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Development of International Educational Systems by Competence Networking based on Project Management

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Abstract

The globalization demands new kinds of concepts and models to ensure the provision of skilled labor by international educational systems based on advanced competence networking. The success depends on the professional use of the latest project management theory, methodology, and practice. Multinational multi-projects fail and are aborted. A reason for that could be the deficiency of project readiness. The project management approach should be integrated into other management subsystems such as information, knowledge, competence, network management etc. One of the most important challenges is to ensure the communication and information transfer for competence balancing and sharing. A successful and efficient cooperation is only possible under equivalent partners. It creates the necessary trust. Beginning with the presentation of the need for cooperation and the exchange of knowledge for global and fair growth, the relationship between education, competence development and applied project management will be explained for educational transfer systems. Subsequently, the application of the approach will be illustrated by the planning, designing, implementing, and further developing of a large-scale Sino-German cooperation in higher education. The success of the project and the sustainability will be guaranteed. The roll-out to other network partners on a national and international scale is in progress.

Keywords: International Educational Systems; Competence Networking; Sino-German Higher Educational Project; Sustainable Advanced Competence [?]Networks Project

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1. Introduction

The globalization promotes the international knowledge transfer and sharing. A growing number of particular qualified professionals are required for new kinds of tasks. The satisfaction of demands for interdisciplinary and intercultural qualified manpower is one of the most important challenges for the global economy and the international project management. The complexity of the task and the required investigations are so high that the education institutions are forced to create educational networks and trusts sponsored by foundations or public funding. The cross-linked processes concerning organizational, contentual, methodological, contractual, etc. aspects can only be mastered by professional project and process management. Derived from an innovative theory of knowledge transfer and sharing by networks of competence, a large-scale, educational Sino-German project will be explained. It will be linked to the application of the methods of project management for the development of the trust, the cooperation networks, the organization, the controlling and the educational processes. The main objectives, phases, and results of the project will be described with focus on usage of the large variety methods for the particular case. Finally, an overview of the project status and perspectives will be given.

2. Global challenge of manpower for project development

2.1. Globalization of divers systems

The recent development is influenced by changes of human relations and global systems. It is necessary to understand the phenomena for controlling the processes. The phenomenology can be used to open up the epistemological and scientific access to the mastery of the complex problems. (Hegel, 1807) The analysis of the different definitions of the term of globalization shows that it can be directly placed in this context. Globalization is a phenomenon in itself that we encounter in all ways of life in different forms in the modern society. It influences our everyday life in a complex, various, and sustainable manner and usually more than we think or perceive it. Globalization is not only determining our future but it also dominates our lives in the present. It is a process encompassing the causes, procedures, and consequences of transnational, transcultural and transcontinental integration of individual and collectivistic activities. (Rodhan & Stoudmann, 2006) The dilemma is that it pushes standardization and unification beyond the boundaries of the national states accompanied by dilution of social, cultural, legal, etc. and particular educational features and quality, but it promotes the worldwide competition requiring the increase of comparative advantages generated by specialization and diversification. (Pagano, 2007)

2.2. Levels of different knowledge, competence and behavior

Competence is the quality of being adequately or well qualified physically and intellectually. The humans are able to answer adequate, sufficient, suitable, capable and qualified. Skill is the ability that has been acquired by training or learning in order to produce solutions in problem domains. It is the familiar knowledge of any art or science, unified with readiness and dexterity in execution or performance, the application of the art or science to practical purposes, the power to discern and execute, the ability to perceive and perform as well as expertness, adroitness and aptitude. Skill is more intelligent, denoting familiar knowledge united to readiness for performance.

Knowledge is the psychological result of perception, learning, and reasoning. Acquiring of competences and skills in the framework of learning and training programs is accompanied by the incremental improvement of the human knowledge. Knowledge has to be managed in order to improve the competences and skills of the humans. The implicit knowledge of the individuals has to be transferred in the explicit knowledge of the organization by socializing, externalizing, combining and internationalizing. (Fig. 1)

The mastery of relevant knowledge and skills alone is not the assurance for successful performance; individuals should be able to select available knowledge and skills for achieving an efficient and effective behavior. In this

way, competence is conceived as a cognitive structure that facilitates specific behaviors. (Westera, 2001) (Fig.2) Target-oriented behavior should be produced as competent behavior on the correct knowledge base. The problem lies in the variety of individual and collective knowledge bases, the different levels of the available competences and several ways to acquire skills. Therefore, it is necessary to develop a human potential which will be positioned to compensate the different behaviors based on intercultural and international multiple developmental stages in the cooperation, working and business processes.

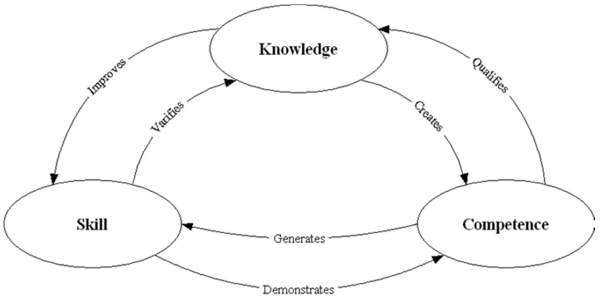

Fig. 1: Circle of competence, knowledge, and skill (Schumann & et. al., 2004)

2.3. Deficiency of well-qualified manpower

The education of qualified and universally usable professional staff requires medium- up to long-term training. Because of the extreme growth of some emerging economies and the still ongoing development in the industrialized countries, it is increasingly difficult to provide the necessary quantity and quality of professionals especially for such complex intercultural and transnational job assignments. According to a survey of the World Economic Forum and the Boston Consulting Group from 2011, the deficit of skilled employees put the worldwide economic growth in risk. Million additional highly qualified employees are needed in the coming years (about 45 million in Europe until 2030) to maintain the requested growth. Human capital becomes one of the most important key competitive factors. Well-trained professionals, technicians and managers are urgently needed worldwide in the coming years. Countries and companies will have to compete for world professionals, managers and skilled workers. Education and training are not sufficiently geared for providing the global cooperation in science, technology, business, management and administration. The educational institutions and organizations are often inadequately prepared for the new requirements. (Arkless & et. al., 2011, 10-15)

2.4. Satisfaction of the human resource requirements

The global shortage of skilled labour is a huge challenge. It will be controlled by a systematic procedure. The expert group of the World Economic Forum and BCG suggest going providing a three-dimensional approach including geographic, structural, and professional aspects as the mobility of labour forces, the extension of resources, and the change of education programmes. It assumes that the risk of global labour bottleneck can be defined in the following ways: strategic human resources planning, simplification and transparency of immigration, transnational knowledge transfer, improvement of the employability, flexibility of individual career and education management, increase of mobility, extension of labour supply. (Arkless & et. al., 2011, 19-32) The most important aspect of the study is that all ways for eliminating the shortage of skilled employees, scientists, managers etc. are directly related to training and development. It is important to educate specialists, executive staff, and students, to transfer knowledge and professionals, to improve transitions and interoperability of training systems, to increase real individual and virtual mobility as well as to exploit new target groups for employment.

2.5. Role of the project management

Management is the goal-oriented design, controlling and development of an organisation or of a network of organisations. In order to be able to provide enough skilled professionals in the international context, these very complicated processes must be managed. The leadership and management of organizations through projects have proven to be successful in the past years. The integration of project and process organisation means: better structuring and complex reduction, scope of tasks are more structured and manageable, different disciplines coordinate acts, resource-efficient execution of the tasks in a limited period of time. (Olfert, 2012) That is why; the complexity of the future satisfaction of the demands of skilled personnel especially of young professionals can only be guaranteed by the application and adaption of the methods of the modern project management.

3. Value added response by advanced competence networking

3.1. Description of the complexity of the network development

Systems are sets of elements connected by relations. Large systems are characterised by a large number of elements and relations. Ordinarily, they have a high complexity, variability, and diversification. They should be adaptive in order to be able to develop und control the systems. Complex adaptive systems are characterised by subsystems, openness, self-similarity, synergy, and adaptability. (Pushnoi & Bonser,2008) Advanced networks of competence are large systems including the complex and adaptive activities of individuals integrated in a higher level of human organisation. It is extremely ambitious to model, to structure and to control such a large number of elements and relations in networks determined by social, organisational, emotional, intercultural, interdisciplinary, etc. aspects in the framework of the related project management including the management of the particular complexity. Additionally, the complexity includes the variety of the behaviours of the elements, the changes of effects, and the internal dynamics.

3.2. Challenges of resources and investigations

The international education systems are based on the creation of competence networks. But, the networks of excellence are only one subsystem required for this development. Additionally, the following related subsystems should be provided and integrated into holistic educational unit: quality and project management and control system, knowledge acquisition and distribution system, lecturer and teaching staff organization group, computer and e-learning platforms, facility service system, etc. Moreover, if the goal is that the models and offers are replicated and repeatedly offered globally, a single faculty or university or small network of them reaches the limits of their available resources and investigations very quickly. The solution is a powerful network in various combinations of the stakeholders from education, financing, business, or government, respectively. The resources and investigations have to be professionally planned and managed by approved methods such as balanced scorecards. (Schumann, Gerischer, Feng, & Zhu, 2012)

3.3. Creation of networks of competence

The key issue is to discover the different levels of knowledge and competence. If the mutual access to the information is limited by intercultural, behavioural, locational, and linguistic barriers, the challenge is particularly critical und complicated. But, it is essential to solve this problem before discussing business, organisational or legal aspects because the success of the project depends mainly from the mastery of the knowledge and competence transfer as the prerequisite for the operation of the educational transfer system. The diverse scattered competences have to be discovered, analysed, and bundled. (Schumann, Tittmann, & Tittmann, 2008) The cluster of competences is the basis for the design of the inter-organisational as well as the intra-organisational networks for knowledge and competence transfer.

3.4. Differentiation of higher educational transfer systems

The design and implementation of the educational network for the competence transfer will be influenced by the differentiation of the transfer due to the demands of the learners and employers. (Fig. 2) The best way is to create a modular-design and multi-processing system for fulfilling the diverse requirements of different target groups.

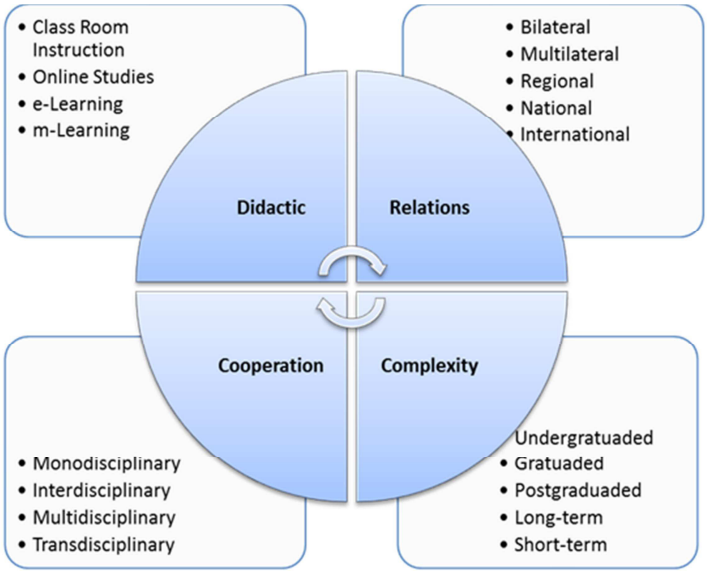

Fig. 2: Aspects for the kind of transfer system

3.5. Trust sponsoring and funding

Because of the huge resources and investigations for a market entrance and penetration, the partners have to inspire the sufficient confidence in the internal and external networking. Especially, sponsoring and funding are imperative for the success of the network development. The sponsoring includes general, technical, informational, educational sponsorship. The implementation of fundraising is essential. The sponsoring for international educational systems is typically provided by enterprises, chambers, non-profit organizations, circle of friends, alumni associations, etc. The developments of supporting networks and of relations to the sponsors have to be important part for the project management in the educational transfer network organization. It has to be done in parallel with the design of the core processes of knowledge and competence transfer.

4. Deliberate development of international educational transfer systems

4.1. Essentials of modern project, process and competence management

Project, process and competence management are inextricable linked together. Competence development is one of the critical success factors for the project and process management. Otherwise, project and process management are required for the successful competence development. The dynamic and the complexity of global developments presume the creation of new knowledge and competences in an iterative procedure. Educational organizations, organizational learning, organizational culture, knowledge management, process management and project management laid the foundation for the project management competence development (PMCD) framework. It is characterized by the competence development in a learning organization using the latest methods of the project management. The particularity of the global competence networks in education consists of high complexity, dynamic and the manifoldness of the challenges and chances. (Suikki, Tromstedt, Haapasalo, 2006)

4.2. Application of state-of-the-art project and process management

A significant number of projects are too complex to be able to plan and to control the project processes in the traditional way by the sequential approach. One of the possible solutions is the transition of the methods of agile project management. Management and control of the projects will be realized in a flexible and dynamic manner. The planning and leading activities are less intensified. The agile management was mainly created in the framework of software development and is transferred to the holistic approach of the project management in general. In the case of agile project and process management, the main principle is to approach the solution by iterations. The top targets are defined and sought by the project team step by step. The beginning marks the iteration zero: the preplanning as project preparation without building value. Afterwards, the value-added iterations will be started including the recurrent phases of estimating/prioritizing, learning/impediments, and retrospective/requirements. The result is built in slices of functionality rather than in layers. The early test of the parts of the final solution thought ahead will be possible by using the functioning slices of the project. The lessons learnt during the project periods are transferred to the process management to make it available for the internal project processes and the external processes of the organization. The concepts will be integrated with the current best practices in project management such as business orientation, risk management and project controlling. (Verzuh, 2012, 434 pp.)

4.3. Principles, objectives and attributes for the educational transfer concepts

According to the procedure of the agile project management, the iteration zero creates the baseline for the following project iterations especially by the definition of the principles, objectives, and the attributes of the education transfer model and concept. (Fig. 3)

The compliance of the principles is inviolable rule during each of the iterations. After each of the iterations, the goal achievements are verified, and the objectives are adapted as may be necessary. The attributes help to make qualitative and quantitative statements by benchmarking if required.

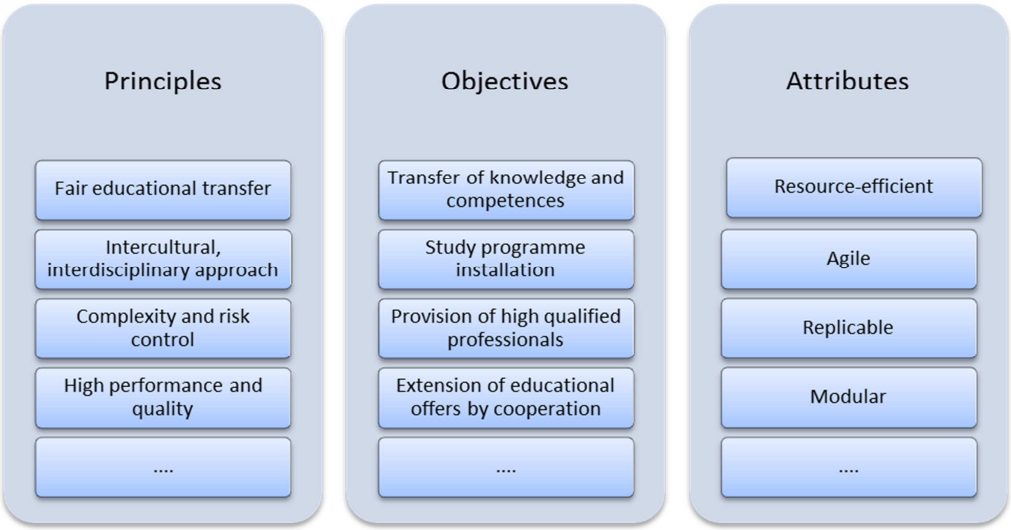

Fig. 3: The key aspects for the educational transfer models and concepts

4.4. Phase model of the development of the educational transfer model

The irreversible and dogmatic chance from the classic phase-oriented project management to the agile methods is dangerous because every approach has particular advantages and disadvantages. The the combination of the

methodologies makes sense. Especially, the strategic orientation of the educational transfer model can be discussed by using a phase model in advance. (Olfert, 2012)
Referring to the common procedures models, a special phase model can be generated for the education transfer via competence networks. Other kinds of phase concepts and models such as waterfall model and V-model are applicable for the case. (Lock, 2013, 73-83)

5. Purposive sample of Sino-German interdisciplinary higher education cooperation model

5.1. Necessity of Sino-German cooperation in higher education

Relations between Germany and China are currently more intesified than ever before. The German-Chinese economic relations have developed to a success story. 1972 German companies exported goods for just 270 million U.S. dollars, in 2012, German exports to China amounted 66.6 billion euros (+2.7% YOY).; German imports from China 77.3 billion euros (-2.8% YOY). Germany is by far China's largest trading partner in Europe and is in the ranking of global trade partner of China in sixth place. China is Germany's most important trading partner in Asia and the world's third most important trading partner. The companies need for the further growth more professionals. The universities respond to this situation. About 24,000 Chinese students were enrolled, and thus formed the largest group of foreign students, at German universities in 2012. The engineering sciences enjoy special popularity. More than 4,000 German students were enrolled at Chinese universities in this year. But, separate universities and small educational networks already come to their limits. Therefore, the synergy and efficiency of the educational and knowledge transfer project has to be increased. (Auswärtiges Amt, 2013)

5.2. Prerequisites of knowledge network und competence sharing theory

The development of partnerships and networks must be more professional. It is not primarily the pure organisational development of cooperation but it is more important to improve the efficiency of the knowledge transfer process as the core process. The design and implementation of the knowledge networks and competence sharing should be secured before further development will be pushed. There are essential basics for aspects such as discovering the competence cells and knowledge nodes, determining the level of competence and knowledge, finding the opportunities for the potential equalization, defining the chances and rules for the sharing of knowledge and competences, constituting of a network for knowledge transfer and sharing, installing of a cooperation networks, processing knowledge transfer in networks, evaluation of the results and maintenance of the advancement. All tasks are viable by modern project management.

5.3. Prerequisites of multi and interdisciplinary project management

The size of educational transfer models will extremely increase because of the complex demands of the commercial, business, industrial, governmental networks as sub-purchaser of the high qualified individuals. It is imperative to use multi-project management on conditions of interdisciplinarity and global cultures. It consists of project management, program management, and portfolio management. (Verzuh, 2012, 373 pp.) Management of the multi projects in an international context requires that interdisciplinary and intercultural teams have to be integrated by: installing and adding new projects, injecting progress information and changes for current projects, managing the resources of all projects and allocating priorities, planning the multi-project scheduling, controlling the interactions and interfaces of several projects, and evaluating and removing complete projects or subprojects. (Lock, 2013, 485-495) The rules and method will be adapted to the particularity of educational transfer models.

5.4. Approach to the international education transfer project

The demand for individuals, doing international work, increases permanently. The practice partners expect the provision of highly qualified personnel for further growth. Single universities are already overwhelmed with the

adequate provision of professionals. Therefore, greater cooperation networks must be created to ensure the participation of diverse stakeholders and to satisfy the right quality and quantity. After defining the objectives and contents of the international multi project, the governmental and institutional contract framework was signed to provide the resources, knowledge, and competences. The main activities referring to (Lientz & Rea, 2002) were:

- Define the project: Higher education double-degree and non-degree programs particularly in special kinds of engineering in an own Sino-German faculty
- Identify the stakeholders: Chinese and German universities working on an approved high level and offering the special subjects
- Fixing the project organization: Competence network guided by an international board of directors, an academic senate and a group of coordinators and staff members supported by consortial meetings and expert committees
- Develop the project plan: Common project description for gaining the governmental and university support and detailed planning of activities, resources, facilities, communication, etc.
- Use technology for advantage: Design and implementation of communication and knowledge transfer facilities, platforms, means, scheduling, etc.
- Manage international team and work: Exchange and work planning including leaders, managers, coordinators, lectures, staff, etc. integrated and scheduled in different meeting and working groups
- Manage vendors and consumers: Installation of special groups of providers, stakeholders, students, employers, business networks, officials in network of management, administration, information and knowledge transfer

5.5. Readiness for project start

Before starting a project, it is helpful to organize and execute a pre-project review to be sure that the preconditions for the project are fulfilled. The institution´s readiness to start the project should be made including the allocation of priorities, risks, resources, etc. Big points for the project readiness are:

- Confirmed objectives: Three up to four double degree programs in Engineering for about 1500 students
- Affected stakeholders: Signed contracts by governmental, institutional, and network partners
- Involved leadership: Defined roles of the leaders, managers, and coordinators
- Prepared for change: General and individual preparation of personnel and organizations
- Minimized risks: Use of professional skills, competence, methods for project and risk forecast
- Managerial and deciding structure: Established working, expert, meeting, control, etc. groups of professionals
- Defined KPI´s: Set of quality and quantity key performance indicators such as costs, times, etc.

The project readiness was declared and the large multi project could start in both countries.

6. Sustainable establishment of advanced competence networks by professional project management

6.1. Project implementation

The international competence, organizational, and legal network was implemented by 20 German universities of applied sciences and the Tongji University Shanghai as pilot project between the Chinese Ministry of Education (MoE) and the German Federal Ministry of Education and Research (BMBF) in 2004. Due to the project management guidelines, the organization of the project was realized as a matrix organization including boards, senate, expert groups, public and professional representatives of all stakeholders from government, universities, industry, promoters, and body of students. After developing the curricula for automotive engineering, green building technology, and mechatronics, the study programs were started as double degree offer with 180 beginners per year. The approach is interdisciplinary because of the modular design system including mathematics/natural/engineering sciences, management/business/social sciences & law, integration subjects, soft skills & foreign languages. It is intercultural because of the trilingual education, the international teaching staff, the

intercultural content of the courses, and the practical applications in international companies and associations. The legal and communication network, administration, staff body, and study content was prepared to gain the project readiness.

6.2. Project growth

The number of students was increased up to about 1000 incomings and outgoings administrated in the faculty of the Sino-German University of Applied Sciences (CDHAW). The staff and administration body and the facilities were completed at first. The establishment of the cooperation between the CDHAW and the German Language School was for the growth essential. The intercultural training and the language skills are one of the main the precondition for mastering the courses. The professional coordinators train periodically the language teachers in the special subjects of the study programs. The association network for the stakeholders especially for the relations between business, industry, and science was created. The information and knowledge transfer was stabilized and rolled out for the increasing number of participants using the standard method and tools of project management. One of the subprojects was the project planning, execution, controlling, financing, and investment management by special departments established as international offices in both countries. The growth was supported by the integration of business partners and business networks as well as governmental assistance for instance by fees.

6.3. Project extension

The study portfolio was extended by introduction of the business administration and engineering in 2008. The number of students was enlarged up to 1400 students. Especially, the number of German students involved in the exchange and double degree program is significantly rising. The paradigm change was essential because the main engineering focus was enhanced by business and administration. The network cooperation of the universities was extended to the faculties for management and business in Germany as well as the School of Economics and the College of Traffic and Transportation Engineering in the Tongji University. The implementation of multilateral summer schools became part of the better integration of lecturers and students. The modern project management was increasingly applied as multi-resource and multi-project management in the international context by embedding the competence network of education. The success of the long-term project is only obtainable by the application of modern integrated management of risks, resources, finances, investments, curricula development.

6.4. Project re-organization

The multi-project includes a dynamic development of the curricula and the portfolios. The permanent growth is subject to ongoing changes. Following the modern project network management and exploiting synergy effects, the several Sino-German activities were bundled under one umbrella organization. Since 2011, the Sino-German University consists of the Sino-German College for Graduate Studies, the Sino-German University of Applied Sciences, and the Sino-German training center for teachers of vocational education. Significant results are the consistency of the study and training programs from the bachelor via master to the PhD degrees, the joined use of facilities, resources, relations, etc., and the integrated exploitation of the laboratories, libraries, etc. The staff groups were adapted to new organization, the laboratories are modified, the export of competences and know-how is updated, etc. The transformations were focused on the curricular profiling of the portfolio with regard to the demands of the international partners as well as the global changes. The engineering programs are re-accredited.

6.5. Project control and evaluation

The project control and evaluation promotes the quality management and the satisfaction of the stakeholder demands. The system is based on the matrix organization, the modern kinds of controlling and revision, the common standards of evaluation and validation programs. It is important to implement a service and support network for the competence transfer and sharing for educational administration in order to be able to harmonize the

different regional systems in Germany as well as in China. One of the important subprojects is the regular exchange of staff, documents, and knowledge especially for the quality management. Last year, a SWOT analysis was performed. The controlling systems are dominated by the standards in the public service of the two countries. Additional impact to the evaluation is generated by the cooperation networks such as Chambers of Commerce, Society of German Engineers, Chamber of Foreign Trade, Friends of CDHAW, Alumni Association, etc. The results of this cooperation are focused on contentual and professional aspects supported by international educational systems and competence networking based on project management.

7. Conclusions and perspectives

The international educational multi-project of the Sino-German cooperation as competence transfer network was only realizable by using the latest achievements of the project and process management. According to the management theorems, the project management methods and procedures as well as the related practical experiences, the project was developed very successful, efficient and sustainable. Moreover the results are used to extend the network in China by including a second university. The study program will be simply modified for the new contractor and afterwards rolled out. The functioning competence transfer is the main precondition for that. At first the competences are analysed and shared and after that the partner will be included. It is the same procedure as in the Tongji University in the past, but it will be more efficient because of the development of the project management as such and the special experiences of the application for larger higher educational systems. The sustainability looms in the recent project concepts and models. The concept of the international educational systems based on competence networking will be transferred to another country by the whole consortium next year. The use of project management in theory and practice will be indispensable again.

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