials handling and
100 transformation of physical forms, especially, normally are very simple and do not require a
101 higher degree of specialization, say all we have along the boulevard of the army, I mean
102 not requiring a degree of preparation as required by slightly more complex processes,
103 petroleum, refinery, power generation, where the competences demanded are going to be
104 more and different. **In summary I would say is that it is too new, it's a, it's an**
105 **interesting system, I think it gives better results than the traditional, of course they**
106 **do, but should be extended, the sample is still very, very small, very small to draw**
107 **conclusions as well as to be definitive** (Category: Recommendation to expand Dual
108 system).

109 *Interviewer. When you mean sectors, do you consider that the dual system could be*
110 *developed in certain sectors like the farming sector, services or others?*
111 Mr. [K2]: **Of course yes, also commercial areas, very specialized, like for example,**
112 **one of the new careers that you showed, customs management which is now very**
113 **distinct, customs for that, well if it works for sure, but if you go to the national GDP**
114 **structure, you will see that most heavy demand and demand they take the energy,**
115 **water and some that are very typical industrial and are still holding as sugar, coffee,**

116 **and finally, the competences they require, are different from the skills of a**
117 **processing industry where machines are what make everything and what you need**
118 **are machine operators, then yes, as mechatronics, automation and control systems**
119 (Category: Recommendation to expand Dual system),, if yes, but the competition you need
120 a technician who is going to get into thermoelectric or, or wit, say, or a textile , or energy or
121 petroleum sector, they are different is not enough, I'm very quickly of course, because I
122 have not been at it directly, but if a study plan I have seen very shallow so I say, well, a
123 boy doing this two months in class, in the classroom and then goes to the factory to start
124 his career, at the very start of his career, what is this guy going to make in the factory,
125 what competence can he grab, I think, and said in a very general practice should probably
126 start a little later, when the boy has a few basic elements, that well; but the system if I see
127 it, I see you have, the many advantages that could be exploited, and there is a factor
128 there, imponderable, that is, the kind of apprehension that the student gets, seeing that he
129 is practicing what will be after a career that is a very positive for them, because as you say
130 the internship, then yes, it does help, but what we have had are internships and
131 undirected, very open, well I'm going to the factory and I'm there six months and barely
132 directed, but the interest of the company is not concerned about my training, however here
133 there is a structure system.

134 *Interviewer. The current structure having at least at the time of this research, in the coming*
135 *months, a month of company induction, to meet performance standards, and assessments*
136 *within the program leading to if they are achieving new skills or not, is that both the student*
137 *is being integrated teams to work within, within the company, as this was more to the side*
138 *of the industry, within the plant, whether it meets standards of safety, which means*
139 *oriented more topics, including behavior and his attitude regarding its compliance of*
140 *schedule, which is what can be seen as a purpose, but the observation is made by the*
141 *same tutors and some students who also observed.*
142 Mr. [K2]: For example, In what companies are this young people?

143 *Interviewer. They are all related to the industry, most of them classified as companies semi*
144 *automatized or automatized.*
145 Mr. [K2]: But, What type of process?
146 *Interviewer. It varies, there are some food ones, construction, services, textiles, among*
147 *others.*

148   Mr. [K2]: Is for what I saw**,** we saw basically the study plan precisely, the mechatronics

149   study program is new, but, look, join mechanics with electronics and try to comprehend it

150   still technically in two years is not possible, I think it is a mistake, it's a good try, and there

151   is a good purpose, but when you see the program you say, well these guys were given a

152   single introduction, sell, they do not have the skills required by for example a plant as

153   businesses in El Salvador, which are a bit more complex, processes are industries where

154   the machine and what you have to do is to know how to operate the machine, nothing

155   more, whether or not this automated, is the kind of company which is going to go, because

156   that is important because I do not think you can have a good practice.

157   Ten months is a bit beaten, so I say I'm sorry that you have to expand the sample, I would

158   guide the specialties by specialties, say it was engineering, we will draw mechatronics

159   technicians or technical developments either, but rather by processes, by which the

160   demands of the processes, perhaps consider whether it should go more by processes,

161   hence the problem is the smallness of the domestic supply, there is a mill or refinery in the

162   country, if there are three thermals.

163   *Interviewer. Do you consider that the challenge to resolve is the reduced national offer in*

164   *that industry by processes?*

165   Mr. [K2]: Yes, yes, not to abandon specialties, myself that Mechatronics concept I don't

166   understand it very well, in this period is to get back, I remember when I entered the faculty,

167   the engineers, in the electric and mechanic branch ended up in one as electro mechanics,

168   then they divided, in electrics, mechanics, electronics, and now I feel that is coming back

169   when the specialty level is higher, it appears to me that is a bit contradictory, not

170   contradictory but because you are trying to do so much in a short period of time, in some

171   areas that are very specialized, but well you can keep the options, **but also try**

172   **processes, by industry processes, by sectors, sub sectors, how to behave or how to**

173   **prepare the ones that are going to the energy sector, or to the sugar sector, the**

174   **coffee sector or the textile sector, that effectively is strong and not so much on**

175   **industries by physics processes, because in there you take the machine and learn**

176   **how to operate, and you operate and then take another machine that is different and**

177   **you simply learn how to operate it and you operate** (Category: Recommendation to

178   expand Dual system).

179   *Interviewer. About the dual system how do you consider the concept of forming between*

180   *the Academy and the company?*

181   Mr. [K2]: The concept is magnificent, it seems really good to me, with some shades there
182   as I was saying the practice should start later, but those are design things, study plan, but
183   the concept of the system to me is really good.

184   *Interviewer. What challenges do you think, should be confronted to enlarge the system?*
185   Mr. [K2]: **Greater involvement of the company, and I think what is missing is that the**
186   **company to start to have confidence, in educational institutions has been a little**
187   **problem, the company for various reasons have not trusted educational institutions**
188   **and a bit like has been closed** (Category: Conditions for Dual system), if achieved
189   greater openness of business and the boys had a greater chance of entering participation
190   in that system, I think is very good; the system concept, I think, to the technical level, I
191   think it's excellent, it's very, very good, it greatly improves the traditional, I mean, I finished,
192   as we said, and now we will practice this is, is more substantive especially if there is a
193   connection, if there is supervisor follow up, if there is control, if the boy on his appraisal
194   practice which is very good, the problem I see in that first two years to train a technician,
195   that is no problem for the company, is a problem of the education sector, but two years to
196   train a technician, you cannot, even three, I think it's a bit short, but well three years, it
197   seems a good value, especially in specialties like that, as mechatronics where elements
198   mechanical, electrical, electronic, control, automation, security, well that's a problem that
199   the educational system must solve, the law says that at least two years but at least when
200   he says the institution will therefore obviously that's a problem, then the type of specialty, I
201   insist the type of specialty that are forming. Technicians are always in auto mechanics,
202   food technologists, technicians, the same, the same, the same elements, mechanical
203   technician, well yes, but today is a lot of things, electrical technician, yes, but a lot of
204   things, is too wide in a very short time, because there is greater electrical technicians. Let
205   power systems technicians or technicians that can manage substations, or do this, and
206   expand over time, and the other is that it is important to go to sectors, the need of the
207   sectors are sometimes very specific especially when the industry is of a continuous type,
208   continuous flow process because bundles of processes for batch or charge, then examine
209   the possibility that they may see specialties, technicians prepare say control systems for
210   the sugar and alcohol industry, and technical control systems for the textile sector, which
211   will be the two technicians that will be in control systems but the needs of the textile and
212   sugar sector or energy sector are different.

213 *Interviewer. Do you consider that the implementation of the Dual System, helps to improve*
214 *the quality level of the technical formation?*
215 Mr. [K2]: **Yes, yes, the model of the concept is really good we wished we had it**
216 **generalized in the technical level** (Category: Areas for Dual system), now what you are
217 facing is that there are problems with the application that were logical appeared mostly
218 under test, which is starting in order that it is normal that you are seeing happen, then
219 there you go, well, the experience is saying this happened here needs to be altered, but
220 the concept as such is undoubtedly good outweighs the traditional, there are two
221 requirements, one, a good education and a good opening of the company because, the
222 system without the business, is more than the company is finished believing in him, and
223 more willing and provide better conditions, better elements, better tutoring, because I
224 understand that tutors, I do not know who pays them.

225 *Interviewer. They are paid by the company; the tutor is an employee of the company,*
226 *normally a production manager.*
227 Mr. [K2]: Which is really good so then the tutor keeps or gives follow up, with a very
228 practical sense, and is not just another theoretical element that is in there. **The concept**
229 **is really good, it has difficulties, it has to keep being tested, maybe needs to be**
230 **enlarged, try to harmonize that of study plan of the technicians, I still think they are**
231 **a little weak, a little fragile, and a better relation, try with the sectors** (Category:
232 Measures to expand Dual system); because you can go to the GDP and you are going to
233 see what that sub sectors or industrial and commercial sectors are contributing, there may
234 be many more factories of industries, large and small and stuff, but the others are few and
235 contribute more and, and have much more demand in the mills I saw it, they complain that
236 the technicians come so very general. Since I can remember, but always so very general,
237 then the technician always get to learn there in the company, to the company.

238 *Interviewer. Do you consider that this system could be enlarged to university careers?*
239 Mr. [K2]: In there, well because of the university level, is now an academic level, we are
240 not talking about competences anymore, I mean, technician is a technician, the engineer, I
241 don't know if the engineer, is a bit of confusion we have, we believe that the electrical
242 engineer is the one who walks changing bulbs, no, the engineer is a designer, a calculator,
243 a planner, a cost optimizer, in short, is another concept, going, if it is, can be an operating
244 engineer, but the purpose of the engineer is not to go to operate the machine, first, what
245 the worker does better or the technician that is more prepared, the engineer is a man who

246 will design, estimate, repair, install, operate in the sense of optimizing costs, streamline

247 operations, there is a completely different concept, the engineer needs other skills other

248 skills, do not think it's convenient.

249 *Interviewer. There are experiences in Germany, where university formation is linked to the*

250 *company, do you see it doable for El Salvador?*

251 Mr. [K2]: But I do not think, that is, be an engineer to operate a machine will think it is a

252 waste time, money, resources and the man is going to get frustrated, that's a concept

253 we've had mechanical engineer well he is going to go to repair the car, is not that he

254 cannot do it, but that is to spend seven-year career to go to change a light bulb or to go to,

255 this is not the work. An extra cost is spent, and also on a personal level,

256 *Interviewer. My question refers to the company going to develop experience in the*

257 *planning, design and other tasks proper of engineers.*

258 Mr. [K2]: No, I do not think is necessary, that continuous system of being part in the

259 university, part in the company I do not think is needed.

260 *Interviewer. Until here with the interview, than you for your time and inputs for this*

261 *research. If you wish to add anything that could be useful to the research.*

262 Mr. [K2]: As I repeat, **that I see there is a lot of impulse to continue with this system I**

263 **find to the technical level, excellent, a good alternative, does not negate the other,**

264 **but it is a good alternative, what you have to do is continue the pilot , trying to**

265 **expand, improve, get into some good examine study plans of institutions and**

266 **practical ways to establish a better relationship, because one hundred and ninety**

267 **boys, or one hundred companies is still very little that should be in thousand**

268 **companies** (Category: Measures to expand Dual system) or so, but the, the system as a

269 concept seems to me a very good alternative, where to put it, that's a matter of plan

270 design, most going to the education system. For example in mechatronics, I see so much

271 enthusiasm and that of mechatronics and that is fine and I see the plan and tell where are

272 these guys going to go and I have my doubts, nothing else, I have my doubts, I cannot say

273 no , but I have my doubts, then, is too comprehensive for such a short time, in a time

274 where we are in the area of specialization, today we are talking of subspecialties, then put

275 electronic, mechanical, control systems, PLC, in two years a compressed there, I still have

276 my doubts, maybe go to the, to the specialty, more highly targeted toward skills, that is the

277   trend, yes, good or bad but it is the trend.

278   *Interviewer. Thank you for your inputs.*

Key person Interview [K3]	
Interviewer	Reina Durán
Interviewees	Mr. [K3] – Key person Carlos Cromeyer
Date of Interview recording	December,9th 2011
Time duration	33:11 Minutes
Language	Spanish transcription. English translation
Italic	Ask reaction of interviewer
Standard	Answer and responses of interviewees
Bold	Special emphasis

Note: The transcription can vary lightly in respect to the recording due to the conditions of anonymity of the interviews

1　This interview was developed on December 9 2011, in the offices of Carlos Cromeyer,
2　who was the provost in the moment that was decided to implement the Dual System; also
3　he was president and vice president of the board of directors of the academy. With the
4　interview I look to identify the point of view of experts in education subjects and
5　employment of the conditions in which the system could be enlarged in El Salvador as a
6　part of the research called "Research on rising competences in technical education by
7　implementing dual system's elements under El Salvador conditions in the field of
8　Mechatronics".

9　*Interviewer. Good afternoon Mr. [K3], in first place thank you for the space of time you*
10　*have dedicated me to talk a little about the implementation of the dual system that has*
11　*happened in El Salvador in technical formation. The objective of the interview is to know*
12　*from your perspective, of a person that impulse the implementation of this system in El*
13　*Salvador.*
14　*The first thing I am going to do is present to you de results of the research, so that taking*
15　*from the results, you can see what is the panorama and contextualize your inputs, to later*
16　*talk about the feasibility of the Dual System in the country.*
17　*The Dual System that was implemented in the Academy, measured the level of skills and*
18　*employability of graduates compared to a traditional system group. The first was to*

19 *determine if those in the dual system achieved a higher level of competition compared to*
20 *the traditional system, also measure the level of perception of two main actors in the*
21 *system, they were students and tutors from the same company both level of acceptance*
22 *was having the system over time, with measurements in its first year, in its second year*
23 *and already inserted measurements in the workplace, when the process is over;*
24 *additionally identifies motivates entrepreneurs participate in this system.*
25 *The results are that level competencies through assessments (grades) both groups are*
26 *similar. On perception, the traditional system say they strongly agreed not to recommend*
27 *your study system, at the end of the study period although they are satisfied with the*
28 *traditional system, they would not recommend the traditional system. Meanwhile, in the*
29 *evaluation of tutors maintains a favorable view similar during the entire period.*
30 *With tutors was measured the level of acceptance in the program they were participating*
31 *from different variables, one of the variables was that they felt the training they were*
32 *receiving were students mentee and the other opinion was that they thought about training*
33 *student within the company, the other component being assessed was that they felt the*
34 *dual system in general, if they evaluated them if they saw or not if the system could be*
35 *implemented in the country and another component was whether they would recommend*
36 *this system to others . All variables were assessed at the level of perception in the first*
37 *year of study in the second and at the end. The company tutors, and close the program*
38 *saying the system is functional. Those who changed their opinion are the students in the*
39 *traditional way, not to be told that they do not agree with their training, but not the system*
40 *they recommend. Another aspect that worked is to measure the level of employment and*
41 *salary six months after graduation, resulting in better conditions for the dual group*
42 *compared with the traditional. Currently the system has grown in number of students and*
43 *careers of a group of 39 students, now has 196 students, with three new careers and next*
44 *year with the fourth career. Companies participating in the program have also increased.*
45 *Knowing that under your direction the implementation of this system in technical formation*
46 *started could you expose, what were the reasons why it was decided to implement the*
47 *dual system?*
48 Mr. [K3]: Well, at the Academy we were happy with the professional practice students do
49 before graduation, this allowed us to have a rapprochement with business, but as always
50 felt we needed something that practice fell short, because those very few months what the
51 student was associated with the company. So we went to talk with GTZ to ask for them to
52 tell us if they knew more about the student's relationship with the company, the

53 relationship of the school with the company, and they told us at GTZ, about a dual system
54 that existed similar to INSAFORP like what was driving in the country, but in the
55 professional area, a system that they called ¨dual system ¨ which had been practically
56 developed in Germany, we told them that we found interesting dual system. We ask for
57 help, we ask an expert, and we said yes, they could support us with the expert. When the
58 expert arrived in the country to promote the dual system, the idea was to sell the dual
59 system not only as something new, but to implement it into a career that was very
60 attractive to young people, it was a new career of great need in the country, but not only in
61 the country but in Central America and in almost all parts of the world and since then with
62 the help of the German expert, who seek careers that could be implemented, and this is
63 how we had to choose between Mechatronics and textiles but we felt that the textile field
64 was not where the Academy was developed, then chose the career of Mechatronics with
65 good sense and that is how we decided to link, dual education system in the country with
66 the career of Mechatronics.

67 *Interviewer. According to the data of Technician placement in the companies, it appears*
68 *that they have a good level,, close to 80%, Was there any additional expectation with the*
69 *implementation of the dual system?*
70 Mr. [K3]: Yes, we looked, realistically **we had two expectations, one of them was that**
71 **the enterprise helped the students in the development of their one and a half years**
72 **of study, pay a part of the career and the second one was to improve employment**
73 **levels** (Category: Expectations about Dual system), because with the traditional level that
74 we had, not always the young people stayed working in the company, there 3 really the
75 fundamental ideas, that the students had support for their studies, improve employment
76 **and that at the end they had better salary conditions than the different careers that**
77 **the Academy was promoting** (Category: Expectations about Dual system).

78 *Interviewer. When you refer to salary conditions, What is it that you were looking?*
79 Mr. [K3]: Looking that the student exceeded the average, because we had a study of how
80 much the students earned at the end of the career, and was well below average, then we
81 thought them with last-minute technology, with a career that substantially was needed in
82 the country, after companies have known them for two years and a half, they could offer
83 better than average salary that were making the others who were in the traditional system.
84 The decision was taken by the board of the institution, and on board were these decisions
85 and what board was hoping was, to improve the quality of life of young people when they

86   graduated through better pay, and a rapid and early employability, we expected that 90 or
87   95% of students to stay working in companies that had sponsored his studies.

88   *Interviewer. Are you satisfied with the results of the model implementation?*
89   Mr. [K3]: Yes.

90   *Interviewer. Why?*
91   Mr. [K3]: We are pleased but we think it can be improved, and should improve, there
92   should be more support. **Well, first it was supported by a lot of companies, because it**
93   **was a pilot project, we obtained financial support for students to cover their**
94   **expenses and they could go visit, and pay tuition and then as I've learned , is a good**
95   **percentage of young people who have stayed within companies, not the percentage**
96   **that was expected, but quite acceptable percentage to be the pilot, to be the first**
97   **experience, I think it has been very successful** (Category: Expectation about Dual
98   system).

99   *Interviewer. What was the percentage you expected?*
100   Mr. [K3]: As I was telling you before, we thought of 90% or 95%, should have stayed in the
101   companies, but we did not have data, we did not have any numbers to say that, it was just
102   our expectation, our feeling and I feel that in near times when the economy of the country
103   improves and they know more the career of Mechatronics and know all the goods of the
104   dual system I think they are going to reach 100%.

105   *Interviewer. Do you consider that the present economic situation could be affecting the*
106   *development of the system?*
107   Mr. [K3]: **Yes, definitely, because sadly is that many companies have reduced their**
108   **staff, others have not grown for the lack of sales** (Category: Conditions about Dual
109   system), and if the economic situation definitely not only of the country but the entire
110   region globally affected some companies can hire new staff.

111   *Interviewer. Which do you think are the consequences in the subject of employment, that*
112   *the implementation of systems that combine theory and practice?*
113   Mr. [K3]: The consequences are positive, because one of the biggest accusations about
114   university studies is that they are theoretical and that if the student does not care about
115   himself, to seek work that is within the competence of what he is studying, actually
116   graduate with theory only, and there in the Academy had professional practices but it was

117 very little, **I think it should be stronger the implementation of combining theory with**
118 **practice and that's a good thing for young people when they are graduates**
119 (Category: Advantages about Dual system).

120 *Interviewer. How do you think that the dual system could improve the quality of technical*
121 *education in El Salvador?*
122 Mr. [K3]: When you combine the theory with intensive practice definitely the quality of
123 technological or technical studies is going to improve.

124 *Interviewer. Why?*
125 Mr. [K3]: For the combination, because they're going to live since he started his first
126 months in the institution, in the academy, they are going to live what is the practice, they
127 will learn how to operate a business, what are the requirements, what are the demands of
128 working within a company, but they do not come as laborers, or as people who go to work
129 there, but they come as students going to complement their studies in the workplace, but
130 the experience of being there is a production to meet, you have to meet the standards of
131 reality, hygiene, industrial safety, that they were going to remember from the beginning
132 and the end they are good technicians, good professionals.

133 *Interviewer. This has any implication from the teachers' side, of the teacher preparation?*
134 Mr. [K3]: Yes, definitely, **the teacher has to go out of the classroom, and have a**
135 **relation with the companies, because is not possible that a person is giving theory**
136 **and does not know how a company works, does not train and does not know more**
137 **of this relation of company- student** (Category: Conditions for Dual system), this is
138 complete, then teachers have to be more prepared and more ready to get into what is the
139 dual system. The implementation was done through a pilot, not all areas were covered,
140 and all needs, as they do in Germany, as they do in other countries in South America, or
141 the United States. Maybe teacher training was a weak thing of the plan but it was
142 overcome, why? Because within companies we took some tutors who taught them what
143 the dual system, was dealing with students, they were able to develop the snap, the study
144 that the young within the company, that overcame a little, not necessarily 100%, the lack of
145 the teacher was connected with the company, but I believe that today the practice is being
146 exceeded.

147 *Interviewer. What do you consider are the possibilities that this experience could be*
148 *expanded in El Salvador?*

149　Mr. [K3]: **I think that this experience should be supported, expanded, the Ministry of**
150　**Education must put all the effort in this new method, is an innovative system in the**
151　**country** (Category: Measures to expand Dual system). It has to expand just like in South
152　America, this could go to other careers, that not necessarily are technical, the dual system,
153　but here in the country has to expand, the Ministry of Education must know the goods of
154　the system of the dual system and we thank this would solve and great quantity of
155　employment problems that are there, people would be better prepared, the students would
156　be loyal to the companies, that have helped them, that have godfathered them during all
157　their studies and has opened their companies, **I think that here in El Salvador is a good**
158　**soil for this, and it must be done, we must change the laws, they must implement**
159　**the dual system modality in their laws and norms** (Category: Measures to expand
160　Dual system).

161　*Interviewer. When you say "the great quantity of employment problems; and that with this*
162　*it could work, to what type of problem do you refer?*
163　Mr. [K3]: For example: when a student is on the old system the practice is a very short
164　time, this student when he enters, this new professional when he enters to work do not
165　know much of the safety, quality standards, of the demands of companies within a
166　company that is certainly not going to be robots that are very serious but they must keep
167　order, must be serious, when the jokes are perhaps for snack time, but not within the job,
168　as it may cause great danger to the health of them, then young people are often dismissed
169　or are removed because they do not meet the requirements of business, they have their
170　rules of conduct, of how they should behave, and as personnel working in them, if they
171　already get to know from student when they graduate and become professionals, will no
172　longer have that problem with the production people because they know how to behave,
173　they know safety and health of companies, institutions, then I think that, that most of the
174　layoffs, reductions of working people, that is why, because they do not know how to
175　behave within a company.

176　*Interviewer. What do you think are the big challenges that must be confronted to have a*
177　*successful implementation in El Salvador?*
178　Mr. [K3]: That's a difficult question to answer, I say that the State must continue its
179　subsidiary part, and that part which is the subsidiary of the state, make rules and
180　regulations so then will move the two major components of this game. A dual education,
181　the dual system, then the two major components are: the academy and employers and the

182   state must participate as within its subsidiary agreement that is to establish the norms,
183   rules of the game for not participating, do not make it mandatory, not be said to exist, and
184   that people should go slowly participating, laws and all that, as will be implemented with
185   the help of the three elements, the state as a facilitator and then the business relationship
186   with the academy**, I think that's the best way to implement this, they can talk, the**
187   **academy can speak freely with employers to agree on how they will support, how**
188   **they will do and how many students are going to take, and the State to recognize the**
189   **efforts of companies giving some incentives to make the program a success**
190   (Category: Measures to expand Dual system).

191   *Interviewer. What positive conditions do you identify that help to the development of this*
192   *model?*
193   Mr. [K3]: Is an attractive model, there are good experiences, is a model that incentives
194   youth, youth with low resources that cannot study, would see this of being able to find
195   sponsors, that help them with the studies because this has to be expanded to other
196   careers not only to stay in Mechatronic, if it was inside of the technical careers it would be
197   much better, that is what the country needs, more technicians; so then what is good, is
198   attractive, is beautiful, is innovating, the young students would be motivated, they would
199   have an incentive, the desertion would drop in academic centers, and at the end the
200   companies would see that they do not have to spend that much in additional training when
201   they treat a person to work in a certain area, Mechatronic, CNC or any other..

202   *Interviewer. What measures do you consider that should be implemented for the*
203   *implementation of the system?*
204   Mr. [K3]: Well, I said before, here is that the three major participants sit down, and agree,
205   as the state dictates the rules and laws, the private company that is going to put the
206   resources and will accommodate and will open their businesses to students and the
207   academy, it cannot be something imposed where you say to the company, you are going
208   to accept 10 students, cannot be because that would be a burden, employers have to see
209   it as an investment , and if it is imposed ruins the game, ruining the business, then they
210   must sit and talk, and should see the experiences that are outside, remove all color of
211   party flags, and work the state dictating its rules and laws, spoken with employers and with
212   the Academy, I think that's the positive way in which they could implement it.

213 *Interviewer. What do you consider that motivated the companies to participate in the*
214 *system?*

215 Mr. [K3]: Look, businessman are smart, entrepreneurs definitely saw that this was going to
216 yield good fruits to them, I remember many times saying ¨ I will not have to bring a
217 technician from Germany to see my machine, and I will not have to go to bring, search for
218 technicians in Costa Rica, Colombia or elsewhere ¨ ... because I'm going to have a skilled
219 workforce, although they are not workers, but I will have specialized technicians and
220 skilled in this area, and will know what they think and how I want things, then
221 entrepreneurs saw that, but I think that is part of the corporate social responsibility of
222 business, then they saw a way to help, unless fate willed it so many of these companies
223 have people who already knew the system from different viewpoints, different angles and I
224 knew then that was what had helped a sufficient opening to start with the first group.

225 *Interviewer. How do you see, the role that has been played by international cooperation in*
226 *the implementation of the model?*

227 Mr. [K3]: **Important, here with this model, it should seek international cooperation to**
228 **bring experts, experts not only in technology, but experts who can open his eyes, to**
229 **the industrialists, entrepreneurs to know that this system has a lot benefits, virtues**
230 **and benefits** (Category: Measures to expand Dual system) that they can catch, they can
231 enjoy, then yes. You definitely have to do; the institute was supported to mount all
232 Mechatronics laboratories, which were a success, then the international community's
233 support of foreign people are critical, should not be neglected.

234 *Interviewer. You mentioned the support with the implementation of the laboratories, there*
235 *are some documents that say that the system works, but is expensive for the country,*
236 *because it means investing in this equipment; for what you are saying it seems that the*
237 *system is associated with the implementation of technology. Is it like that?*

238 Mr. [K3]: I cannot teach Mechatronics, with obsolete equipment, definitely I cannot teach in
239 ¨ C ¨ if I don't have the latest in technology so that young people get to know what it is and
240 what companies have, if the country does not think that must have an industrial revolution,
241 where we should support industrialists to change their equipment, put them with the latest
242 technology, there must be a better investment for production, we will not really go out
243 anywhere, there must be an industrial revolution - technological deal where mechatronics,
244 computer numerical control, chemistry, because all that apply dual education, whether to
245 invest and necessary, the academy also has to invest, you cannot be thinking about

246 obsolete things, when the train of the future is well ahead, and still thinking that if we buy
247 our laboratories improve or not, absolutely cannot be only with what I studied, the
248 laboratories where I studied, and are obsolete, that cannot happen, we should worry,
249 things are necessary and for that I say, we have to seek the support of international
250 organizations.

251 *Interviewer. Should I understand then that, from your point of view the expansion of the*
252 *dual model should go next to innovating careers, with up to date technology?*
253 Mr. [K3]: That is correct.

254 *Interviewer. What recommendation would you give so that other institutions implement the*
255 *dual system?*
256 Mr. [K3]: Here you have to go to teach to the enterprises, go touch the door of each of
257 them, teach them, look what is happening in the world, look at what we are bringing into
258 the country, mount the train, dual education is good, flexible, something that will get us out
259 of the impasse that we have fallen, then we have to go and visit these companies and
260 show them. Look this is what we have done with this support, with this company, if you
261 help us we can do much more, but if you come to the company to ask them: look company
262 help me to pay the secretary, the accountant and the janitor, no, this is a win - win, you
263 hop on this boat company, help these students, do not help me, help students to finance
264 their studies and they will serve you the best way to you, you are going out winning
265 because you will have better productivity, have lower labor problems, will be able to think
266 of exporting and being better. That is my way of thinking.

267 *Interviewer. How do you think the system could support the development of the economy?*
268 Mr. [K3]: **Giving better technicians, technicians with better salaries, companies with**
269 **better production** (Category: Advantages of Dual system), because if a technician is
270 better, I say it is a technical but a professional, better paid will carry more goods to your
271 home, and young people are going to think about forming a new home, and think about
272 buying their furniture, then we will have a generation, and the wheel of the economy will be
273 rotating, the multiplier effect of the economy is going to get known and we will be watching,
274 then it will bring wealth where we have only subsistence wages right now, remember that
275 one of the main objectives was to seek better pay and better employability, what good
276 could it be to have thousands of young professionals seeking employment, that maybe

277 become taxi drivers, no, I think that in the dual education you overcome all these
278 problems, all these obstacles, and the economy is going to be favored, I believe fervently.

279 *Interviewer. Any additional information that you would like to make?*
280 Mr. [K3]: I think that the implementation of this dual system, is a success, was in that
281 moment an innovative system, it has to keep being an innovative system, we have to keep
282 working in innovation, we have to keep expanding to the whole country, and hopefully all
283 central America had it, but right now we have to think in our country, the recommendation
284 is: They have to work from the Academy so that the government through the Ministry of
285 Education recognizes how successful this system is and make the changes and necessary
286 implementation in their norms, in their laws in everything they have to look so they can
287 give existence and own life and then convince the companies that is a win – win project for
288 everyone.

289 *Interviewer. Finally, thank you for the information provided.*

Key person Interview [K4]	
Interviewer	Person from the Academy
Interviewees	Mr. [K4] – Key person Klaus Schmidt
Date of Interview recording	It was downloaded from website www.itca.edu.sv, on December,12th 2011
Time duration	10:11 Minutes
Language	Spanish transcription. English translation
Italic	Ask reaction of interviewer
Standard	Answer and responses of interviewees
Bold	Special emphasis

Note: The transcription can vary lightly in respect to the recording due to the conditions of anonymity of the interviews; only facts related with this research are considered

1 The interview was published in the website of the Academy at the end of 2011, it is a
2 transcript in some parts that are of interest for this research, because it inputs information
3 of the Dual System implementation in technical formation in El Salvador. Is an interview to
4 Klaus Schmidt, of German origin, international assessor in the implementation of the Dual
5 System in El Salvador.

6 *Interviewer. Today we will share with you some of our educational methods pioneered in*
7 *El Salvador, which has improved the technology education, dual formation a social*
8 *pedagogical, generating productive ..., welcome engineer Schmidt. Basically we can say*
9 *that the dual training does not cost anymore, contrary can leverage the benefits of the*
10 *Academy and the opportunities offered by the company, that way we could please explain,*
11 *what the dual system is.*
12 Mr. [K4] Good day and many thanks for the possibility, we can discuss the dual system, so
13 your question was what was the dual system in Germany, **The dual system in Germany**
14 **as in Academy, is a triangulation between the company and the student, and the**
15 **university, in our case with the Academy, means between these three parts there is**
16 **an agreement, an agreement that each party has do its part of this agreement, for**
17 **the practical curriculum** (Category: Actual conditions for Dual system), and the student is

18 responsible for fulfilling the Academy of theory and practical curriculum, it is necessary and
19 has to meet these, with great discipline, highly motivated with great enthusiasm, then the
20 last part of this triangulation is the Academy, is, responsible for coordination in three parts,
21 with the coordination is an instrument the binnacle, is the compass, to fulfill this
22 agreement, this coordination and the Academy is also responsible for the study plan, and
23 also to the study plan that exist in the classroom practice, we have here in mechatronics or
24 in other careers, then I have company also has a very important task**, they have to pay
25 one hundred twenty-five U.S. dollars each month, to the student, which means the
26 student receives this context twenty-five dollars and the Academy receives a
27 hundred dollars each month from the company** (Category: Actual conditions of Dual
28 system), well for the control of this system triangulation in Germany is responsible camera
29 industry to control this system, is the only point of difference between Germany and here,
30 as well as the dual approach in El Salvador is the same in Germany the student is on the
31 run for two years and a half, two months Academy and a month in the company, and also
32 after two months and one month in the Academy company, in the end, is ten months in the
33 company, **in relation with traditional careers, students in traditional courses, they
34 take practices six weeks, in the dual system ten months, then it is very clear that in
35 ten months advantage is quite large, for the student, for the Academy and for the
36 company** (Category: Advantages of Dual system).

37 *Interviewer. We would like you to explain to us, what are the benefits of the dual system?*
38 Mr. [K4] **Benefits in this dual methodology, have the students, business people, the
39 Academy and also the Salvadoran society, that are the benefits for students who are
40 following, primarily students receive experiences, good practices and theory, but of
41 course these are ten months into his career at the company, is the first time in this
42 country that they receive a renewal for its work currently are one hundred twenty-
43 five dollars per month, they get job security for the company, in these months when,
44 working, studying in the company, they have a content, a high practical content, so
45 they work, work in real small groups in enterprises** (Category: Advantages of Dual
46 system), they are very real learning tasks are directly from the company and also has
47 close contact with tutors, businesses and students, have a close contact with customers in
48 the enterprise, small firms is clearly more intensive contact, with larger companies, and
49 students do their graduation work, an innovation project in the company we have good
50 examples.

51 *Interviewer. Can we confirm then, that the main purpose of dual formation is oriented to an*
52 *integral education process, through a strategic alliance between the company and the*
53 *Academy, in this process engineer, What is the level of development, that the student*
54 *reaches in a work position?*
55 Mr. [K4] The dual system is good challenge, a good chance, good opportunity for students
56 to develop their personality and also a great opportunity for the training of technical
57 competences, work competences and social competencies, so this is a great motivation in
58 technical education in the dual system, **we have fewer desertions in relation with**
59 **traditional careers, and at the end we have good results, seventy-one percent of**
60 **these, students in the dual system, receive directly after study, an offer to work in**
61 **the company, in relation to the traditional that are about fifty-five percent** (Category:
62 Advantages and job opportunities), directly after receiving their study also found wage
63 work of our students in the dual system is highest in average of one hundred U.S. dollars,
64 as the students, who study in the traditional system, they are also advantages for our
65 students our students come from families that are struggling financially, so after his study,
66 is a great chance to help your family also.

67 *Interviewer. And what are the benefits that the company receives engineer?*
68 Mr. [K4] **Without benefits companies do not participate, entrepreneurs Germans and**
69 **Salvadorans are the same, they need a benefit for participation in the dual system**
70 (Category: Conditions for Dual system), but in the dual system exists many benefits for
71 employers who are entrepreneurs can be selected, students start in the career in the dual
72 system, traditional careers do not have the chance to select students before they study
73 which is also a great advantage in this system for employers, so students know deeply, the
74 company ten months they have time to know the company, and that those in the traditional
75 relationships are six weeks, then at the end of ten months, the employer knows the
76 student and also naturally, is a good company is a good job, a good condition for me, and
77 also the employer knows is good student, he has several competences they used, this
78 employer for their products for market competition, students also have greater flexibility, in
79 front of the corporate structure, discussed each year with employers to improve to optimize
80 the teaching practice in the company, subject missing, which is more important, then it is a
81 very flexible system and each company has a chance to participate in technical education.
82 *Interviewer. How has it been the implementation of this model, in El Salvador?*

83   Mr. [K4] **Right now we have three careers in the dual system, that is mechatronic,**

84   **custom logistics and electronic, and right now preparing a new career, is for CNC**

85   **mechanics numerical computation control, this career starts January 1st of next year**

86   (Category: Current areas in Dual system)**, right now we have one hundred and ten**

87   **companies that participate in the dual system, and one hundred and ninety six**

88   **students, and we have qualifies one hundred and fifty one tutors, is a great**

89   **advantage** (Category: Expansion of Dual system) and I also want to say, thanks to

90   German cooperation and also to German businessman and Salvadoran Businessman,

91   who have supported the implementation of the dual system.

92   *Interviewer. Engineer Klaus Schmidt, thank you so much for your valuable information,*

93   *and for the valuable support to this important project, for the benefit of El Salvador-*

94   Mr. [K4] Thanks for your attention and thanks for your help in the dual system.

Key person Interview [K5]	
Interviewer	Reina Durán
Interviewees	Mr. [K5] – Robert Brunn – Director of the program Improving Access to Employment – USAID El Salvador
Date of Interview recording	December,16th 2011
Time duration	25 Minutes
Language	Spanish transcription. English translation
Italic	Ask reaction of interviewer
Standard	Answer and responses of interviewees
Bold	Special emphasis

Note: The transcription can vary lightly in respect to the recording due to the conditions of anonymity of the interviews; only facts related with this research are considered

1 This interview is developed on December 16 2011, in the facilities of Don Bosco
2 University. With the interview I look to identify the point of view of experts in education
3 subjects and employment of the conditions in which the system could be enlarged in El
4 Salvador as a part of the research called "Research on rising competences in technical
5 education by implementing dual system's elements under El Salvador conditions in the
6 field of Mechatronics".

7 *Interviewer. Good morning Mr. [K5], in first place explain to you that this research is*
8 *relate to the implementation of an education system that looks to improve the*
9 *employment index in El Salvador in young people; after I present to you the results I*
10 *am interested to talk about your point of view from the experience you have in El*
11 *Salvador of being implementing a program that also looks to improve the access to a*
12 *job.*
13 *Since 2008 in El Salvador began the dual system in technical courses, the dual system*
14 *has many more years of being here in El Salvador that was implemented through the*
15 *program INSAFORP Enterprise Centre, with the difference being a more vocational in*
16 *nature which is not recognized by the Ministry of Education here in El Salvador, while*
17 *in technical careers if they are part of the formal education system in El Salvador. So,*
18 *this is the first experience that starts in El Salvador, a system which works in the*

19   *training of students in cooperation with the company. The system works well, and starts*

20   *that way, and to date remains the same: Two months of study at the Academy, the*

21   *company one month, two months after returning to the Academy one month after the*

22   *company and will be alternating for two and a half years in this career that is*

23   *Mechatronic*

24   Mr. [K5]: How many years?

25   *Interviewer. Two and a half years, a technical career that is registered in the Ministry of*

26   *Education, with the research I have been following, from the moment you start the*

27   *group dual system and the start of the traditional system group. The dual system is*

28   *running on this alternation between academy and business, while the traditional system*

29   *is two years in the academy develop their workshops, laboratories, their assessments*

30   *within the academic institution and an internship at the end of June company of 6*

31   *months in the company.*

32   Mr. [K5]: Two and a half years plus 6 months?

33   *Interviewer. No, 6 weeks, which means month and a half in the company.*

34   Mr. [K5]: Plus 6 weeks.

35   *Interviewer. 6 weeks. The difference is that they are 10 months in the company in a*

36   *training process that alternates and are responsible both (Academy and company),*

37   *because there is a track of what is happening within the company. In the traditional*

38   *system, at the end of study, you do an internship, the internship is not guided. In both*

39   *groups are the same teachers, the same study plan and the training is a competency-*

40   *based approach. The research follows up the evolution of the process of implementing*

41   *the model, then after graduating an additional six months to follow up their*

42   *employment.*

43   Mr. [K5]: Last year, 2010 they graduated?

44   *Interviewer. They graduate in 2012, after 2010 I follow up, 6 months after you spend*

45   *with them, as their employment, the conditions on which they are inserted in the labor*

46   *market where it is evaluating the time to put into the company, and salary that they*

47   *start with. Those are the two variables to measure the level of employability, and try to*

48   *determine which of the two systems worked best. Then, the final results, as measured*

49   *by assessments that are made within the academy, in both groups, the two are similar.*

50   *An important fact is that the time of assessment was given before they left the*

51   *company. Regarding the level of placement, is much higher placement level in the dual*

52 *group, the difference makes the retention level in the company, once they graduate is*

53 *41% is immediately working within the company and closing.*

54 Mr. [K5]: And the other group?

55 *Interviewer. In the other group, none of them had a contract immediately after*

56 *graduating.*

57 Mr. [K5]: That means, that the 41% stayed in the 22 companies?

58 *Interviewer. Yes*

59 Mr. [K5]: Ok.

60 *Interviewer. At the end of the 6 months the 85% of the dual group 85% already had a*

61 *job, and 53% of the traditional had a job.*

62 Mr. [K5]: I understand, is interesting. I like the idea. This are the ones that got a job in

63 the 22 companies. The point is that the difference more or less is the same, and that

64 the program gave advantage to 40.

65 *Interviewer. Yes correct. The other point that they had to measure is what motivated*

66 *employers to enter the program, what was reason they said Yes I will enter the*

67 *program. When the show started it was said, no, the employer is not interested in being*

68 *in the process of forming the paradigm that's serious program starts, even said that the*

69 *employer would not accept to pay a fee for the student who would be there and above*

70 *all had to assign people in your plant are tutors so they will give follow up, and that*

71 *normally the company assigned tutors that normally were production managers that*

72 *had a binnacle and was developing their formation process, that's an extra task for the*

73 *company, so what I'm going to research is to develop depth interviews with a group of*

74 *entrepreneurs, tutors, to identify what actually cause them to be in the program ,*

75 *important facts that I was able to determine, in my opinion is that a good number of*

76 *companies already knew this academy cooperative work system. Other motivations are*

77 *graduates of the dual may affect and improve their productivity levels, this is an*

78 *important issue for them, that if the program is being presented in this case was a*

79 *Mechatronics program, they could help them to improve production levels, then they*

80 *said yes to the program. The system started in 2008, by 2010 the system was*

81 *extended to new careers.*

82 *Knowing these results, from your experience, how do you consider that the dual*

83 *system could keep growing in the country?*

84 Mr. [K5]: It is a group with a few people, the difference in the rate of employment is so

85 impressive that employability wins. The traditional model is two years in school, the

86 other model is 30 months, 20 months and 10 no class, and in the 10 months that are
87 not in the academy or teachers are hired? With a teacher can you cover two groups?

88 *Interviewer. Yes, exactly.*

89 Mr. [K5]**: This is very attractive. Very important, well I would say that every**
90 **university has to look at the extra costs they are doing** (Category: Advantages of
91 Dual system), the question is how can you expand it. Well, what I can tell, is that not
92 how listening to this example, but the Mechatronics career has good reputation,
93 because there are companies that are saying that there are no more groups to
94 Mechatronics, not sure today's rate employment change much by demand from these
95 people, but the career itself is attractive to the employer, do not know why, sometimes
96 by mixing, for the skill, the interesting thing is, you have to do a little research, I am not
97 aware that the industrial sector is an economic growth sector of wanting to employ
98 people, we are talking about small numbers of people, where this may be a case where
99 companies have previous rotation and do not know what people have done and are
100 willing to look for people with better training, **because the advantage is that in the**
101 **practice you meet them and finally, we have this internship program, and in the**
102 **end, they companies use these experiences to determine if it is worth investing**
103 **with the person or not, in some way, such time is an opportunity to think**
104 **because it is only 40% were employed in companies, because it is supposed that**
105 **in a business, I have made that companies are participating because they think**
106 **they can find a person who can work with them or not** (Category: Motivations to
107 expand Dual system).

108 *Interviewer. That is correct.*

109 Mr. [K5]: I am a person who likes to segment the market, and that has two parts, more
110 attractive to more companies involved in the training, or more attractive for companies
111 looking to hire more people, what I have heard of companies is: they want more
112 people, I have not heard more people saying I'm not hiring, either, but I have heard of
113 the career and they want more people, I think that in terms of skills, it must be a kind of
114 forms that have graduated and always pay them and to come, I think sometimes I
115 cannot hire for different reasons, even in the competition, but I'd like to hire, maybe you
116 could talk about the influence of the students in the processes where it has made an
117 impact because this could be I do not know if this is the case. Where I see it easy to
118 promote career skills that respond to the needs, get companies that want to do it, for
119 this really you have to do a bit of study that will cost the company involved, for
120 example, 10 months were paid.

121 *Interviewer. The program started, they (the companies) paid $75 monthly for each*

122 *student they had, right now in the program $125 monthly for each student; it has gone*

123 *up.*

124 Mr. [K5]: The company has paid the 30 months?

125 *Interviewer. The company has paid for the 30 months, two and a half years.*

126 Mr. [K5]: Excellent.

127 *Interviewer. And now they are paying more compared to the beginning to the student.*

128 Mr. [K5]: Well in there, is another expense for the company. Ok let's do some math 30

129 x75 is $2000 so in effect I'm feeding. Not even call centers pay $3000.

130 *Interviewer. Now is more what they pay.*

131 Mr. [K5]: Now more, yes… 30%, $3700 so I can see. If this people are valued at

132 $37000 advanced, the thing is when you evaluate, you have to evaluate how much

133 more time in advance of $3000 but $3000 paid in two and a half years realistically are

134 worth more now days, because this could have been invested so I have to consider

135 that the company has lost, so we are now talking about $4000 where a company could

136 say I prefer to hire them than investing $4000 in advance. Is this the first group of

137 Mechatronic?

138 *Interviewer. This is the first group.*

139 Mr. [K5]: It means, that before there was no Mechatronic?

140 *Interviewer. Before there was Mechatronic Engineering in Don Bosco University, but*

141 *the Technician is first.*

142 Mr. [K5[So then for example: you are telling me that at the end they have the same

143 skills both careers.

144 *Interviewer. The evaluation inside of the academy says so.*

145 Mr. [K5]: It is assumed that the evaluation within the academy reflects what is intended

146 to give, perhaps companies are not wrong, but it could be, then technically are the

147 same **the only thing is that your group had the dual advantage of having a**

148 **relationship with the company** (Category: Advantages of Dual system), but if an

149 academy with much popularity that what I'm hearing, it may be that the group

150 traditional coveted **because companies want these people and maybe some not,**

151 **certainly some will not want to invest $ 4,000 to train someone unless the thing**

152 **is you have to evaluate these people are contributing to the productivity of the**

153 **company 10 months might be a contribution worth $ 4000 then the company is**

154   **gaining in training, productivity** (Category: Advantages of Dual system), gains a
155   person, you can compete, but it's complicated but I can see many companies saying I
156   will not invest and wait until I graduate and I'll wait, I'll find a way to maybe pass the
157   internship.
158   If the university was clever I would offer enterprises, people with this training that you
159   know that this has to be an excellent internship to graduate, this is your chance to
160   recognize them and say if you want to gain employment.

161   *Interviewer. From the tutor side they always prefer the one that is in the company*
162   *because, to them it assures them that they have lost the fear of managing tools and*
163   *equipment.*
164   Mr. [K5]: The thing is that, you have to see from this way: they are saying look I have
165   seen this people when they started and they did not know this things and what they
166   have learned then, I am happy because they have not seen the other ones that have
167   finished, that could do the same without seeing any moment when they were learning.
168   Is interesting but what I see, **because of what you are demonstrating is that the**
169   **dual system has had a great immediate impact in hiring and the average salary**
170   **after 6 months** (Category: Advantages of Dual system) could be offered something
171   higher you have to recognize that this impact affects revenue, what matter is how much
172   they make, when they start and that at the end of the 9 months another person has the
173   same salary because I have earned because I have more months with the salary, that
174   is very important. Well, the thing is that this is better for a person than for a company,
175   has a lot of level of hiring learning.

176   *Interviewer. Thank you, for the time and support to the research.*

Annex 25. Information of the teachers

Information about the teachers who were in charge of the mechatronic career cohort 2008-2010, are presented in Table Annex 25-1. These information has been classified by Type of teacher, Academic degree, kind of module that teach, type of system where teach, and the experience being teacher. Every data of this table has been introduced in SPSS into the database "Teacher.sav" in order to analyze the information in relation to the formation area, the academic degree and the experience.

Table Annex 25-1. Information about teachers from cohort 2008-2010

No.	Type of teacher	Academic degree	Academic Degree: 1.Technician 2. Engineer / Bachelor 3. Master	Module: 1. Technical 2. Basic	Name of the module	System: 1.Dual 2.Traditional 3. Both	Teacher's experience
1	Technical Teacher	Industrial Engineer	2	1	Material Science, Technical Drawing, Fundamental of Mechanics, Applied Mechanics, Computer AID Design, Robotics and CNC technologies	1	1
2	Technical Teacher	Electronic Engineer	2	1	Electrical Circuits, Industrial Electronics, Industrial Power Facilities, Troubleshooting, Integrated Production Systems, Assembly and calibration Mechatronic	3	1

No.	Type of teacher	Academic degree	Academic Degree: 1.Technician 2. Engineer / Bachelor 3. Master	Module: 1. Technical 2. Basic	Name of the module	System: 1.Dual 2.Traditional 3. Both	Teacher's experience
3	Technical Teacher	Technician in Electrical and Computer Maintenance	1	1	Electrical Drive Control system, Digital Electronics, Installation and setup of PC and Networks	3	2
4	Technical Teacher	Technician in Industrial Productivity	1	1	Technical Drawing, Safety Rules and Standards	1	1
5	Technical Teacher	Technician in Mechanics	1	1	Material Science, Quality Control and Cost of Management	3	1
6	Technical Teacher	Technician in Mechanics	1	1	Material Science, Technical Drawing, Fundamental of Mechanics, Applied Mechanics, Manufacturing Processes	3	1
7	Technical Teacher	Technician in Electrical	1	1	Digital Electronics	3	1
8	Technical Teacher	Mechanical Engineer	2	1	Hydraulics and Pneumatics, PLC Programming, PLC System and Industrial Network, Industrial	1	1

No.	Type of teacher	Academic degree	Academic Degree: 1.Technician 2. Engineer / Bachelor 3. Master	Module: 1. Technical 2. Basic	Name of the module	System: 1.Dual 2.Traditional 3. Both	Teacher's experience
					Process Control, Automation of Hydraulic and pneumatic circuits		
9	Technical Teacher	Electronic Engineer	2	1	Digital Electronics	1	1
10	Teacher for Basis Areas	Technician in Administration	1	2	Office	3	1
11	Teacher for Basis Areas	BA in Mathematics	2	2	Computer Logics	3	2
12	Teacher for Basis Areas	Degree in Computer Systems	2	2	Programming	3	1
13	Teacher for Basis Areas	Computer System Engineer	2	2	Programming	1	1
14	Teacher for Basis Areas	BA in Mathematics and Physics	2	2	Mathematics	3	2
15	Teacher for Basis Areas	Master in Financial Management	3	2	Oral and written communication, Entrepreneurial Fundamentals	3	2

No.	Type of teacher	Academic degree	Academic Degree: 1.Technician 2. Engineer / Bachelor 3. Master	Module: 1. Technical 2. Basic	Name of the module	System: 1.Dual 2.Traditional 3. Both	Teacher's experience
16	Teacher for Basis Areas	BA in Business Administration	2	2	Oral and written communication, Professional Ethics	1	1
17	Teacher for Basis Areas	Degree in English Language Teaching	2	2	Basic English I and II	1	2
18	Teacher for Basis Areas	Degree in English Language Teaching	2	2	Basic English I and II	1	2
19	Teacher for Basis Areas	Degree in English Language Teaching	2	2	Basic English I , II, III and IV	3	2
20	Teacher for Basis Areas	Technician in Gastronomy	1	2	Basic English I , II, III and IV	3	2
21	Teacher for Basis Areas	Degree in English Language Teaching	2	2	Basic English I and II	1	1
22	Teacher for Basis Areas	Degree in English Language Teaching	2	2	Basic English I and II	1	1
23	Teacher for Basis Areas	Degree in English Language Teaching	2	2	Basic English I and II	3	1

(Source: Own elaboration, data from Department of Mechanics and Department of Basic Area of the Academy)