Faculty of Science and Technology

Process Improvement in Higher Education Institutions

By

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Copyright Statement

Abstract

In a competitive environment for good quality prospective students, where academic institutions are under pressure to develop employable graduates, quality of education has become a crucial differentiator. Therefore, institutions need to focus on the way they manage the quality of their processes in order to remain competitive in the business of education. Although the literature review shows several approaches have been adopted to improve quality in higher education, there is still no agreement on how best to apply quality within Higher Education Institutions. Hence, the main motivation for this research was to be able to improve the quality of educational processes.

This research begins by exploring how business process modelling techniques can be transferred to educational processes. A mixture of hard and soft modelling techniques was used and findings were analysed, both with respect to the utility of techniques and the process improvement itself. A 'novel' hybrid Role Activity Diagrams (RADs) – Soft Systems Model (SSM) – Rich Picture was proposed and applied to the student journey process. However, even though the integrated model was useful in uncovering process issues, it did not always support innovative solutions for change nor did it help in deciding which solutions fit best with the organisational context. Therefore, a fusion method combining modelling, improvement alternatives and organisational context was proposed.

The fusion method provides guidance to the nature of improvements that are suitable for a given context. While process modelling provides detailed process description, alternative improvements will enable the discovery of better solutions. Finally, determining the suitability of different improvements can be identified by matching those improvements to organisational context which will enable institutions to derive changes according to their capabilities. It would enable HEIs to have a development strategy that leads to continuous improvement. As a result, it would enable institution to being able to provide and then maintain high quality processes and in turn student satisfaction.

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List of Abbreviation

AASTMT	Arab Academy for Science, Technology and Maritime Transport
BPM	Business Process Modelling
BPMN	Business Process Management Notation
BU	Bournemouth University
DFDs	Data Flow Diagrams
HEI	Higher Education Institution
IDEF	Integrated Definition for Function Modelling
NAQAAE	National Authority for Quality Assurance and Accreditation of Education
OECD	Organisation for Economic Co-operation and Development
PQI	Productivity and Quality Institute
QAA	Quality Assurance Agency
RADs	Role Activity Diagrams
SSM	Soft System Methodology
TQM	Total Quality Management
UML	Unified Modeling Language

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Declaration

It is hereby declared that the work contained within this thesis has not been submitted to the requirements for an award at this, or any other, education institution, other than that which this submission is made for. The thesis contains no material previously published or written by another person, except where due reference is made. This work has not been previously presented, not has been submitted for presentation (in full or in part) except for academic publications.

Chapter 1
Background of Study

1.0 Introduction

The quality of education is becoming significant in an increasingly competitive environment. Increasing global competition, rapidly changing technology, increasing costs, demands for accountability and rising customer expectations about quality have forced Higher Education Institutions (HEIs) to continuously improve their educational processes in order to remain competitive in the business of education (Venkatraman, 2007). In order to have full control over their core processes, HEIs are responsible for determining the learning methods for future generations to survive with the challenges of sustainable development (Khan and Matlay, 2009).

Both Temponi (2005) and O'Neill and Palmer (2004) agree that it is important for HEIs to concentrate on their core business processes. They also highlight that academic institutions are under pressure to develop an updated curriculum that qualifies students to enter the workforce and thus, encourage employers to hire graduates. Higher education is also criticised by its stakeholders with respect to coping with the ever-changing market situations, socio-economic conditions and stiff competition worldwide (Venkatraman, 2007). These challenges have thus given a rise to the need for HEIs to cope with such a dynamic environment through continuous improvement of their processes to ensure provision of high quality education (Temponi, 2005, O'Neill and Palmer, 2004).

> ***"The old saying that "only the strong survive" has proven to be false. The real truth is that only those who are capable of adapting quickly and effectively to change survive.***"(Morris, 2008).

One of the approaches suitable for dealing with HEIs challenges and enabling organisations to adapt by improving their business processes is Business Process Modelling (BPM). Although there is no widespread understanding

concerning the benefits that business processes can bring to the service industry (Vergidis et al., 2008) Aldin and Cesare (2009) stated that BPM is useful in facilitating human understanding and communication. Therefore, it is becoming a more popular research area for both organisations and academia. The following section will introduce the research aims and objectives.

1.1 Research Objectives and Aims

The purpose of this research is to examine HEIs processes with the following two aims:

1. Explore how and if Business Process Modelling (BPM) techniques are suitable for transfer to educational processes this will be achieved by the following objectives:
   1.1. conduct a literature review about quality in higher education;
   1.2. investigate the application of BPM to HEIs processes;
   1.3. analyse and select appropriate modelling techniques and
   1.4. apply the selected techniques and evaluate the results

2. Enhancing the results from Aim 1 in order to explore additional improvement to HEI processes. This will be achieved by the following objectives:
   2.1. adopt improvements that are suitable for the HEI context;
   2.2. design a method that will be suitable to improve processes within Higher Education;
   2.3. determine other aspects that may affect improvement initiatives and
   2.4. apply method and validate any findings

1.2 Thesis Structure

Chapter 2, ***Higher Education Context****,* comprises a literature review. It starts by describing HEI and their role. Then it provides an overview about quality management in higher education as well as quality improvement approaches. Moreover, it emphasizes the problems faced by HEI in Egypt.

Chapter 3, *Business Process Modelling*, starts by defining business processes. It provides an overview of business process modelling techniques, discusses the modelling perspectives and highlights the use of different modelling techniques.

Chapter 4, *Research Methodology*, presents an overview of the methodological aspects of research. It highlights the research methodology applied for this study followed by the research approach, data collection methods and data analysis. Finally, the case study design and the propositions for the study are presented.

Chapter 5, *Pilot Case Study*, presents the pilot case study conducted in this research. This study is part of a real life process at the Productivity and Quality Institute (PQI) in an Egyptian HEI. The course design and delivery processes are captured and modelled processes to reveal any underlying features that could imply process improvement through modelling and analysis of the process. A hybrid model combining Role Activity Diagrams and Rich Pictures is presented. Moreover, this chapter illustrates a comparison of applied models, in which sequence the models will be implemented and how the models are combined. A modelling approach is proposed by the researcher for illustrating business processes. Finally, an improvement proposal for course design and delivery processes is introduced based on the findings and outcomes of the hybrid model

Chapter 6, *Second Case Study*, this study was carried out in order to verify the hybrid model and validate its steps and capability in capturing all process aspects. The RADs-RichPicture model was applied to the students' journey at PQI and was successful in revealing issues which would not have been uncovered using either of the notations alone. The hybrid model proved to be suitable in terms of accessibility, for modelling higher education processes. However, the models were limited in identifying suitable improvements. Therefore, further study was needed to identify the suitability of proposed improvements to the organisational context.

Chapter 7, *Higher Education Process Improvement Method*, explores the practicality of creating a method for adopting improvements that are suitable for HEIs context. Since the hybrid model did not provide suggestions for improvements, benchmarking and maturity models are proposed to complement the shortcoming of the modelling. A Fusion Method combining Modelling, Benchmarking and Maturity was created.

Chapter 8, *Revised Fusion Method*, investigates further aspects that may affect improvement initiatives. As a result, the initial Fusion Method pillars were changed. The mind map technique to brainstorm the Revised Fusion Method pillars and break them down into more in depth details. Thus the method was further developed to provide higher level of detail.

Chapter 9, *Revised Fusion Method Implementation*, aims to validate the Revised Fusion Method. The method was implemented to the Final Year Project Process at the Faculty of Science and Technology, Bournemouth University. The implementation of the method was successful and helped in identifying the most suitable improvements for higher education processes.

Chapter 10, *Conclusions and Further Work*, concludes the thesis. This chapter summarise the work that has been carried out. It introduces the findings of the research and shows how it relates to fulfilling the research objectives and how the work contributes to knowledge before discussing areas for further work.

Appendix A shows the interview questions, *Appendix B* illustrates he Data Flow Diagrams (DFDs), ***Appendix C*** presents the Role Activity Diagrams (RADs) for the course design and delivery processes, ***Appendices D and E*** show the RADs for the students' journey processes, ***Appendix F*** illustrates the Mind Map and finally ***Appendix G*** shows the RADs models for the Final Year Project Process.

Chapter 2
Higher Education Context

2.0 Introduction

This chapter introduces the higher education context. It starts by defining Higher Education Institutions (HEIs) and the educational process. Afterwards, the role of higher education and core business processes are highlighted. Finally, it introduces the importance of quality management in higher education and provides a brief description of the most common quality improvement approaches.

2.1 Higher Education Institutions

Stensaasen (1995) considers educational institutions as "*industries which provide education as the service with raw materials as incoming students on whom the processes of teaching are applied and turned out as the finished products of graduates*." From the stakeholders' viewpoint of quality in higher education, courseware are considered as products, the current and potential students as users of products and the graduates as output with employers as their users (Srikanthan and Dalrymple, 2003)

Moreover, Hwarng and Teo (2001) stated that education is a process of converting tangible resources into intangible resources. The educational product is often intangible and hard to measure because it is reflected in the transformation of individual's knowledge, their characteristics, and their behaviour. They added that higher education should not be considered as a career preparation; however, it is an intellectual development which should have permanent impact on individuals.

Many researchers have compared industry with education and discovered that although industry and education are different from business process perspectives, they share some of their outcomes such as focusing on building flexibility and improving customer satisfaction in a dynamic environment

(Stensaasen, 1995, Lundquist, 1998, Srikanthan and Dalrymple, 2003). However, in higher education what happens in the classroom is intangible. Unlike industry, where they deal with tangible processes measuring the quality of the goods based on the product specifications. Hence, HEIs have to face the main challenge of dealing with the intangibility of education (Venkatraman, 2007).

2.1.1 The Role of Higher Education Institution

The role of HEIs is to produce highly skilled students and responsible graduates who can meet the needs of all segments of society (Khorasgani, 2008). HEIs are responsible for cultural, social and economic development by contributing to the enhancement and improvement of knowledge through enhancing education and research at all levels.

In order to achieve this role and produce highly qualified graduates who contribute to society through their knowledge and skills and also benefit their personal careers, HEIs should focus on enhancing their effectiveness and efficiency. Thus, HEIs will need to continuously improve their business processes to be able face any challenges and survive in the competitive environment.

Since the role of education is to equip individuals with knowledge, skills and techniques so that they can contribute to the society after graduation, then quality education means enhancing intellectual growth and development by adding value to student's knowledge, skills, and techniques and thus adding value to the society. This has influenced the researcher in the development of the scope of the study, which is improving the students' journey process and in turn enhancing students' knowledge and skills to enable them to have better chances in career preparation.

To achieve its role, HEIs are under pressure to enhance their processes in order to be able to improve. The following section provides an overview on quality management in HEIs starting by defining quality.

2.2 Quality Management in Higher Education Institutions

HEIs have a unique culture which hinders rapid change and limits their readiness to change (Angehrn and Maxwell, 2008), but they exist in an environment which is constantly changing with such things as changing nature of work, increased competition, certain improvement initiatives, quality awards, internal and external stakeholders needs, technological advancement and globalization (Anderson and McAdam, 2004).

In this essence, quality has become one of the most important concerns of HEIs (Mehralizadeh et al., 2007). There are various definitions of quality, Juran and Godfrey (1999) define quality as "*fitness for purpose*", while Crosby (1979) is known for the concept of "*Zero Defects*". Deming (1986) define quality as "*a predictable degree of uniformity and dependability at low cost and suited to the market*".

For the sake of this study Juran's definition will be considered. As highlighted in the literature (in Section 2.1.1) HEIs play an important role in enhancing countries' economy as it is responsible for qualifying individuals with knowledge and skills that will provide the society with experts capable of contributing to economic development. Therefore, HEIs should focus on their fitness for purpose in today's challenging environment, in order to be able to maintain a high level of quality and be able to contribute to the society.

Various authors agree that due to the complex and multifaceted construct of higher education, there is still no widespread agreement/compromise on how quality should be best managed/applied within HEIs (Mehralizadeh et al., 2007, Becket and Brookes, 2005, Becket and Brookes, 2008, Srikanthan and Dalrymple, 2003, Campbell et al., 2002, Middlehurst, 2001, Cheng and Tam, 1997, Owlia and Aspinwall, 1996, Harvey and Knight, 1996). Moreover, Dick and Tarí (2013) conducted a literature review of quality management in HEIs, which indicates that there is lack of research on quality management although the importance of quality is growing as universities are increasingly facing competition.

As a result, HEIs have undertaken various attempts to apply quality management approaches which were initially developed as industrial models in order to achieve continuous quality improvement (Becket and Brookes, 2008). The following section provides an overview of some quality improvement approaches.

2.3 Quality Improvement Approaches

The most widely implemented approach is Total Quality Management (TQM) which is defined by ISO 8402 as "*a management approach of an organisation centred on quality, based on the participation of all its members and aiming at long term success through customer satisfaction and benefits to all members of the organisation and society.*" Most quality improvement approaches and quality awards are derived based on a TQM philosophy (Gershon, 2010). Table 1 shows various models that have been implemented in HEIs.

Table 1: Quality Management Models

Model	Definition
TQM	A comprehensive management approach which requires contribution from all participants in the organisation to work towards long-term benefits for those involved and society as a whole.
EFQM excellence model	Non-prescriptive framework that establishes nine criteria (divided between enablers and results), suitable for any organisation to use to assess progress towards excellence.
Balanced scorecard	Performance/strategic management system which utilises four measurement perspectives: financial; customer; internal process; and learning and growth.
Malcolm Baldrige award	Based on a framework of performance excellence which can be used by organisations to improve performance. Seven categories of criteria: leadership; strategic planning; customer and market focus; measurement, analysis, and knowledge management; human resource focus; process management; and results.
ISO 9000 series	International standard for generic quality assurance systems. Concerned with continuous improvement through preventative action. Elements are customer quality and regulatory requirements, and efforts made to enhance customer satisfaction and achieve continuous improvement.
Business process re-engineering	System to enable redesign of business processes, systems and structures to achieve improved performance. It is concerned with change in five components: strategy; processes; technology; organisation; and culture.
SERVQUAL	Instrument designed to measure consumer perceptions and expectations regarding quality of service in five dimensions: reliability; tangibles; responsiveness; assurance and empathy; and to identify where gaps exist.

Source:(Becket and Brookes, 2008)

Quality is considered a main concern of HEIs, because of the increased pressure by the competitive environment. As highlighted in Table 1 a variety of approaches like TQM and Business Process Reengineering have been introduced to apply quality in HEI (Venkatraman, 2007, Srikanthan and Dalrymple, 2003, Stensaasen, 1995, Sohail et al., 2006). However, even though there has been a huge amount of research concerning this subject there is no general agreement how to best apply quality management within HEI (Becket and Brookes, 2005, Cheng and Tam, 1997, Mehralizadeh et al., 2007, Owlia and Aspinwall, 1996, Srikanthan and Dalrymple, 2003).

2.4 National Accreditation Bodies

In many countries there are also national organisations responsible for quality in HEIs. These organisations focus on managing the effectiveness and reliability of quality systems and procedures implemented by institutions to manage quality and academic standards, rather than on stressing practical changes that might lead to improvements.

In Egypt, the National Authority for Quality Assurance and Accreditation of Education (NAQAAE) was established by the end of 2007 as an accrediting body for all Egyptian HEIs. Its main role is to evaluate and provide accreditation to HEIs which are able to fulfil the criteria covering various areas of the activities of HE institutions (NQAA, 2004). Also, within the UK, the role of Quality Assurance Agency (QAA) is to examine, review and report on the quality procedures within institutions. However, Dick and Tarí (2013) advise higher education managers not only to focus on fulfilling national and accreditation bodies standards as it generally leads to symbolic adaption of quality management rather than a undertaking a real quality improvement strategy.

Having introduced quality management in HEIs, the next section will highlight the problems and challenges facing HEIs in Egypt.

2.5 Higher Education in Egypt

Egypt has one of the oldest and largest educational systems across the Arab region. Modification and enhancement of the educational system in Egypt lead major reform efforts since the beginning of the 21st century, ranging from economic, political and social to educational. The success of the reform process depends greatly on how the government agencies, institutions, faculty members and students are committed to the anticipated change (Said, 2001).

Although Egypt has the largest educational system in the Arab region the main challenge facing the country is concerned with quality. HEIs in Egypt are now facing severe competition and are under increase pressure to enhance the efficiency and effectiveness of their programmes (OECD and TheWorldBank, 2010). To achieve improvement in quality issues, higher levels of funding are needed to upgrade facilities, teacher training, curriculum development, monitoring and evaluation (UNESCO, 2008). Egypt's reform strategy consists of 25 priority projects amongst which are:

- developing a new map for university and higher education;
- enhancing study programmes and curricula;
- developing new admission mechanisms;
- setting up library and learning resources;
- promoting open and distant learning;
- developing information technology and networking;
- promoting faculty development;
- developing graduate studies;
- upgrading scientific research, systems, and mechanisms;
- modernizing the Management Information System (MIS) for university administration and management;
- promoting linkages with business and industry;
- promoting international cooperation;
- developing programmes towards gifted and talented individuals;
- establishing a centre of excellence in higher education.

According to the Global Competitiveness Index in 2007 Egypt has a score of 4.1 out of 7 and is ranked 65th out of 128 countries at the same development stage. Furthermore, there are several areas that have been identified as competitive disadvantages for Egypt most importantly the low quality of the education system. Research and Development are also an area of weakness where there is lack of integration and cooperation between the industrial sector and universities. Hence, the Egyptian government has shown increased interest to apply a fundamental reform to the higher education system in order to deal with the existing pressures and accumulated deficiencies (OECD and TheWorldBank, 2010).

The World Bank and the Organisation for Economic Co-operation and Development (OECD) jointly conducted an independent review of the higher education system in Egypt. The review recommends reforms in Egypt's higher education system to ensure responsiveness to the labour market requirements and reduce social inequalities arising from differences in educational opportunity. The following four challenges currently facing the higher education sector were emphasised:

1. narrow access and limited opportunities for students;
2. poor quality of educational inputs and processes;
3. deficiencies and imbalances in graduate output relative to labour market requirements; and,
4. under-developed university research capability and linkages to the national innovation system.

As highlighted in the Country Background Report cited in (OECD and TheWorldBank, 2010), higher education in Egypt is based on a narrow, inflexible and outdated curriculum bound by the single perspective which forms the content of a course. Also the teaching process neglects the development of analytical skills and there is a need to be more interactive rather than depending on the traditional memorization.

Consequently it is essential to introduce broader and more innovative approaches to curriculum design which will in turn expand the graduate knowledge and provide them skills that they need to become more successful in their careers (OECD and TheWorldBank, 2010).

Holmes (2008) investigated the challenges facing higher education based on previously conducted studies for improving education outcomes. His research focused particularly on quality of education. He stated that higher education in Egypt is experiencing "*an overall lack of quality*" and that "*ineffective policies and reforms*" can prevent economic development. These problems surfaced severely after the Egyptian revolution embarked in January 2011 which has triggered a wave of social demands related to higher wages, pensions, improved education and employment opportunities (Dabrowski, 2011). Accordingly, Kandeel (2011) stated that: '… *proper education is absolutely critical to Egypt's future.*' She added that it is important to improve education and vocational-training systems whereas they constitute one of the most problematic sectors in their current state. She also stressed that improvements are crucial to support educational outputs and labour skills with local market requirements.

2.6 Conclusion

This chapter discussed HEIs and their role in educating and developing individuals who can contribute to economic enhancements. Quality Management in higher education was introduced to emphasise the importance of quality in HEIs. Quality improvement approaches has been discussed as well as national accreditations bodies and its role. Finally, higher education in Egypt was illustrated with an emphasis on the challenges facing this sector.

The literature review showed that quality is considered a main concern of HEIs because of the increased pressure of gaining competitive advantage. However, although there are various attempts and approaches that have been implemented in the educational construct, there is no agreement on how to achieve quality to HEIs.

Chapter 3
Business Process Fundamentals

3.0 Introduction

This chapter will start by defining business processes. It will also illustrate the various classifications of business processes as well as defining business process modelling. It will provide a brief discussion of some of the process modelling techniques, followed by a detailed discussion on the selected techniques: Data Flow Diagram (DFDs), Role Activity Diagrams (RADs) and Soft System Methodology (SSM) and the reason for choosing those techniques.

3.1 Business Process Definition

A process view shows how functions co-operate in order to achieve customer satisfaction. In order to emphasise the relation between processes, and identify the activities; processes should be mapped, defined, and modelled (Gibb et al., 2006) as processes have different meanings in different perspectives.

There are numerous definitions but almost all have the same meaning: processes are relationships between inputs and outputs, where inputs are transformed into outputs using a series of activities, which add value to the inputs (Aguilar-Savén, 2004). Hence, a process converts inputs by adding value throughout a range of activities into outputs. The input and output, and the entry and exit points specify the process boundaries within which the relationship between the process and its environment is created through the inputs and outputs (Damij, 2007). Table 2 introduces various process definitions according to different researchers.

Table 2: Process Definitions

Process Definition	Reference
"*… a set of logically related tasks performed to achieve a defined business outcome.*"	(Davenport and Short, 1990)
"*… a partially ordered set of tasks or steps undertaken towards a specific goal*"	(Curtis et al., 1992)
'' … a collection of activities that takes one or more kinds of inputs and creates an output that is of value to the customer''	(Hammer and Champy, 1993)
"… a sequence of pre-defined activities executed to achieve a pre-specified type or range of outcomes"	(Talwar, 1993)

The definitions indicate that *activities* of business processes are executed by *actors* performing explicit *tasks* in order to contribute to the achievement of a specific *goal* or *outcome* that is of value to the customer.

Therefore, business process identifies the means to achieving organisational goals. In this essence business process is described as a group of activities which can be performed to attain a certain objective of an organisation. The literature shows that there has been a great focus on business processes in recent years as they potentially add value to the organisation (Martinez et al., 2001, Aguilar-Savén, 2004, Chan and Chung, 2002, Hammer and Champy, 1993, Hammer, 1990, Damij, 2007).

Business processes are distinctive among organisations (Venkatraman, 1994) accordingly they are an important factor leading to competitive edge (Hinterhuber, 1995). Therefore, analysing business processes for potential improvements helps organisations to achieve competitive edge (Yen, 2009). As a result organisations need to recognise the need to move away from focusing on individual tasks and functions to focusing on more communicated, integrated and coordinated ways of work by looking at operations in terms of business processes (Davenport, 1993, Hammer and Champy, 1993).

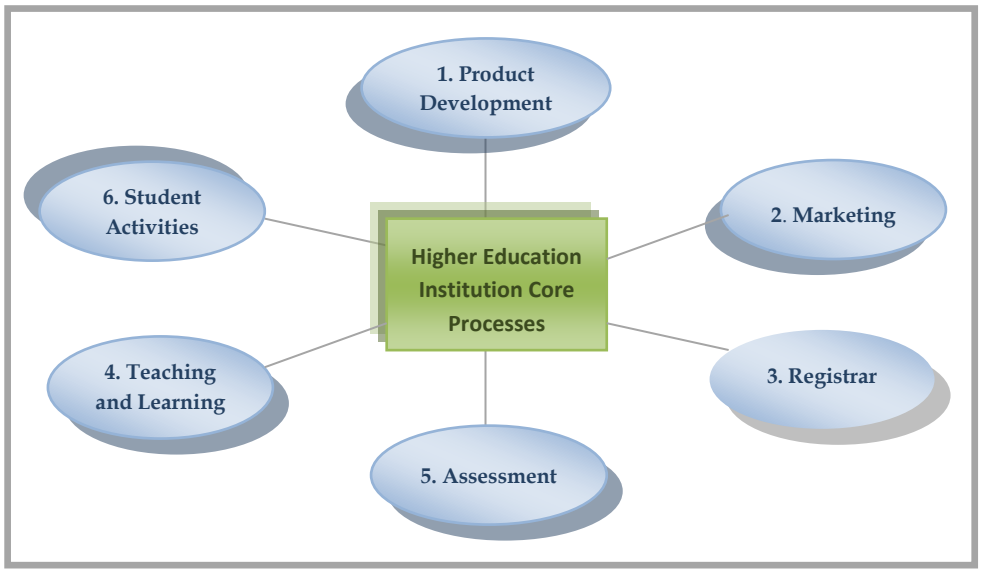
3.2 Classification of Business Processes

Business processes are often classified into *core processes*, *support processes* and *management processes* (Ould, 1995). Core processes are initiated from outside an organisation for servicing external customers, e.g. fulfilling orders, administering insurance policies, etc. (Ould, 1995, Aguilar-Savén, 2004). They should make the organisation distinctive and/or differentiate the sector in which it operates. They are also affected by customer demands and satisfaction as they are the main reason for configuring and improving these processes (Gibb et al., 2006).

Support processes; on the other hand, provide the environment for the core process to be performed. They support the core processes by offering sufficient resources (Ould, 1995, Aguilar-Savén, 2004). Finally, management processes manage both the core processes and the support processes.

In higher education, Sohail et al. (2006) divided core business processes of the HEI into six main core processes (see Figure 1). The objectives of the following core business processes are to fulfil customer requirements; to obtain customer feedback and to ensure customer satisfaction:

1. ***Product development*** includes the design and development of programmes/courses.
2. ***Marketing*** involves all the marketing activities including surveys on customer perception. Also required of this core process is to measure and analyse the effectiveness of the marketing activities.
3. ***Registrar*** includes activities such as registration; accommodation; sponsorship; collection of tuition fees; releasing academic transcripts; and alumni.
4. ***Teaching and learning*** involve all processes linked to delivering knowledge to students.
5. ***Assessment and examination*** include all academic procedures pertaining to continuous assessment and examination.
6. ***Student activities*** emphasis on major students' activities which will be conducted and facilitated by the student council.



Source: (Sohail et al., 2006)

Figure 1: HEI Core Business Processes

Core business processes in Figure 1 include design and development of programmes/courses, registration, teaching and learning .. etc. Generally, core processes are analysed to improve customer satisfaction, support processes to enhance the enterprise efficiency and management processes to enhance the enterprise structure (Mili et al., 2004). For this reason, HEI will always focus on improving their knowledge base and developing better processes and services in order to increase the efficiency of knowledge transfer to students.

3.3 Business Process Modelling

Recently there has been an increased interest in methodologies, techniques and tools to facilitate a common understanding and analysis of business processes. Aldin and Cesare (2009) believe that BPM is useful in facilitating human understanding and communication therefore it is becoming a more popular research area for both organisations and academia.

As defined by (Havey, 2005) BPM is "*.. a set of technologies and standards for the design, execution, administration, and monitoring of business processes*". Thus, BPM provides a comprehensive understanding of a process as it combines a set of activities within an enterprise with a structure showing their logical order and

dependence whose objective is to generate a certain outcome (Climent et al., 2009, Aburub, 2010). Moreover, it is a useful tool to capture structure and formalise the knowledge about business processes (Guha and Kettinger, 1993, Abate et al., 2002).

Aguilar-Savén (2004) stated that BPM can be used to learn about a process, make decisions about a process, or develop business process software. Tam et al. (2001) pointed out that using BPM facilitates discovering critical processes, improving the overall performance, and help in software development. Phalp (1998) argued that BPM techniques can illustrate traditional software development in addition to enabling business processes improvement or restructuring. Moreover, a review about business process-modelling techniques shows that business process models are primarily used to discover inconsistencies in a process, in order to make improvement decisions (Aguilar-Savén, 2004, Völkner and Werners, 2000).

3.3.1 Modelling Perspectives

Cull and Eldabi (2010) indicate that common modelling techniques are designed to satisfy one particular purpose and thus they are not able to model all process aspects. Giaglis (2001) also added that there is no single process modelling technique that covers all aspects of process modelling. Therefore, it is necessary to determine the purpose of the model in order to be able to choose the suitable modelling technique/s.

It is important to choose the right technique taking into consideration the purpose of the analysis and understanding of the available process modelling techniques and tools (Luo and Tung, 1999, Kettinger and Guha, 1997). Therefore, Curtis et al. (1992) classified BPM techniques by the purpose that they would have when applied to any project. According to this taxonomy, modelling techniques could be categorised as follows:

1. The functional perspective illustrates a process showing *what* activities are being performed and *which* data flows are necessary to link these activities.

2. The behavioural perspective represents a process illustrating *when* activities are being performed and *how* they are performed using mechanisms such as feedback loops, iterations and triggers.
3. The organisational perspective illustrates a process showing *where* and *by whom* activities are being performed.
4. The informational perspective represents how data are produced or controlled by the process.

From another perspective Melão and Pidd (2000) pointed out that a business processes can also be described in terms of various perceptions created by different individuals and groups according to different interpretation. Viewing a business process as a *social construct* is appropriate with strategic, intangible processes, where human action is the main driver, such as health, social and educational services. This viewpoint of business processes is related to 'soft' thinking for which Checkland's soft systems methodology (SSM) is proposed to model business processes.

There are several techniques to model business processes, each technique employs a different set of notations and models business processes from rather different perspectives. In order to clearly illustrate a system from various perspectives, and present a holistic understanding of business processes, it is essential to integrate more than one modelling technique to create a set of graphical models (Shen et al., 2004, Climent et al., 2009, Abeysinghe and Phalp, 1997).

3.4 Modelling Techniques

Various studies discuss a number of techniques and their application in modelling business processes (Miers, 1994, Aguilar-Savén, 2004, Aldin and Cesare, 2009). There are a number of modelling methods, each one has its own advantages and disadvantages considering the perspective of the organisation that it can provide. A number of the most well-known modelling approaches are Flowcharts , Integrated Definition for Function Modelling (IDEF) (IDEF, 2003), Business Process Management Notation (BPMN) (OMG, 2004), Unified

Modelling Language (UML) (Rumbaugh et al., 2005), Data Flow Diagrams (DFDs) (Yourdon and Constantine, 1979, DeMarco, 1979), Role Activity Diagrams (RADs) (Ould, 1995) and Rich Pictures (Checkland, 1993). Table 3 illustrates briefly the main process modelling techniques where some of their key factors strengths and weaknesses are identified (Aguilar-Savén, 2004).

The techniques highlighted in table 3 are described briefly hereinafter illustrating an example of each technique.

3.4.1 Flowcharts

The flowchart was created by Herman Goldstine and John von Neumann in the 1940s (Roebuck, 2012). It is a formalised graphical representation of a program logic sequence, work or manufacturing process, organisation chart, or similar formalised structure (Lakin et al., 1996, Damij, 2007). As illustrated in Figure 2 flowcharts illustrate processes, data, and flow direction for resolving problems. Although flowcharts are flexible and easy to illustrate, there is no identification of main and sub-activities, thus making the chart complex and hard to read. Also, roles are not displayed in flowcharts which make it difficult to connect organisational activities to performers. Thus, Flowcharts are only suitable for providing a process outline (Aguilar-Savén, 2004).

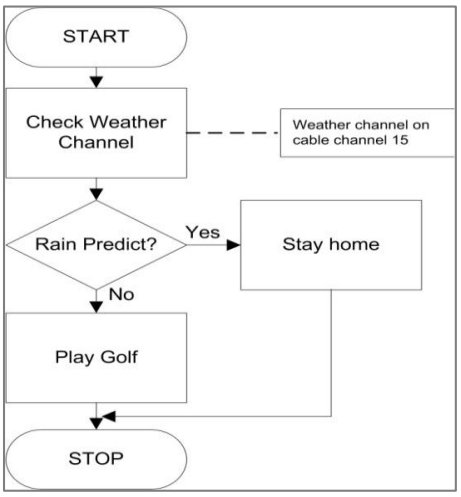


Figure 2: Flowchart Example

3.4.2 The Integrated Definition for Function Modelling

The Integrated Definition for Function Modelling (IDEF) is a family of methods created for use within the United States Air Force to create graphical illustrations of different systems. The IDEF family consists of various versions which represent different types of modelling (IDEF, 2003). The commonly used methods for business process modelling are IDEF0 and IDEF3 and are explained therefore further below (Aguilar-Savén, 2004).

IDEF0 method (Figure 3) is derived from a graphical language called structured analysis and design technique (SADT) (Damij, 2007). It is used to specify function models, which are "*what do I do*?" models. As stated by (Aguilar-Savén, 2004) IDEF0 illustrate the high-level activities of a process representing main activities and the input, control, output, and mechanisms related with each major activity. Therefore, IDEF0 models cannot represent the behavioural or informational modelling perspectives. Moreover, IDEF0 models tend to be interpreted as presenting sequence of activities.

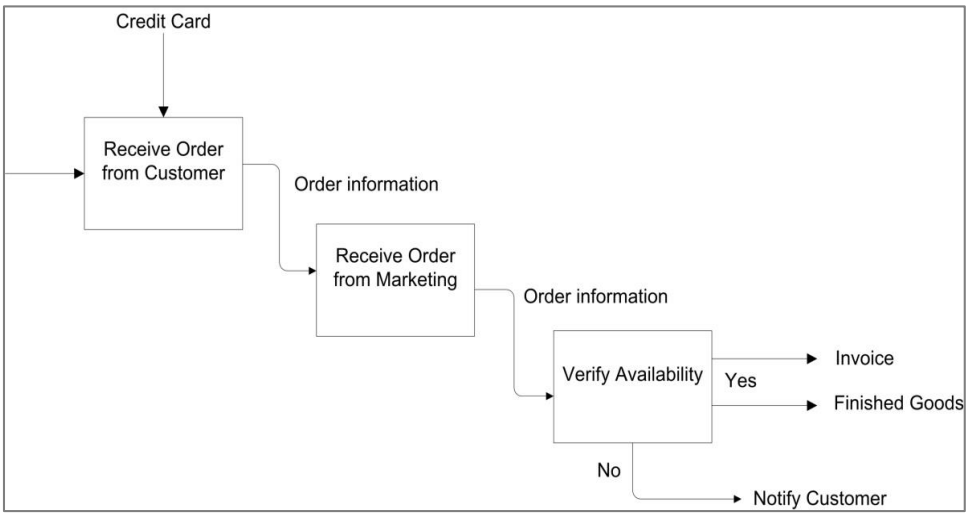


Figure 3: IDEF0 Example

On the other hand, IDEF3 (Figure 4) illustrates the behavioural aspects of a system. It allows an easy mechanism for capturing process information as it provides a structured method to illustrate a sequence of events and any contributing objects. It illustrates *how* a particular system or organisation works as opposed to IDEF0, which is mainly concerned with *what* activities the

organisation performs. However, (Shen et al., 2004) stated that the disadvantage of IDEF3 is that they are deficient in adequately showing the flow of information between various activities.

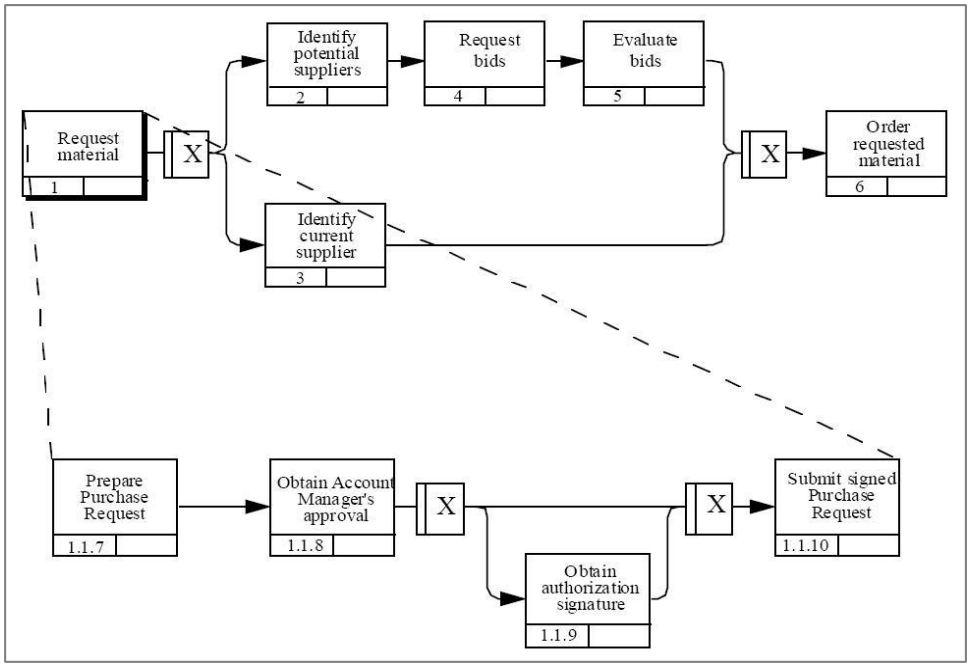


Figure 4: IDEF3 Example

3.4.3 Business Process Modelling Notation

Business Process Modelling Notation (BPMN) was developed by the Object Management Institute (OMG, 2004) for designing, implementing and monitoring business processes in a form of a diagram (Chinosi and Trombetta, 2012).

A BPMN diagram is created out of a set of core elements which are categorized into three main groups: flow objects, connecting objects and swimlanes. Flow objects illustrate specific events and activities. Flow objects are linked with connecting objects, which appear as solid, dashed or dotted lines and may include arrows to indicate process direction. Swimlanes are straight lines with a rectangle called pool. They organise various flow objects into categories according to their functionality. Figure 5 provides an example of BPMN diagram (Chinosi and Trombetta, 2012).

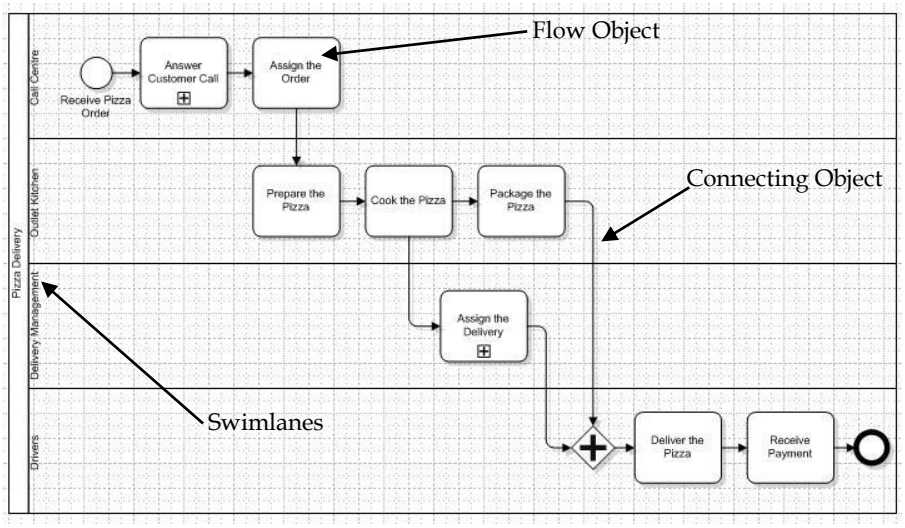


Figure 5: BPMN Example

Yousef et al. (2009) stated that although BPMN is a rich process modelling notation it does not clearly demonstrate roles or interactions. Harrison-Broninski stated that techniques such as BPMN is "*biased towards providing IT support, rather than towards describing human behaviour*" and "*dealing with mechanistic and repetitive activities*" (Harrison-Broninski, 2005a). Therefore, BPMN is more software-oriented, which makes the notation inadequate in managing processes that depend on humans. Harrison-Broninski (2006b) also added that "*BPMN is not suitable, and cannot realistically be extended, to cover the more dynamic, interactive forms of human collaborative work"*

3.4.4 Unified Modelling Language

The Unified Modelling Language (UML) was first introduced in 1997 in the field of Software Engineering as a graphical language for visualising and documenting of software system (Giaglis, 2001, van de Kar and Verbraeck, 2008, Rumbaugh et al., 2005). The UML can capture static structure and dynamic behaviour of a system (Rumbaugh et al., 1999). The static structure defines the types of objects that are significant to a system and its implementation, in addition to the relations between the objects. The dynamic view describes the history of objects over time and the communications between objects to achieve goals. Booch et al. (1998) state that UML consists of a variety of diagrammatic notations including, use case diagrams and activity diagrams.

Use case diagrams (Figure 6) tackle the static view of a system and capture system functionality and their relationships. The use case diagram model illustrate the 'boundary of a system', the actors and the use cases (Dolques et al., 2012). While activity diagrams (Figure 7) address the dynamic view of a system and illustrates the flow between activities. It provides an accurate graphical representation illustrating participants responsibilities and interactions (Brown, 2008).

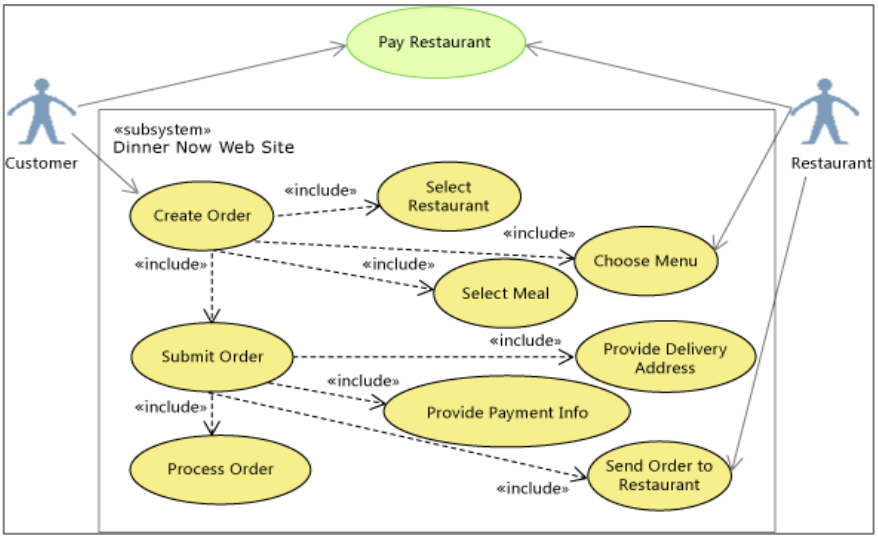


Figure 6: Use Case Diagram Example

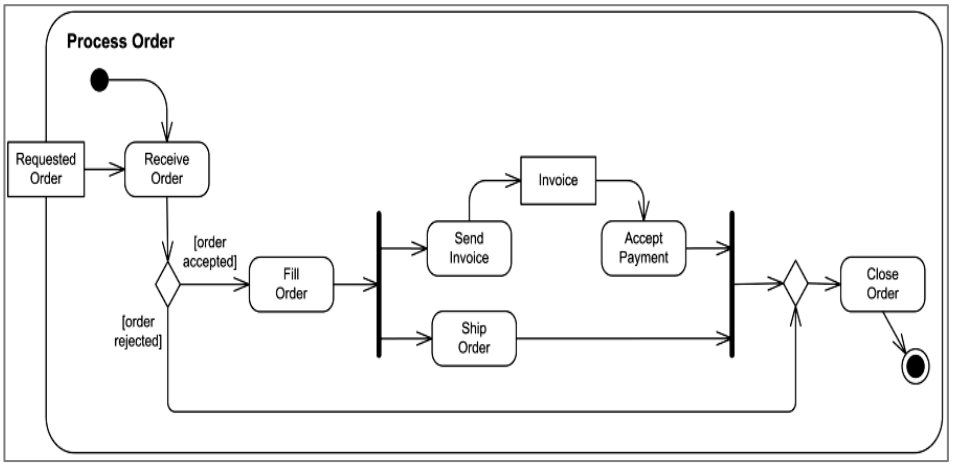


Figure 7: UML Activity Diagram Example

Table 3: Business Process Modelling Techniques

Technique	Description	Attributes	Characteristics	Strengths and Weakness			
				User perspective		Modeller perspective	
				Strength	Weakness	Strength	Weakness
Flow Chart	Graphic Representation	Flow of actions	Not sub-layers Great details No overview	Communication ability	Can be too large	Flexibility quick, simple	No method available Different notations
IDEF0	Structural graphical representation, text and glossary	Flows of activities, inputs, outputs, control and mechanisms	Based on SADT Sub-layers The most Popular	Shows inputs, outputs, control and mechanisms overview and details	Trend to be interpreted only as a sequence of activities Roles are not Represented	Strict rules Possible to build a software Quick mapping	
IDEF3	Behavioural aspects of a system	Precedence and causality relationships between activities	Allows different views Process flow descriptions and object state transition description diagrams Sub-layers	Easy to understand dynamic aspects in a static way	Many partial diagrams to describe a process	Strict rules and notation Possible to build a software	Need lot of data Time consuming when modelling complex systems
BPMN	Diagrammatic View	Flow of data	Designing, implementing and monitoring business processes in a form of a diagram	Very commonly used	Difficult to understand	Mapped to execution language	Too complex to learn and adapt
UML Case Diagrams	Graphical representation	capture static structure of a system	Capture what a system is supposed to do, i.e., systems functional requirements	Simple notation	Difficult to determine what the diagram represents at first glance	Easy to use	Lack of non-functional requirements

Technique	Description	Attributes	Characteristics	Strengths and Weakness			
				User perspective		Modeller perspective	
				Strength	Weakness	Strength	Weakness
UML Activity Diagrams	Graphical representation	Capture dynamic behaviour of a system	Illustrate participants responsibilities and interactions	Easy to interpret Facilitate discovery of related processes	Potential to become complex	Easy to learn	
DFDs	Descriptive diagrams for structured analysis	Flow of data	Explains logical level sub-layers	Easy to understand	Only flow of data is shown	Easy to verify and draw	
RADs	Graphic view object state transition diagrams	Flow of individual roles	Detailed view Degree of empowerment No overview	Supports communication Intuitive to read	Not possible to be decomposed	Include business objects	Different Notation
Rich Pictures	Contextual representation of things	Represent process human problematic	Represent some of the richness of the process being examined	Support communication and understanding of the process	It is not structured approach	Easy to illustrate components as clients, people, tasks and environment	Lack of a particular notation

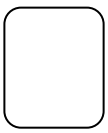
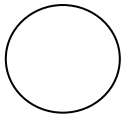
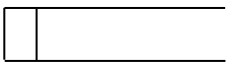
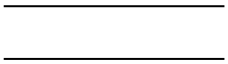
Adapted from: (Aguilar-Savén, 2004)

3.4.5 Data Flow Diagrams

Data Flow Diagrams (DFDs) were introduced in 1979 by Yourdon and Constantine (Yourdon and Constantine, 1979), De Marco (DeMarco, 1979), and Gane and Sarson (Gane and Sarson, 1979). It is a common form of process modelling, which shows how data moves through an information system. A set of DFDs provide a logical model that shows what the system does, not how it does it (Shelly and Rosenblatt, 2009).

There are two different standard set of DFDs symbols. One developed by Gane and Sarson (1979) and the other set was developed DeMarco (1979) and Yourdon and Constantine (1979). Table 4 shows the difference between the DFDs notations. Each set consists of four symbols that represent the following: data flows, data stores, processes and external entities (Dixit, 2007).

Table 4: DFDs Notations Source

Data Flow Diagram		
Gane/Sarson	Use collection of symbols to represent the data related objects of a system	**Yourdon/DeMacro**
Notations		
	External entity	
	Data Flow	
	Process	
	Data Store	

Source: (Stobbs, 2002)

By using DFDs, a process can be specified at the logical level, i.e. it shows what a process will do, rather than how it will be done. Each process can be broken down into sub-processes at a lower level to show more detail. DFDs shows how information enters and leaves the process; what activities change the information; where information is stored within the process, and the organisational function to which the activity belongs (Aguilar-Savén, 2004). This makes DFDs a suitable notation for this research as they can enable the illustration of information/data flow among the activities of higher education processes and decomposition of the processes to the lowest possible level. The following Figure 8 shows an example of a DFDs

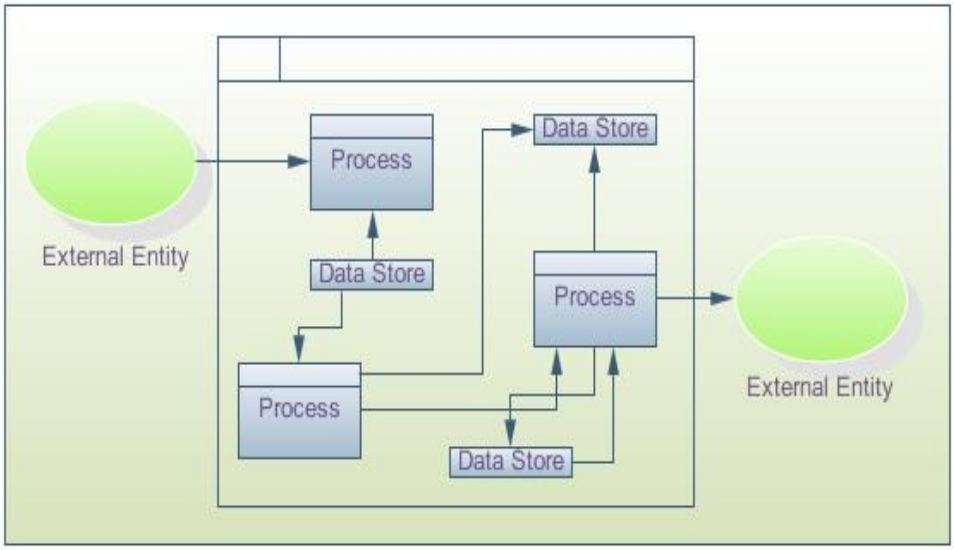


Figure 8: DFDs example

3.4.6 Role Activity Diagrams

Role Activity Diagrams (RADs) notation was originally introduced for software process modelling. It is an illustrative notation that focuses on modelling individual or group roles within a process, showing their activities and interactions (Huckvale and Ould, 1995). The RADs concept contains roles, actions, and interactions. Roles are defined by (Ould, 2005) as: "*… a set of actions and interactions which are governed by rules which, taken together carry out a particular responsibility*" while actions are "*… what actors do on their own in their roles to carry out their responsibilities*"(Ould, 2005).

The RADs notation is part of the RIVA method, which is defined by (Ould, 1995) as "*a method for the elicitation, modelling, analysis and design of organisational processes*" (Tbaishat, 2010). Riva utilises two languages to illustrate processes: the Process Architecture Diagram (PAD) and the Role Activity Diagrams (RADs). PAD is responsible for breaking organisation's activities into processes, while RADs on the other hand is process modelling technique which embraces individual processes within an organisation and shows roles, their activities and interactions.

RADs is a technique for modelling human side of processes and helps in understanding human working activities (Harrison-Broninski, 2005b). Unlike RADs, BPMN "*only vaguely captures the process*". Also BPMN swim lane assumes that some activities should be accomplished by the same agent; on the other hand, a role box in RADs is not just a grouping of activities it contains data used by the activity and not shared by other process participants. Moreover, BPMN does not allow interactions with more than two entities, whereas RADs supports multiple interactions between activities (Harrison-Broninski, 2006a).

Even though there have been various initiatives for translating RADs into BPMN or UML AD, it was found out that more research is needed for bridging the gap between business process models and system models (Yousef et al., 2009, Odeh et al., 2003). Since BPMN or UML are inadequate in illustrating human interactions; as they are focused on software requirements rather than supporting human dependant processes; RADs are proposed as a technique for modelling HEIs processes as they are human driven.

Organisations carry out activities or processes using resources (such as items, machines, material things and people). Dzimbiri (2009) view organisations as "*an assemblage of interacting human beings.*" He added that "*the people who create and form the organisation are crucial in the running of those organisations*." According to Kazlauskaitė and Bučiūnienė (2008) human resources are considered as a valuable asset of an organisation. He states that "*human contribution is nevertheless evident and undeniable, for people make an integral and indispensable part of the organisation*."

In the case of HEIs the structure of the institution is formed by lecturers, Heads of Departments, Deans, support staff, directors and managers of various divisions up to the Vice Chancellor or President (Dzimbiri, 2009). Though HEIs function with a number of resources (financial, machinery, information, time), human resources are considered crucial for the survival of institutions (Gilde, 2007). HEIs depend on individuals in providing their services, therefore individuals are fundamental to the improvement and delivery of courses (Garrison and Kanuka, 2004).

Therefore, RADs illustrates human dependant processes that are easy to understand by business users showing a full perspective of the process and are mainly useful in supporting communication (Aguilar-Savén, 2004). They represent business models in more simple means (Yousef et al., 2009). Moreover, RADs assist in revealing problems and proposing possible ways to resolving those problems (Ould, 1995). Consequently, the RADs technique was chosen to model the students' journey processes, since this process is totally dependent on human factor.

Many researchers used RADs in various areas to model processes and extract problems in a business process (Dawkins, 1998, Rojas and Martı´nez, 1998, Beeson et al., 2002, Odeh et al., 2003, Cox and Phalp, 2003). However, there has been no evidence in the literature about exploring the modelling of students' journey processes.

In higher education, Tbaishat (2010) examined the process for the acquisition of print and electronic periodicals acquisition process in academic libraries using RADs. She stated that this modelling technique was feasible, and provides a basis for improvement and management by supporting the analysis of process performance and behaviour. Also Cordes (2008) highlights the complex issue of developing management processes for learner centred library media production service. He states that the RADs introduces a clear understanding of system roles, functions, and interactions to managers and other participants in the service process.

Thus, stakeholders can view the overall details of processes; each one knows what the other is doing, when, and why as a result system inefficiency can be more easily recognised and improved.

Hence, RADs can demonstrate the roles that play a part in the students' journey processes, what starts them off, the actions they carry out, the decisions they take, the ways they collaborate and the goal(s) they have. Since most of the students' journey processes depend mainly on human interactions it is expected that RADs would be suitable for modelling these processes. RADs are useful for discovering aspects that will help in continuous process improvement; the researcher will apply this method to show the roles participating in the process of course design and delivery, along with their activities and the interactions between these roles, thus enabling the enhancement of the processes.

3.4.7 Rich Pictures

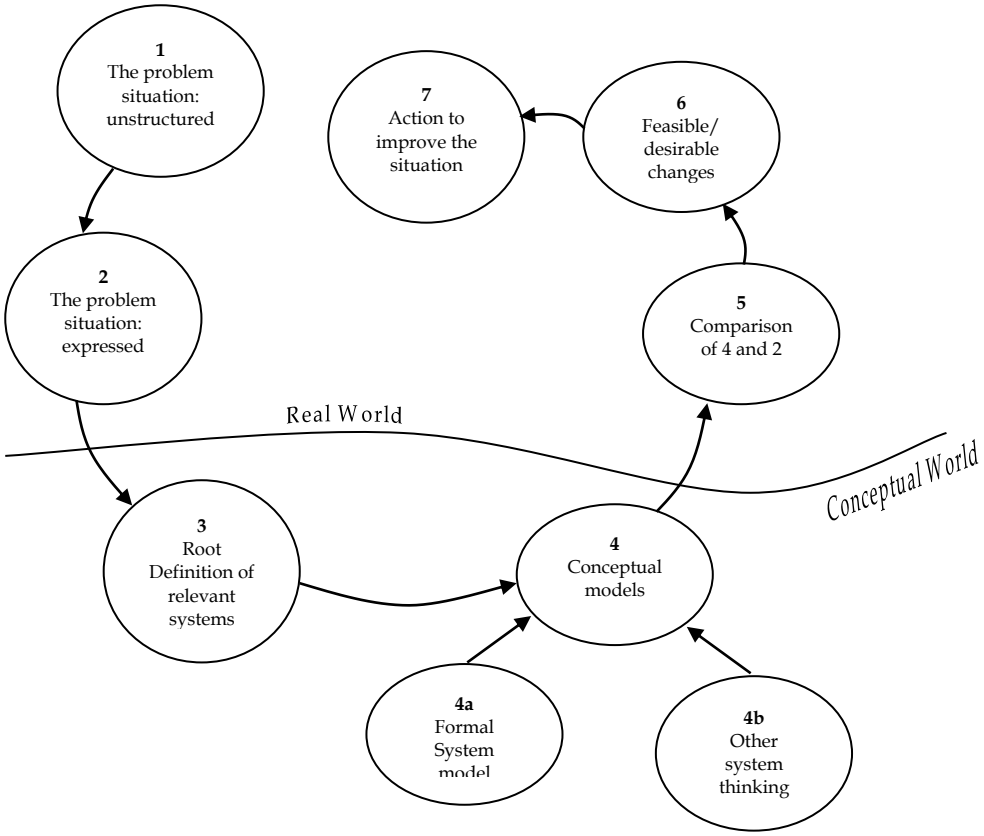
From another standpoint a business process can be described in terms of various perceptions created by different individuals and groups according to different interpretation. An organisation including people illustrates a much more complex condition than one which does not. This gives rise to distinguish between 'hard' and 'soft' problems.

Checkland (1993) differentiates between 'hard' and 'soft' systems. Hard systems are realized as physical entities as they can be rigorously defined and specified. 'Hard' systems assume that there is structured real world problem represented in which there is an agreement on what causes the problem. Unlike hard systems, soft systems focus on 'unstructured' problems within social activity systems in which there are ill-defined problem situation. Thus, soft problems cannot be identified precisely therefore they are an area of concern that needs attention (Nandish, 1995).

Therefore, SSM is a method for investigating complex human activity systems' problems (Checkland, 1993). It emerged at Lancaster University as part of an action research programme when Checkland and other researchers found out

that hard systems methodology was inadequate for dealing with fuzzy human problems where different perspectives of participants are complex (Cox, 2010). SSM focuses on the whole rather than focusing on particular problems. It is typically applied to '*fuzzy ill defined situations involving human being and cultural considerations*' (Tajino et al., 2005).

SSM is illustrated through seven stages which are shown in Figure 9. Stages 1, 2, 5, 6 and 7 are 'real-world' activities essentially concerning people in the problem situation; stages 3, and 4 are 'system thinking' activities which may or may not involve those in the problem situation (Checkland, 1993).



Source: (Checkland, 1993)

Figure 9: Checkland's 7 Stages SSM

Step 1 and 2 express the real world area of concern in a rich picture, to provide an easy understanding of the area of concern. It includes the organisational entities of interest, the relationships between them, roles of apparent significance, issues, and areas of conflict. By drawing a rich picture of the

processes of students' journey it becomes expressed to enable consequent structuring. The next step is to derive a root definition which describes what the system is depending on a particular Weltanschauung – a special perspective on a given reality in a human activity system - under investigation. The major component that distinguishes one Root Definition from another is the Weltanschauung. The CATWOE in Table 5 is used to formulate the relevant Root Definition (Checkland, 1993, Nandish, 1995, Wilson, 2001).

Table 5: CATWOE Elements

C	Customer
A	Actors
T	transformation process
W	Weltanschauung
O	Owner
E	Environment

Source: (Checkland, 1993)

In step 4 the conceptual model is derived on the basis of the Root Definition. The conceptual model illustrates those activities that are logically necessary to realise the transformation described in the Root Definition (Patching, 1990). Lastly on the completion of the conceptual model, a comparison will be made with the real world processes. The comparison is done activity by activity between the real world, where the area of concern exists, and the systems world, where the Root Definition and conceptual model have been built.

3.4.7.1 SSM Application

Gencoglu et al. (2002) used SSM to study supply chain management (SCM) since it is affected by cultural, political, and social issues. The research concluded that the use of SSM provided the participants a better understanding of the problem situation, and that issues and conflicts could be identified more effectively. Thus, this research highlights the effectiveness of SSM to be used for exploring social constructs.

The literature also shows that SSM was successfully implemented in various educational settings handling different aspects of teaching and learning.

Nandish (1995) applied SSM for analysing the teaching and learning processes in higher education. He added that it can also be used to analyse the teaching and learning strategies employed to deliver academic courses. Furthermore, Tajino et al. (2005) used SSM for designing English for Academic Purposes (EAP) course.

They claimed that designing an EAP course is a complex process. Their study revealed that SSM was successful in providing a framework based on various perspectives, which achieved full support for those involved with the course.

Also Warwick (2008) applied SSM as a tool for facilitating the review of a taught mathematics module. He explored different perspectives of all participants in the module's design and delivery in order to improve the design and delivery of mathematics modules.

Wade (2004) investigated ways of integrating SSM into the requirements elicitation stage of an agile system development method based on UML. It is argued that there could be some advantage in using SSM and UML in conjunction. UML models can support early design decisions prior to setting improvement opportunities whereas SSM helps in clarifying the purpose of a system and the needed activities to attain those purposes.

Tawileh et al. (2006) also combined the application of SSM with UML to design and implement a supporting information system that would help to integrate users' requirements and expectations early in the development process. They argued that the combination of SSM and UML proved to be highly valuable. SSM supported the identification of required system activities, while UML offered the link between those activities and the final information system and allowed the communication of the system design in a well-designed, standardised notation that is generally understood by software developers.

While many researchers combine SSM and UML, Perumpalath (2005) conducted action research, at a manufacturing unit in the UK, using a combination of hard and soft modelling techniques. Initially IDEF0 was used to capture the As-Is

process information, then SSM and IDEF0 were used to analyse the As-Is process and develop the To-Be processes after setting potential process changes. As a result, a distinctive hybrid method namely 'Soft IDEF0' is presented. It is claimed that it can be applied to any process modelling, analysis, improvement and change initiatives.

The purpose of using SSM in this research is to gain a deeper understanding of the students' journey processes of postgraduate education, such that appropriate action can be taken to improve those processes.

3.5 Summary

As highlighted in the previous sections, several techniques illustrate business processes from different perspectives and have special features and capabilities. Notations such as BPMN, UML and DFDs illustrate the informational perspective of a process (e.g. the tasks, systems and information flow involved in a process). While notations such as RADs show the organisational aspect of a process (e.g. concerned with how the user does something and how an action changes the state of the users and the system).

Many researchers utilised different BPM techniques in order to improve business processes. For example, Climent et al. (2009) used flow diagram (FD) and integrated definitions (IDEF0) techniques to illustrate and analyse the business processes of a bank subsidiary. They emphasised that the modelling techniques helped in discovering critical processes and thus proposing possible areas of improvements. In addition, Shen et al. (2004) conducted a case study to introduce web-based trading, marketing and logistics in small and medium sized enterprises (SMEs). They jointly combined three modelling techniques (IDEF0, IDEF3 and DFDs) in order to describe the process from different perspectives. Moreover Kalpic and Bernus (2002) highlighted the importance of process modelling as a tool that allows capturing and illustrating processes using reference models to re-engineer and improve the process of a new product development.

Paim et al. (2008) stated that over the years BPM has become more important for manufacturing. Today and in the future, the service sector will also increasingly use BPM techniques and technologies. Trkman (2010) declared that due to the changing economic environment organisations are increasingly interested in improving organisational business processes in order to enhance performance. One of the fields dealing with these challenges is BPM and there has been a great amount of research conducted in this area for more than a decade.
Consequently, HEIs lately identified the importance of process-based approaches including 'business process modelling' for information systems development, 'process redesign' to remove duplication and bottlenecks, and 'process management' operational performance improvement. Apart from of the organisational units or functions that are involved, a process-approach is concerned with all activities that are essential to produce an output or deliver a service to a customer (Sarchet and Kenward, 2006). Thus, organisations are constantly required to consider regular evaluation of their core business processes in order to improve their efficiency and effectiveness. As implied in business process change literature, performance improvement can be achieved by implementing process view of business (Skerlavaj et al., 2007).

Many researches indicate that there is a positive correlation between process management and business success (Skerlavaj et al., 2007, McCormack et al., 2009, Mojca Indihar and Jurij, 2007), however Vergidis et al. (2008) stated that there is no widespread understanding concerning the benefits that business processes can bring to the service industry.

The investigation of existing literature also showed that an organisation is a complex system, which constitutes of functions, processes, resources, customers, suppliers etc. Briffaut and Saccone (2002) stated that in order to understand system's components and their interactions, a manageable model of reality is necessary. The need for BPM was investigated and found that it is a valuable tool for improving business processes. The benefits of BPM are in facilitating human understanding and communication; supporting process improvements and process restructuring; facilitate learning about processes, help in software development, and make improvement decisions.

3.6 Conclusion

Various methodologies and techniques are available to model business processes. A review of current literature shows that it is not possible to model business process using a single technique. Therefore, it is important to understand the adaptability and communicability of different business process modelling techniques. This research will explore the students' journey processes and ensure a greater chance for end-users to easily understand the processes. For the scope of this research, the following three modelling techniques were chosen for modelling the students' journey processes:

1. *Data Flow Diagram*: DFDs will be used to represent an *informational* view of business process, since they show how processes interact with each other and with users and external entities through the flow of information. DFDs also show a *functional* view of business processes, since they show functional dependencies, and what activities change the information.
2. *Role Activity Diagrams*: to illustrate individual role, concentrating on the responsibility of roles and the interactions between them. It shows the roles participating in a process, along with their activities and the interactions between these roles. It is a modelling technique from *role/organisational* perspective which can be used to explore features that will enable further improvement of the process.
3. *Soft System Methodology*: from the point of view of this research SSM will provide the ability to cope explicitly with *social construct*. It will enable identifying different perspectives of lecturers, teaching assistants and students via the concept of Weltanschauung or 'world-view' of the different actors.

The RADs technique is expected to illustrate the human interactions and roles involved in the design and delivery processes for the case under research. On the other hand, the DFDs will show the flow of data, the inputs and outputs of each process and the relation with external entities. Since DFDs can be decomposed to the lowest possible level, it can point out process details; hence they could facilitate the discovery of current inconsistencies. The different actors in the real world area of concern have mental constructs which they use to form

opinions about the course design and delivery processes. These opinions provide the actors with varying perspectives on the process. The deep analysis using SSM is able to take as many perspectives as thought necessary to derive Root Definition in order to understand and improve the real world area of concern. The method was helpful in producing a picture based on the rich picture and Root Definition derived from CATWOE.

Chapter 4
Research Methodology

4.0 Introduction

This chapter presents an overview of the methodological aspects of research. It starts by making clear the definition of certain terms to research methodology. The research methodology applied for this study is then highlighted followed by the research approach, data collection methods and data analysis of the current study.

4.1 Definition of Research

In order to plan and carry out research, it is necessary to know what is meant by research in general. Sekaran (2007) defines research as a "*systematic and organised effort to investigate a specific problem that needs a solution*". Furthermore Collis and Hussey (2003) state that the purpose of research is to…

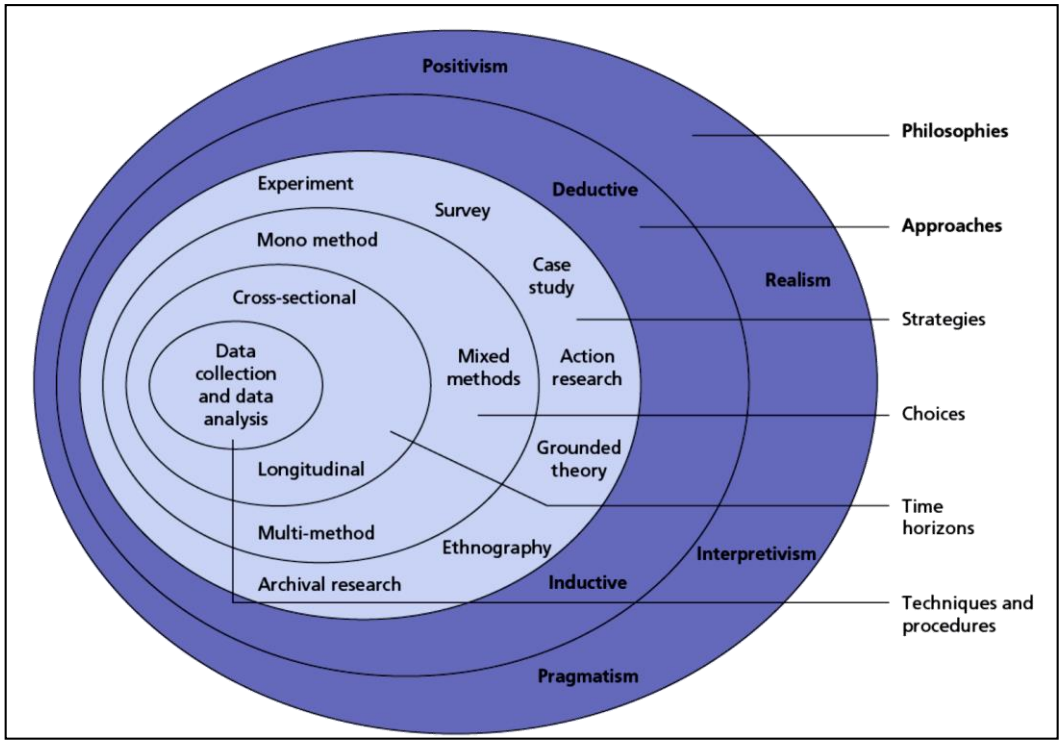
- Review or create existing knowledge
- Investigate existing situations or problems
- Provide solutions to problems
- Explore and analyse more general issues
- Construct or create new procedures or systems
- Explain new phenomenon
- Generate new knowledge

The following section will introduce the research onion and examine each layer in details.

4.2 The Research Onion

Most researchers start thinking about research methodology, which is the centre of the research onion, when starting a research project. Saunders et al. (2009) state that there are important layers that need to be examined before coming to

a choice of collection methods, which is an essential point of the research process. Accordingly, they classify research to include: philosophies, approaches, strategies, time horizons, choices, and data collection methods. The layers of the research onion are shown in Figure 10 discussed in the following sections.



Source: (Saunders et al., 2009)

Figure 10: The Research Onion

4.2.1 Research Philosophy

There are two main approaches to research, quantitative (positivism) and qualitative (interpretative) research. Quantitative research deals mainly with objective data and is concerned with its measurement and quantification in an attempt to test out an established theoretical viewpoint using a positivistic paradigm. On the other hand, Qualitative research, aims to explore a specific issue concerning non-numerical subjective data using a phenomenological paradigm (Gray, 2009). Table 6 provides a summary of some of the major distinctions between positivism and interpretative.

Table 6: Positivist and Phenomenological Paradigms

	Positivist Paradigm	Phenomenological Paradigm
Basic benefit	The world is external and objective	The world is socially constructed and subjective
	The observer is independent	The observer is a party to what is being observed
	Science is value-free	Science is driven by human interests
The researcher should	Focus on facts	Focus on meanings
	Locate causality between variables	Try to understand what is happening
	Formulate and test hypotheses (deductive approach)	Construct theories and models from the data (inductive approach)
Methods Include	Operationalizing concepts so that they can be measured	Using multiple methods to establish different views of a phenomenon
	Using large samples from which to generalise to the population	Using small samples researched in depth or over time
	Quantitative methods	Qualitative methods

Source: (Gray, 2009)

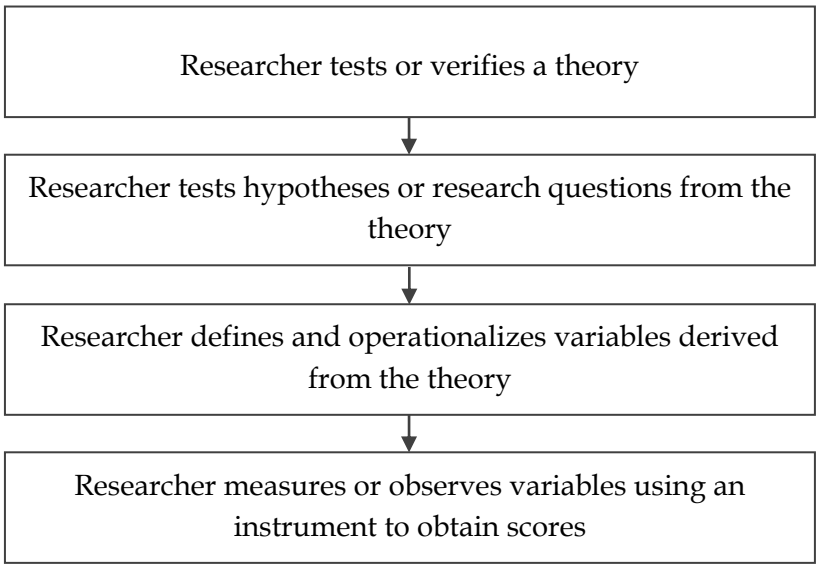
4.2.2 The Nature of Research

There are three different types of studies (Saunders et al., 2009, Blanche et al., 2008): exploratory, descriptive and explanatory Studies. Exploratory studies seek new insight for relatively unknown areas of research in order to clarify one's understanding of a problem, while in Descriptive studies it is the researcher who describes a phenomenon as it naturally occurs. Therefore, it is important to have a clear understanding of the phenomena on which the researcher wishes to collect data before the collection of the data. A descriptive study does not only report things but also answer 'what' questions whereas explanatory studies answer the 'Why' and 'How' questions. They are used to create causal relationships between variables with the emphasis on studying a situation or a problem in order to explain the relationships between variables, thus being able to explain whether one variable causes another.

4.2.3 Research Approaches

As shown in Figure 3 the second layer of the onion illustrates research approaches. A deductive approach, is typically used in quantitative research and is considered as moving from the universal view to the particular (Collis and Hussey, 2003).

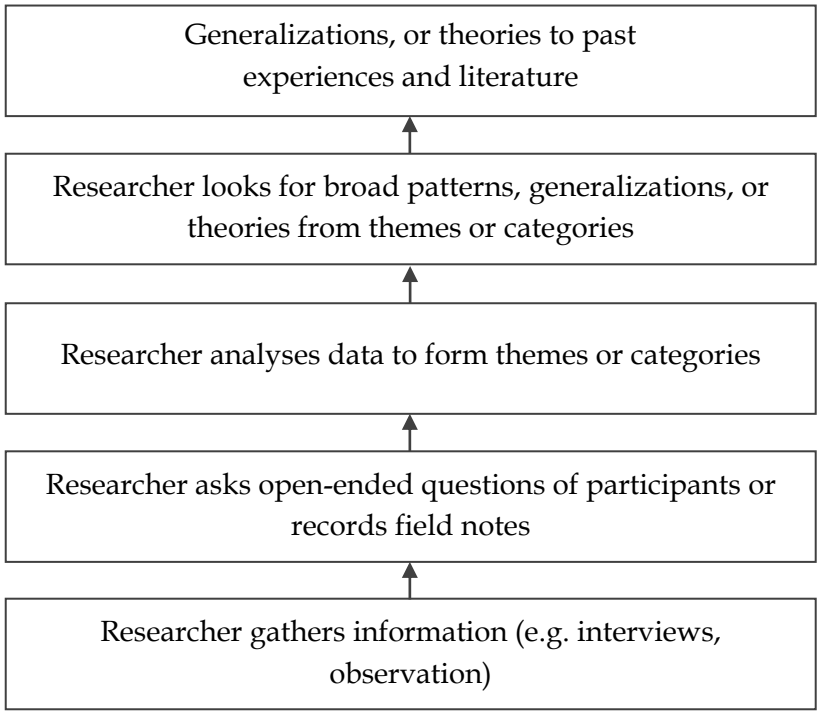
Gray (2009) declared that the deductive approach '… *moves towards hypotheses testing*'. As illustrated in Figure 11, a researcher tests or verifies a theory by creating hypothesis (Collis and Hussey, 2003) defining variables derived from the theory then testing the variables.



Source: (Cresswell, 2003)

Figure 11: The Deductive Approach Used in Quantitative Research

On the other hand, most qualitative research follows an inductive approach (see Figure 12) in which theories are developed after collecting and exploring data. In contrast to a deductive approach, it moves from the specific to the universal view (Collis and Hussey, 2003). Using an inductive approach might be more appropriate to study a small sample of subjects than a large number as with the deductive approach (Saunders et al., 2009).



Source: (Cresswell, 2003)

Figure 12: The Inductive Logic of Research in a Qualitative Study

Table 7 summarises the major differences between deduction and induction approach (Saunders et al., 2009)

Table 7: Difference between Deductive and Inductive Approaches to Research

Deduction Emphasises	Induction Emphasises
• scientific principles • moving from theory to data • the need to explain causal relationships between variables • the collection of quantitative data • the application of controls to ensure validity of data • the operationalization of concepts to ensure clarity of definition • a highly structured approach • researcher independence of what is being researched • the necessity to select samples of sufficient size in order to generalise conclusions	• gaining an understanding of the meanings humans attach to events • a close understanding of the research context • the collection of qualitative data • a more flexible structure to permit changes of research emphasis as the research progresses • a realisation that the researcher is part of the research process • less concern with the need to generalise

Source: (Saunders et al., 2009)

4.2.4 Research Strategies

The next layer of the onion in Figure 3 highlights a number of research strategies is available for conducting research. The kind of research strategy depends primarily on the type of research questions asked (Saunders et al., 2009). The employed research strategy is considered as a plan of how the researcher will answer the research questions based on data and methods. A general overview of some research strategies is discussed:

1. **Experiments** are a form of research generally associated with natural sciences. Experiments therefore tend to be used in exploratory and explanatory research to answer 'how' and 'why' questions(Saunders et al., 2009).
2. The **survey** is a common strategy in business and management research, which allows collection of a large amount of data from a large population. It is used to answer who, what, where, how much and how many questions. As a result it is used for exploratory and descriptive research (Saunders et al., 2009).
3. **Case Study** is used in many situations, to contribute to knowledge of individual, group, organisational, social, political, and related phenomena. The distinctive need for case studies arises out of the desire to understand complex phenomena. Case study method allows investigators to retain the holistic and meaningful characteristics of real-life events (Yin, 2008). Robson (2002) defined case study as a '*strategy for doing research which involves an empirical investigation of a particular contemporary phenomenon within its real life context using multiple sources of evidence*.' Several authors state that case study research is used to tackle areas that are still in the understanding, discovery and description stage and is a recommended way to research an emerging area (Bandara et al., 2005, Stuart et al., 2002, Yin, 2003, Yin, 2013). It typically combines data collection methods such as interviews, questionnaires and observations.
4. **Grounded Theory** was initially developed by Glaser and Strauss in 1967, which is a qualitative inductive data analysis method. The researcher should not begin with prior assumptions; the theory is generated from collected data with no initial theoretical framework (Saunders et al., 2009, Gray, 2009).

5. **Ethnography** seeks to understand social processes in their natural setting over an extended period of time by collecting, primarily, observational data (Cresswell, 2003, Gray, 2009). Ethnographic strategy is naturalistic, which means that the researcher observes the phenomenon within the context in which it occurs (Saunders et al., 2009).

4.2.5 Data Collection Methods

The centre of the onion in Figure 3 highlights data collection. There are several available data collection instruments; the researcher discusses only the sources which were relevant to this research.

4.2.5.1 Literature review

A comprehensive review of the literature is essential because of the following (Gray, 2009):

- Provides an up-to-date understanding of the subject and its significance and structure.
- Identifies the kinds of research methods that have been used.
- Is informed by the views and research of experts in the field.
- Assists in the formulation of research topics, questions and direction.
- Provides a basis on which the subsequent research findings can be compared.

4.2.5.2 Documents

Documents include written documents such as notices, correspondence, minutes of meetings, reports to shareholders, diaries, administrative and public records (Gray, 2009, Saunders et al., 2009). Yin (2013) argue that it is important to support and enhance documents by evidence from other sources. The use of documentation includes:

1. Verifying small details such as spelling and titles or names of organisations,
2. Corroborating information from other sources (triangulation)
3. Making inferences that direct to additional investigation.

Documents should be examined carefully and critically because this data sources may be biased and it may not necessarily contain the absolute truth (Yin, 2013).

4.2.5.3 Observation

Observation has the potential to generate extensive, rich and detailed data. If the researcher intends to investigate what people do, the most suitable way to find this out is to watch them do it (Saunders et al., 2009). Using direct observation, the researcher can develop an understanding of the research issue within the context in which it occurs. Nevertheless observation has the tendency to be subjective and unstructured leading to potential biases (Yin, 2013).

4.2.5.4 Interviews

Yin (2013) considers interviews as one of the most important sources of case study information. There are three types of interviews which can be used depending on the type of data required and the research question being asked as well as the available resources (Gray, 2009).

- *Structured*: involve the use of questionnaires based on a predetermined and identical set of questions. The resulting data is easier to analyse using this method.
- *Unstructured*: these are informal discussions where the interviewer wants to explore in depth a particular topic with another person in a spontaneous way. The resulting data is more rich and salient.
- *Semi-Structured*: the interviewer will have a list of themes and areas to be covered and there may be some standardised questions, but the interviewer may omit or add to some of these questions or areas, depending on the situation and the flow of the conversation. This approach carries with it the advantages of both approaches

4.3 Revisiting Research Objectives

In order to discuss the appropriate research design for this study, it is first important to revisit the objectives of this research

The purpose of this research was to examine HEIs processes with the following two aims:

1. Explore how and if Business Process Modelling (BPM) techniques are suitable for transfer to educational processes this will be achieved by the following objectives:
   1.1. conduct a literature review about quality in higher education;
   1.2. investigate the application of BPM to HEIs processes;
   1.3. analyse and select appropriate modelling techniques and
   1.4. apply the selected techniques and evaluate the results

2. Enhancing the results from Aim 1 in order to explore additional improvement to HEI processes. This will be achieved by the following objectives:
   2.1. adopt improvements that are suitable for the HEI context;
   2.2. design a method that will be suitable to improve processes within Higher Education;
   2.3. determine other aspects that may affect improvement initiatives and
   2.4. apply method and validate any findings

4.4 The Research Onion Revisited

The researcher revisited the research onion of Saunders et al. (2009) to summarise the research process for the current study in Figure 13:

In this research study, a qualitative research approach was applied. A case study was conducted based on evidence gathered mainly from three sources: Interviews, observations, and documentation. The different data sources (data triangulation) will provide a more comprehensive insight into the area under investigation.

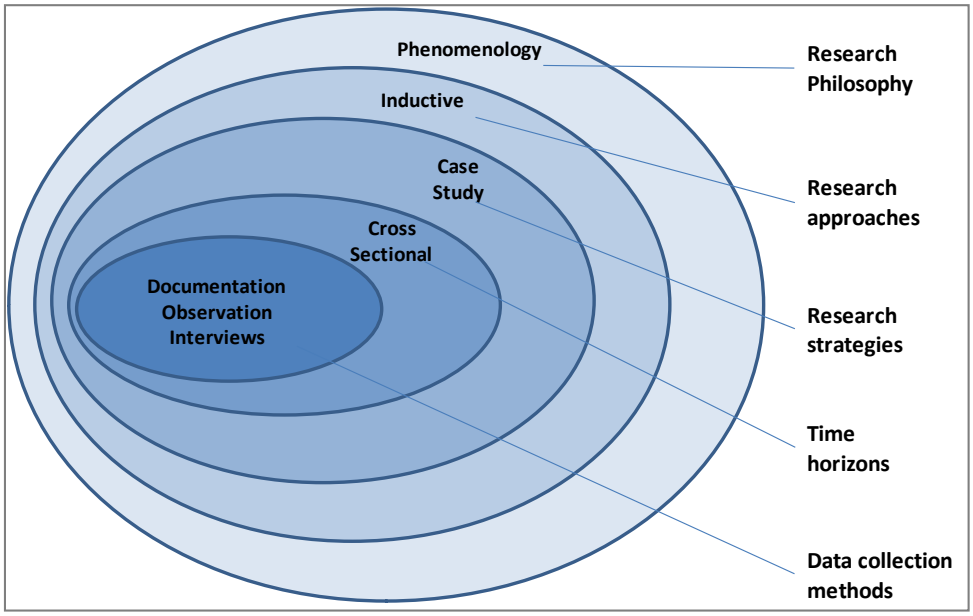


Figure 13: Research Onion for Current Study

4.4.1 Literature Review

An in-depth literature review in chapter 2.0 and 3.0 was carried out. Chapter Two provided an overview of HEIs, its importance and role and identified the challenges facing HEIs. It also highlighted the importance of quality management in higher education and provided a brief description of the most common quality improvement approaches. While Chapter Three provided a classification of business processes and illustrated the differences between BPM techniques.

4.4.2 Documents

The documents used in this thesis are university handbooks that describe HEIs processes. The handbooks were carefully examined in order to understand processes and be able to derive the initial process models.

4.4.3 Observations

Direct observation provided an understanding of the research issue within the context in which the events occurs. Since observation has the tendency to be subjective, the researcher was keen to target important events in an objective manner in order to avoid biasness.

4.4.4 Semi-Structured Interviews

As mentioned earlier the nature of this research guided the researcher to adopt a qualitative approach because there were no academic studies about using modelling techniques for illustrating the higher education processes. The data collection method chosen was semi-structured interview. The main reason for using semi-structured interviews was the limited number of sample size. Also, semi-structured interviews were perfectly appropriate to investigating topics in which various levels of meaning need to be explored (King, 2004).

The purpose was to develop an interviewing guide, which was afterwards applied relatively consistently in each interview (Flick et al., 2007). The interview depended on specific set of questions in order to direct the conversation to flow more naturally and consequently explore people's view of reality and discover new knowledge that may have not emerged in advance (Hesse-Biber and Leavy, 2010).

4.5 Case Study

As discussed earlier in Section 2.2 the increasing power of customers, competitors and today's constantly changing business environment, has forced many businesses to enhance the efficiency and effectiveness of their processes. This research focus is on examining the students' journey processes, therefore case study is suitable for this research as the researcher will be describing a phenomenon within its real-life context using various sources of evidence (Robson, 2002).

4.5.1 Case Study Design

Yin (2013) recommends starting a case study by developing a research design. Figure 14 illustrates the steps in the development of the case study design.

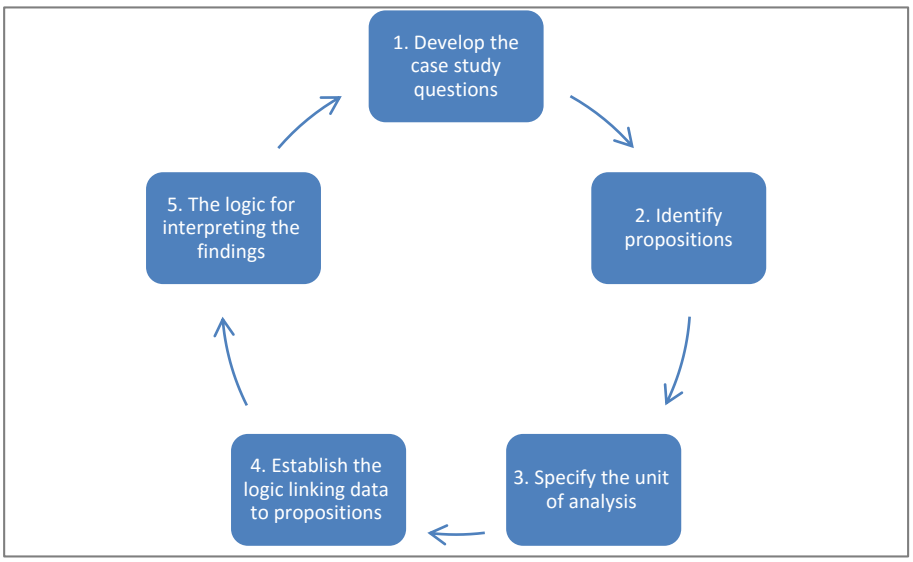


Figure 14: Steps for Case Study Design (Yin, 2013)

The first step in designing the case study is to *develop the research questions* in order to clarify the nature of the study. A case-study approach has a distinct advantage in situations when 'how' or 'why' questions are asked about a contemporary set of events over which the investigator has little or no control (Yin, 2013). The second step which is *creating propositions*, forces the researcher to identify what should be studied (Yin, 2008). Afterwards the appropriate *unit of analysis* becomes apparent (Yin, 2008).

Finally, Figure 15 presents a summary of the research process for the current study with the aim of guiding the reader to understand the link between the research objectives and the tasks and outputs at different stages of the research.

4.6 Research Process for the current study

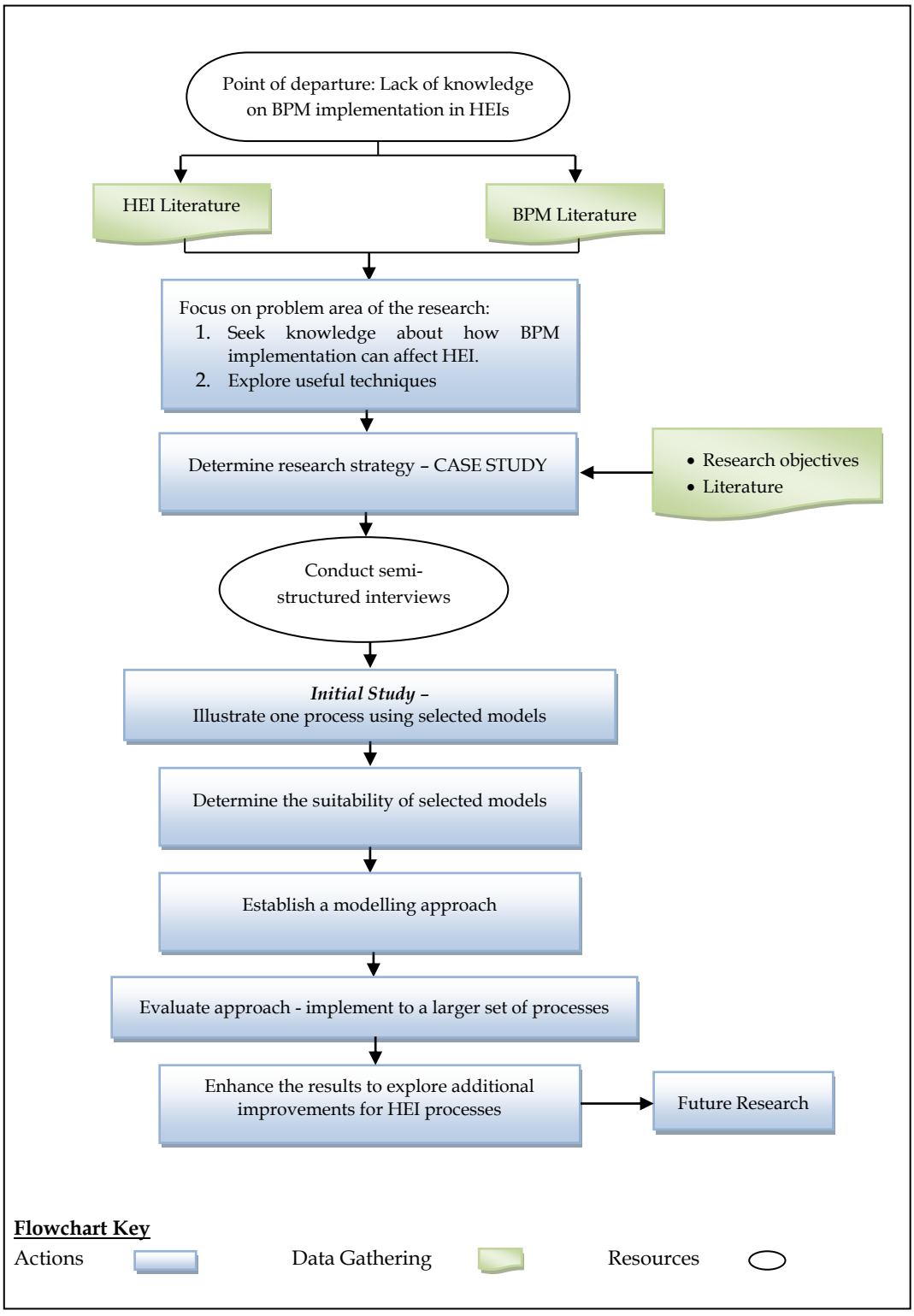


Figure 15: Research Process for the Current Research

4.7 Conclusion

The chapter has outlined the philosophical background to research in general and this research in particular including the research strategy, data collection methods, and the case study design. The following chapter outlines the pilot case study and the modelling techniques applied to illustrate the one process of the students' journey processes.

Chapter 5
Pilot Case Study

5.0 Introduction

This chapter illustrates the Pilot case study which was conducted in an Egyptian HEI - the Postgraduate Department in the Productivity and Quality Institute (PQI) at the Arab Academy for Science, Technology and Maritime Transport (AASTMT). The study focused on investigating the course design and delivery processes of the Master Programme at PQI. The programme duration is a minimum two years study during which the students study 12 courses over four semesters (48 credit hours). Afterwards a thesis should be completed in no less than one academic year.

The purpose was to explore the most suitable technique(s) for modelling educational processes. Data Flow Diagram (DFDs), Role Activity Diagrams (RADs) and Soft System Methodology (SSM) were used for the graphical representation of the selected process. The result of this study was a proposed hybrid RADs-Rich Picture model which is expected to be useful for modelling other processes of educational settings.

5.1 Unit of Analysis

The next step in case study design (see Figure 14 in section 4.5.1) is identifying the unit of analysis (Yin, 2008). The unit of analysis for this study will be the master programme of an Egyptian HEI.

The selected processes were identified, modelled and analysed so that their 'fitness for purpose' could be determined and further actions decided upon. Impressions and anecdotal evidence revealed that:

- The curriculum of the master programme is narrow and rigid as it depends on the TAs' perspective.

- In addition, the assessment is based on content-recall rather than developing critical reasoning and analytical skills which hinder the graduates to broaden their perspectives and gain skills to adapt to future change.

As a consequence, various areas offer opportunities for improvements, amongst which is the course material. Even though there is no feedback from students and teaching staff to know how well the educational process is performing, there are lots of oral complaints from both lecturers and students concerning the quality of taught courses. Lecturers have difficulties while delivering the courses as they have to lecture readymade courses. They are not involved in designing the courses outline or content. Thus, students' learning is affected by lecturers' performance in delivering the course. As stated by Horsburgh (2000) the student learning is considerably influenced by the curriculum, the lecturers and the way the curriculum is taught. The researcher illustrated the processes based on knowledge and experience as a teaching assistant. Afterwards, the models were refined based on interview responses.

5.2 Propositions

The proposition for the pilot study needs to identify which technique/s would be more suitable for modelling the course design and delivery processes in order to reveal process problems.

> *P1:* Using combined techniques is necessary to illustrate the Course design and Delivery Processes. The models will be analysed to realise how helpful they were in illustrating the course design and delivery processes. The evidence of proposition 1 will be displayed in a table illustrating the number of issues that each model revealed, thus being able to explore the benefits/ambiguities of each model.

5.2.1 Data Collection

Data is gathered mainly from three sources: Interviews, observations, and documentation. The different data sources (data triangulation) provide a more comprehensive insight into the area under investigation. Being an employee at the same location where the research takes place, the researcher is able to observe the processes under investigation. Moreover, the process procedures are examined to identify how activities are carried out.

Three sets of semi-structured interviews were carried out with Lecturers, Students and Teaching Assistants to gather different perspectives concerning the course design and delivery processes. Giving respondents freedom to express their views in their own terms hence gaining an in depth view. This expanded the researcher's knowledge and allowed development of a keen understanding of the process. Most interviewees were glad to contribute to the research, and many suggested that it was a significant area which needed investigation.

Interviews were conducted at a convenient time and place to the respondents and were limited to 20-30 minutes duration. Students and lecturers were chosen based on accessibility while five out of seven teaching assistants were interviewed. Moreover, the researcher depended on data saturation, which is interviewing people until no new information or themes were observed in data. Therefore, twelve tape recorded interviews were carried out, three with senior lecturers, four with students (two in fourth grade, one in the third and one in the second grade) and five with teaching assistants with an experience ranging from 3-5years.

Interviews were fully transcribed for later analysis. The interviews were categorised to a set of topic headings to guide the interviews but the participant was greatly allowed to lead the discussion. All data has been made anonymous and all material gathered was considered confidential. Transcripts were presented back for verification by each respondent.

5.2.1.1 Students' Responses

Almost all student respondents stated that they faced problems with understanding the course material. One student commented that "*material was vague and not to the point*" another student stated that "*Course material was not clear*" and also that "*course material was not useful*" whilst a third student thought that course material was "*not effective at all*". They all mentioned that they had to take notes all the time in order to have something to rely on while studying because as one student mentioned that material was "*irrelevant to what was explained during lectures*".

All these responses show that students are dissatisfied with the course material. Though, some claimed that this deficiency was mostly covered by lectures knowledge and experience of the subject area. All students reported that they benefited from assignments as they had to search for resources to prepare presentations or reports. However, one student claimed that while preparing assignments he came across new topics which were not included in the course materiel that is why he thought the material was not up-to-date.

All four students agreed that the teaching aids especially classrooms were not adequate and suitable at all. They also thought that lecturers did not prepare their own material because of the difficulties they faced during course delivery. One student pointed out that some lecturers were "*not able to explain some slides*" and in fact "*skipped slides and mentioned they were irrelevant*". Another student added that some lecturers "*stop at a slide and try to figure out what is meant*". Students thought that some of the lectures were totally not prepared for classes and that some of them did not have knowledge of the subject-matter.

Therefore, they all agreed that some lecturers were not clear and understandable in their explanation. One of the students even commented that "*some lecturers were not able to convey the information*" and another added that "*it would have been better for lecturers not to attend at all*". Even though some lecturers encouraged class discussions, some students felt they were useful and some others thought it was "*boring*".

Moreover, all students reported that TAs were not totally involved in the delivery process they also declared that administrative staff were not helpful and did not show interest in understanding their difficulties. Although their progress relied on grades some students stated that presentations, assignments, class participation and attendance were sometimes taken into account by some lecturers. When students were asked whether there was a formal feedback questionnaire they all responded that they had to complain orally and that "*nothing*" was done to resolve their complaints.

Students were requested to suggest how the teaching process could be improved. They all agreed that lecturers should prepare their own material. One student stated that lecturers should not only depend on their knowledge and experience in order to teach, i.e. they have ready material and struggle with it based on their knowledge and experience. Two students highlighted the importance of having up-to-date material and more practical work stressing the need for more workshops and tutorials. They also pointed out that there should be better teaching aids and classrooms. Last but not least one student reported that there should be "*better support from staff and teaching assistants … We need someone to listen to us and act to our complaints*". Finally, almost all students stated that they did not benefit as they expected from the master programme even though one student claimed that he benefited "*nothing*", which indicated that there is customer dissatisfaction of the programme.

5.2.1.2 Lecturers' Responses

Furthermore, from the lecturers' perspective, course material has several difficulties because they were prepared by TAs and they added that there was no interaction whatsoever with TAs concerning the design of course material. A lecturer stated ironically that the "*executive secretary prepared some courses*". One lecturer commented that the course martial were "*totally unclear parts of the course*" claiming that "*courses prepared by teaching assistant does not cover all knowledge area*" another lecturer stated that "*course contained various subjects that were not related or linked together*" and that "*content was very weak and of low quality*" also a third lecturer claimed that there was "*no preset content that restricts whoever teaches any course*" and that the "*material was very weak*".

All lecturers agreed that the material was not understandable and that they had to depend on their own knowledge and experience to deliver the courses as one lecturer identified that the "*whole burden lies on the skills of the lecturer*". In addition, some of the lecturers had to provide supplementary material in order to compensate the deficiency of course material because students were "*frustrated and annoyed*" and complained about slides being "*totally not understandable*" also described hand-outs as "*vague*" and sometimes even "*missing parts*" of the material. They also added that "*material was not adequate and weak*" and "*not clear*" as well. One lecturer mentioned that he even tried to teach the readymade course material but because of student complaints he said "*I had to prepare new content before each lecture*".

Responding to how students' assessment takes place, a lecturer pointed out that there are "*no pre-set criteria for assessing students' performance*". Another lecturer mentioned that student assessment depends on "*attitude, learning capabilities, commitment in submitting assignments on time and of course grades*"; while, a third lecturer stated that "*there is a great weight on the final exam followed by interaction, assignments, reports and presentation skills*". As well as students, lecturers also stated that there is no formal feedback questionnaire or even complaint procedure to be followed. They received only oral complaints from students and tried to resolve it if possible.

Finally, when they were asked about proposed improvement for course design and delivery they all agreed that the lecturer should at least be involved in designing the course even one stated that the lecturers should prepare their own material. Another lecturer pointed out that there should be "*detailed form that clearly describes the outline for each topic what to deliver and how*" another also reported that each course should have a "*course file summary, session plan, performance criteria, feedback*". A third lecturer stated that "*course should be reviewed and approved by a group of specialised academics in the knowledge area*". For improving the course delivery, they added that course should be always up-to-date and up to the master level. Also lectures should be well prepared for classes and there should be better teaching aids especially classrooms.

5.2.1.3 TAs' Responses

The interviews with TAs revealed the steps followed to design courses. All the steps shown in the researcher's initial model are the same as described by all 5 TAs. Almost all TAs reported that the curriculum design assignment is distributed according to their background "*as much as possible*". Though one stated that "*Sometimes whoever is free prepares any course with no respect to background*". They also added that they were provided very limited and short time to design courses. It ranges between one week and a month at most which was the reason why they felt overloaded because they were also assigned other jobs.

The difficulties TAs faced during curriculum design were mainly lack of up-to-date references, background, and time. There was also no committee or specialised academic to review courses. Moreover, all TAs reported that there were no criteria or regular interval for course updates. Some courses were updated every semester some other every year or even as one teaching assistant mentioned that "*the dean assigns course redesign as he wishes*". Concerning the feedback from students they reported that there is no formal feedback questionnaire and they are not involved in the teaching process or even in contact with students. Therefore, the only complaint they may know about is from internal lectures when they sometimes request amendments to course material.

In conclusion, TAs were asked to make recommendation for improvement. All five TAs suggested that there should be more time and a more systematic way of designing the course and that the lecturer should be involved in curriculum design or at least review the courses to be taught. They also added that it would be better to have a committee of specialised academics to review and approve courses. It is also important to have a formal feedback process in order to keep track of the delivered courses.

5.2.2 Data Analysis

The interviews clearly exposed TAs' opinion and the problems they encountered. Also, because the researcher as a teaching assistant was not involved in the delivery process it was important to explore students' and lectures' point of views about the material and the delivery process. Based on the interviews it seems that there is a major problem with the course material. Lecturers as well as students complained about the quality and depth of the material and eventually about the difficulties of the delivery.

In order to categorise, analyse and interpret the text, template analysis was used to first code and re-arranges the text of the semi-structured interviews. The benefit of the template analysis is to verify the modelling captured all process details.

Template analysis is a quite recent development and has emerged from more structured approaches such as Grounded Theory and Interpretative Phenomenological Analysis (IPA) (Waring and Wainwright, 2008). King (2004) argues that even though template analysis utilises codes and coding of data it is not as prescriptive as Grounded Theory and is not linked to its realist methodology. It supports a variety of epistemological positions and therefore can be useful to a large number of researchers.

King (2004) stated that template analysis is mainly suitable when the purpose is to evaluate the perspectives of different groups within a certain environment. As stated by Crabtree and Miller (1999) '*when using a template, the researcher defines a template or codes and applies them to the data before proceeding to the connecting and corroborating/legitimating phases of the analysis process where the template or codes can be constructed a priori, based on prior research or theoretical perspectives*'. In this study an a priori list of codes (in Table 8) was constructed based on the conducted interviews. To generate an initial template, the interviews were coded into broad themes according to the research objectives and interview questions.

Table 8: Priori List of Codes

1. Course design
2. Course material
3. Course Delivery
4. Complaints
5. Feedback
6. Improvements

The template has been revised in response to the concerns of the interviewees. Respondents' opinions resulted in other key words that were included in the template from all three perspectives. The final template after including all interviews responses is presented in Table 9. All themes shown in the template analysis are expected to provide an indication whether the models were successful in showing all process aspects. Thus, being able to identify the suitability of the models in terms of capturing and illustrating process details through categorizing all responses.

Table 9: Final Template

Course material

1. Unclear
2. Hard to understand
3. Missing data
4. Lack of practical examples and exercises
5. Relevant exams and assignments
6. Benefit from assignments
7. No depth
8. Does not cover knowledge area
9. Not well chosen
10. Spelling mistake
11. Vague notes

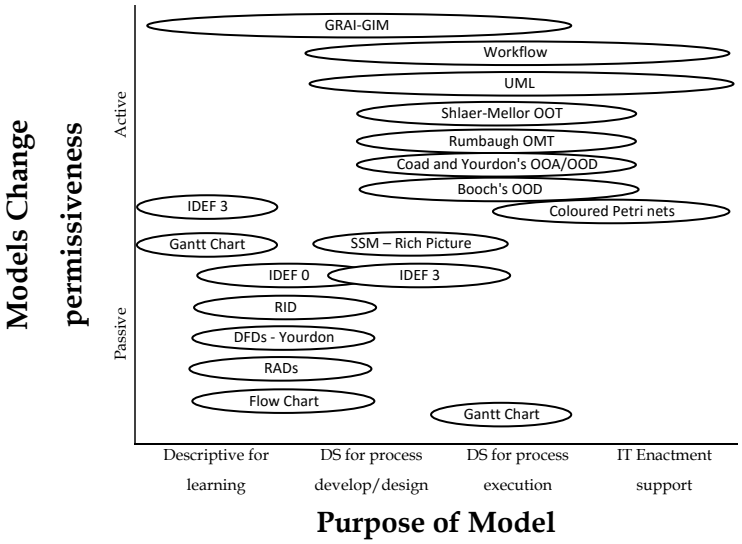
1. Course delivery
    1. Lecturer
        a. Did not prepare material
        b. Not able to explain
        c. Skipped slides
        d. Not prepared for class
        e. Lack knowledge
        f. Class Interaction
        g. Depends on experience to explain
        h. Request amendments
        i. Provide supplementary material
    2. Teaching assistants
        a. Not involved

2. Complaints and problems
    1. Students
        a. Lack of resources
        b. Staff not helpful
        c. Lack of communication
        d. No benefit from master
        e. Don't understand lectures
        f. Lecturer not able to teach
        g. Very bad material
        h. Student frustrated and annoyed
    2. Teaching assistants
        a. No one to consult
        b. Shortage of references
        c. Lack of background
        d. Overloaded
        e. No criteria for course update
        f. No review
    3. Lecturer
        a. Lack of time to amend
        b. Effort to compensate deficiency
3. Student performance and Feedback
    1. Student performance
        a. Attitude and learning capabilities
        b. Commitment
        c. Interaction in class discussions
    2. Lack of feedback
        a. Depends on grades
    3. No formal feedback process
        a. Oral complaints
        b. Complaints ignored
4. Improvements
    a. Up-to-date references (material/books)
    b. Lecturer well prepared
    c. More practical work
    d. Better resources
    e. Better staff support
    f. Procedure/system for course design
    g. Academic committee to review and approve
    h. Enough time to design courses
    i. Pilot course (test course validity)
    j. Control student intake
    k. Maintain credibility

5.2.3 Modelling the Course Design and Delivery Processes

The processes under investigation at PQI were found on first inspection to be heavily biased towards the social dimension. The implication taken from this was that modelling approaches should be used which facilitated communication with the personnel involved so that all hidden and implied process frameworks, rules and detailed business processes could be defined in detail.

Process modelling techniques might be used for different reasons. Therefore, according to (Aguilar-Savén, 2004), the framework in Figure 16 shows on the horizontal axis the purposes of business process models which may be categorised as follows: descriptive models for learning; descriptive and analytical models; enactable or analytical models; and enactment support models to Information Technology.



Source: (Aguilar-Savén, 2004)

Figure 16: Classification Framework to Select Among BPM Techniques

Another specific model characteristic is change model permissiveness. The vertical axis of the framework shows the difference between active and passive models. Passive means they do not have the capability to change without totally remodelling the process. In contrast, active models allow users to make changes, or are dynamic themselves. According to the aim of this research DFDs, RADs and SSM were chosen to model the course design and delivery processes. Based

on the framework in Figure 16 the purpose for choosing DFDs and RADs is to describe the process which helps learning about the process, while SSM will support process development aspect.

The DFDs models (Appendix B) and RADs models (Appendix C) were built initially based on the interviews responses. SSM was used to complete the shortcomings of the DFDs and RADs. The following sections discusses the aspects of choosing the modelling techniques, highlighting the benefits and drawbacks of each technique.

5.2.4 Aspects of Selected Modelling Techniques

Using DFDs enabled breaking down the course design and delivery processes to the lowest possible level in order to provide more details. Figure 17 illustrates the context level of the DFDs model.

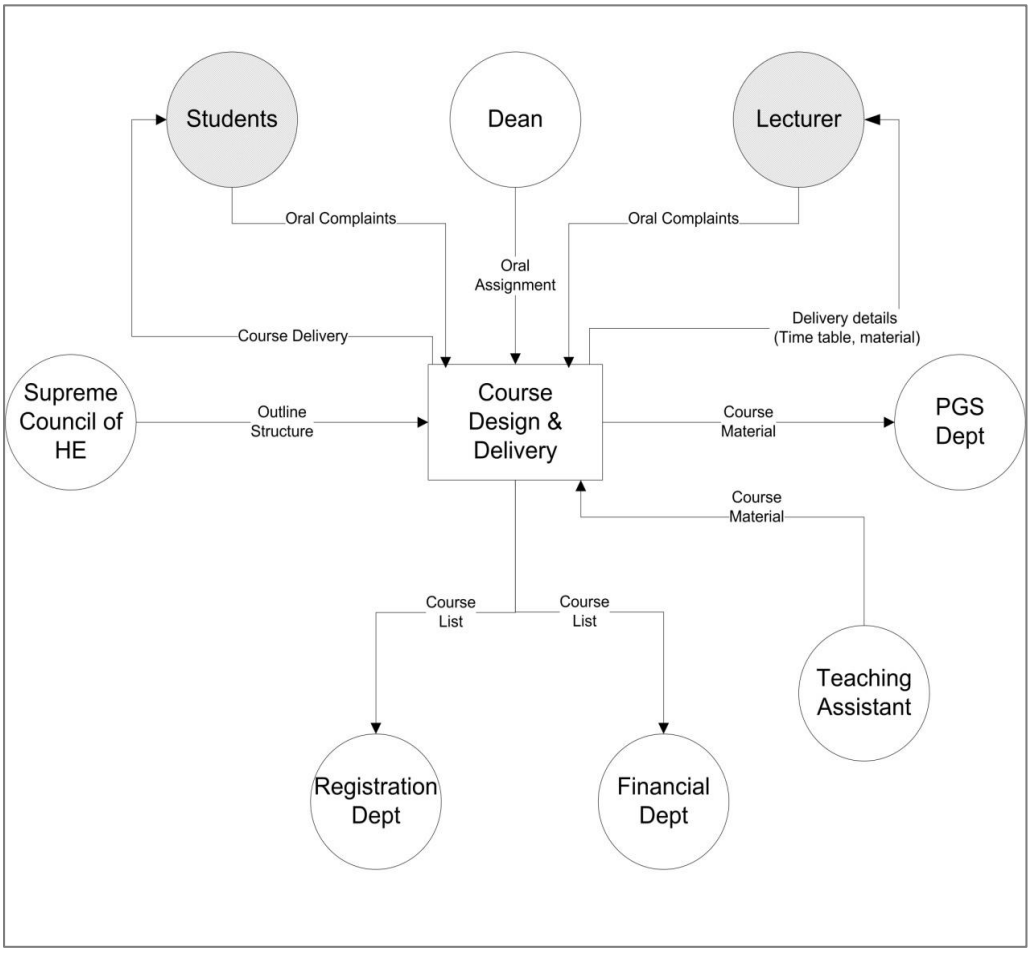


Figure 17: DFDs - Context Level

The advantage of DFDs is that it can describe information flows clearly, from the source to the destination. However, they cannot tell the whole story of a process as they focus mainly on data and do not show other process elements such as people, or events. They do not show roles (lecturers, teaching assistants, students … etc.), nor the interactions between these various roles. Therefore, it was difficult to identify who carries out activities and the communication flow between them.

Moreover, they do not give any information on event sequences as they provide imprecise details on activity sequence and concurrency for example as shown in Figure 18 some activities like defining outline and course objectives were carried out in parallel, which is not clear in the DFDs. In addition, DFDs notations do not express either the dynamic behaviour or the time dimension within a process.

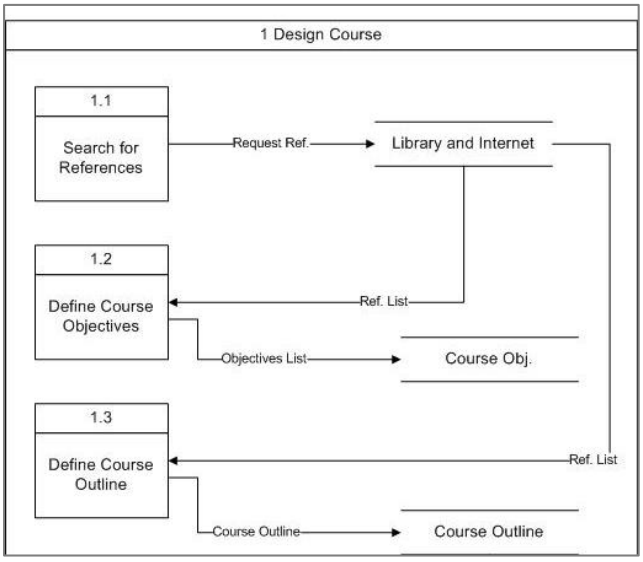


Figure 18: Defining Outline and Course Objectives

Furthermore, DFDs failed to show respondents perspectives about the processes. They could not illustrate the difficulties nor the problems encountered during course design and delivery. Parts of the processes could not easily be illustrated because the notation was not supportive in showing *choice* activities such as assigning the course to internal or external lecturers.

Unlike DFDs, RADs model represents roles, activities, goals as well as their interactions, sequencing and concurrent activities. Therefore, a RADs model was derived to illustrate the roles participating in the course design and delivery processes, along with their activities and the interactions between these roles. The following Figure 19 provides a snapshot of the RADs model.

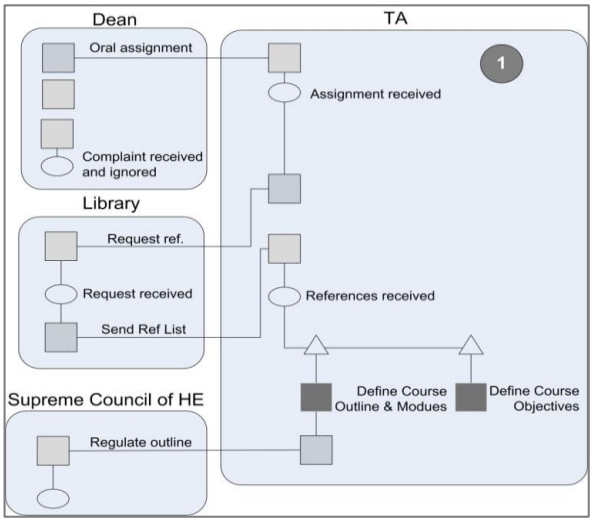


Figure 19: RADs model snapshot

RADs differ from DFDs in that they adopt the role, as opposed to the activity; therefore, they are mostly suitable for organisations in which the human factor is the critical organisational resource that process change aims to address. Even though RADs provides a broader picture of processes as they are easily interpreted, they cannot address the explicit interpretation of the functional or informational perspectives. The model is simple to read and understand showing a full perspective of the process and is mainly useful in supporting communication.

Moreover, RADs illustrates human dependant processes that are easy to understand by business users since it is oriented towards the human aspect of a process in relation to the organisation. It helped in demonstrating the roles that play a part in the course design and delivery processes, what starts them off, the actions they carry out, the decisions they take, the ways they collaborate and the goal(s) they have.

The RADs allows relative ease of understanding of the processes it illustrated, the main roles, activities and relationships. Consequently, the model provided a significant meaning by showing the way a process is divided into roles and how these roles communicate together. Even though RADs helped in showing a holistic picture of the process it does not also highlight the social behaviour that binds its roles to respond in certain socially acceptable ways. It does not either show respondent's opinion and difficulties faced in course design and delivery.

Finally, modelling the processes using DFDs and RADs combines various perspectives (Informational and functional using DFDs, and role using RADs), which helps in providing more details about the processes thus being able to explore all their aspects.

However, neither model was able to illustrate the resource allocation, the number of students enrolled, and the complaint process which was informal because it was always oral. Neither RADs nor DFDs showed respondent's perspective and opinion about course material and problems encountered during course delivery. Furthermore, the notations of the models could not reflect the quality of the programme. Accordingly, SSM was chosen to overcome the shortcoming of the RADs and DFDs. The following section highlights the application of SSM.

5.2.5 SSM for Course Design and Delivery Processes

After applying SSM not only were recommendations helpful for improving the existing process but also the construction of the Rich Picture was useful since it gathered all the relevant entities together in one area thus providing an overview of the area of concern (see Figure 20).

SSM has permitted the examination of various perspectives of lecturers, students, and TAs which were examined to gain a deeper understanding of the process of course design and delivery processes. The various opinions concerning the process and the quality issues were clearly introduced.

Rich Picture

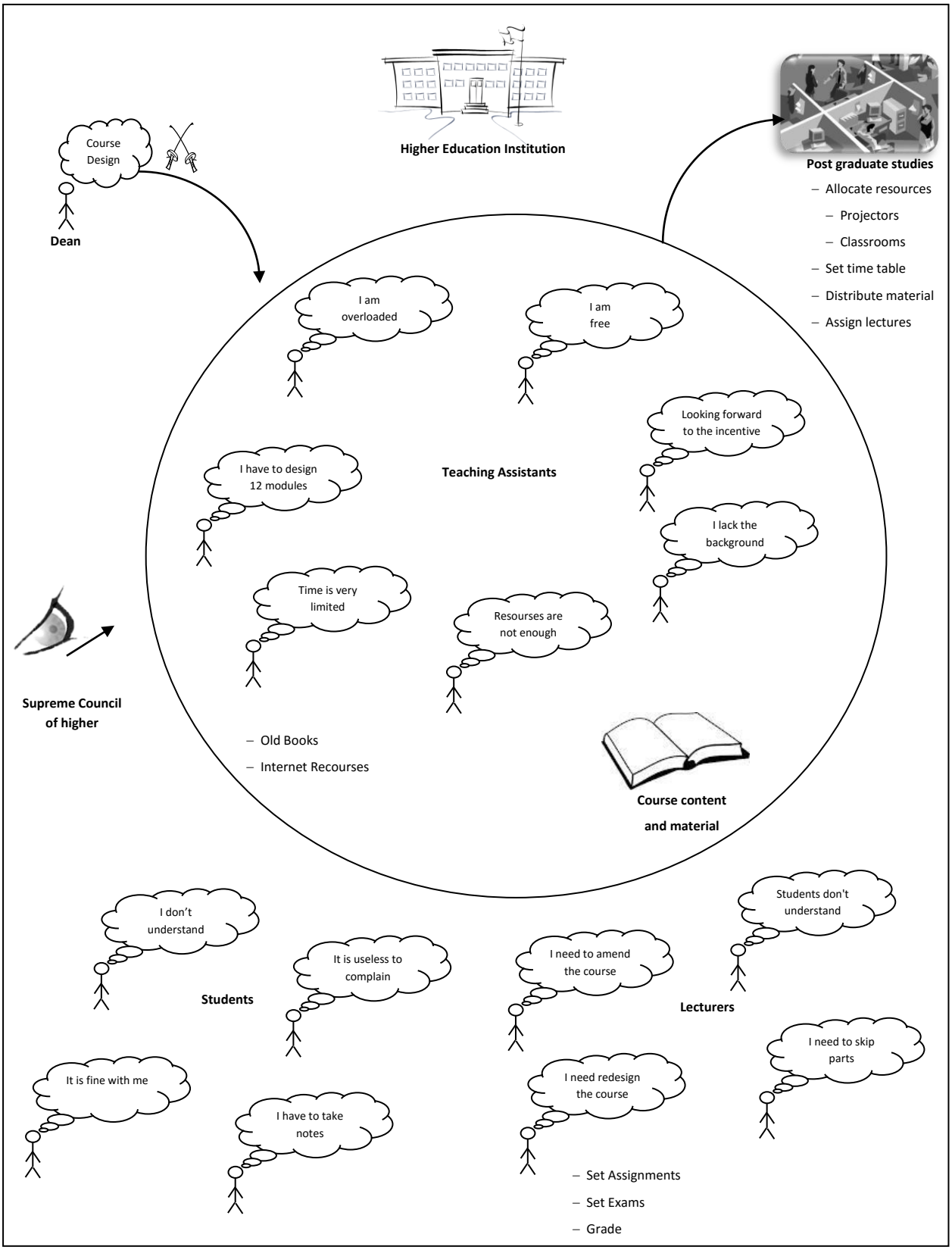


Figure 20: Rich Picture of Course design and Delivery

The conceptual modelling was valuable because it clarifies what needs to be done to achieve certain objectives, which is not possible in neither DFDs nor RADs. Although DFDs and RADs were successful in providing different aspects of the processes as mentioned earlier, they failed to model all the details extracted from the interviews such as issues concerning the quality of the material or various perceptions of respondents.

Root definition

'*A system owned by the Dean and Operated by the teaching assistant and Lecturers to design and deliver quality courses to students in order to enhance their knowledge and skills with the given constraints.*'

The Root Definition presented can be analysed in terms of CATWOE (Table 10). The customers have been specified as students, and the actors in the system are the Lectures and TAs while the owner is the Dean.

Table 10: CATWOE for Course design and Delivery Processes

C	Students
A	Lecturers and Teaching Assistants
T	To ensure that students learn relevant knowledge and skills
W	Improve course design and delivery to enhance students' knowledge and skills
O	Dean
E	Time available for delivery, limitation on available resources, teaching assistant quality, course quality, students' understanding, lecturer performance, Supreme Council of higher education

The transformation shown in Figure 21 illustrates input(s) and the exact expected output(s). The input for this transformation is relevant knowledge and skills to be learned and the output is learned relevant knowledge and skills.

Figure 21: Transformation process

The weltanschauung (world view) is concerned with providing worthwhile knowledge and skills which will give students a good education and be of practical use for their carriers. Finally, the constraints in this Root Definition are as follows:

- Time available for delivering lectures
- Students'' understanding
- TAs quality
- The limitations on available resources
- Course quality
- Lecturers performance
- The Supreme Council of Higher Education

Conceptual Model

Conceptual models describe what the system must 'do' in order to be the system named by the root definition. It is not a description of an existing system but rather is the logical set of activities as carried out in a systemic way. Therefore, Figure 22 illustrates the necessary activities which will achieve the purpose of the defined system. It illustrates the activities of the course design and delivery processes, at the HEI in Egypt, that are necessary to realise the transformation described in the Root Definition. Each square contains a description of the activity and linked together by arrows that demonstrate some form of logical dependency between those activities. The Figure also shows the needed monitoring and controlling actions.

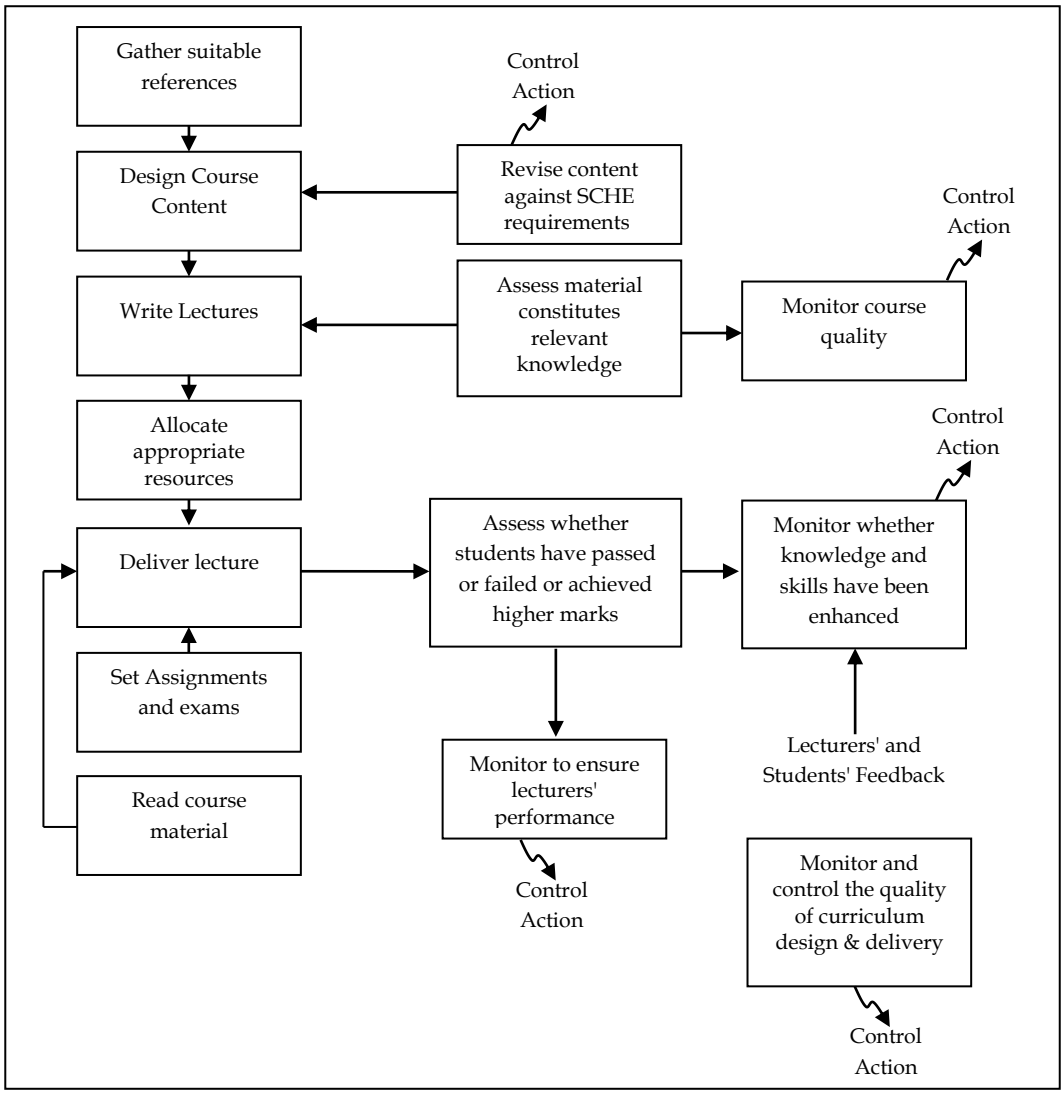


Figure 22: Conceptual Model for Course design and Delivery Processes

After completing the conceptual model it will be compared with the real world process of course design and delivery. The comparison is between the real world, where the area of concern exists, and the systems world, where the root definitions and conceptual models have been built. The comparison is done activity by activity and is presented in Table 11.

Table 11: Comparing Activities in Systems World Model with the Conceptual Activities in the Real World

No	Activity	Exist or not	Present Mech.	Performance measures	Recom.
1.	Gather suitable references	Yes	teaching assistant have old books and internet articles	None	Criteria for gathering references
2.	Design course content	Yes	Design 12 modules	Supreme Council of higher education	
3.	Revise content against requirements	Partly	Make sure 12 modules are prepared	Supreme Council of higher education	
4.	Write lectures	Yes	Prepare course material	None	Include ILO
5.	Assess material constitutes relevant knowledge	No	None	None	Educational Committee
6.	Monitor course quality	No	None	None	Students' comments
7.	Allocate appropriate resources	Yes	Choose suitable resources	Effectiveness of resources used	
8.	Deliver lecture	Yes	Teach and question	None	Students' feedback Grades Lecturers' feedback
9.	Read course material	Partly	Read ready-made material	None	Review and approve material before delivery
10.	Set Assignments and exams	Yes	Prepare assignments and exams	Grades	
11.	Assess whether students have passed or failed	Yes	Student exams	Grades	Rely also on presentations and projects
12.	Monitor knowledge and skills have been enhanced	No	None	None	Test knowledge through workshops
13.	Monitor lecturer's performance	No	Based on oral complaints	None	Students' and Lecturers' feedback
14.	Monitor and control quality of course design and delivery	No	Informal review by teaching assistant	None	Committee or specialised academics to review and approve courses

Table 11 shows the necessary activities for completing the process of course design and delivery. The second column identifies whether the listed activity is currently being done in the real world whereas how it is being done is shown in the third column. The fourth lists how the activity is currently measured to determine whether it meets certain performance criteria. Finally, the fifth

column proposes possible recommendations to improve the present activities. Consequently, to improve the process of curriculum defined in the Root Definition, the proposed recommendations will intervene in the actual process in the real world.

5.2.6 Reflections on Modelling Methods

This section shows a comparison of the applied models, in which sequence the models will be implemented, and how the models are combined. Finally, the modelling approach is proposed by the researcher for illustrating HE business processes.

5.2.6.1 Comparison of Modelling Techniques

A literature based comparison of modelling techniques was presented in Table 4. Following the application of models to a real life scenario a number of observations can be made. Firstly, DFDs is a descriptive diagram which shows flow of data, while RADs is a graphic view diagram which illustrates individual role, whereas SSM is described as a contextual representation of problematic human processes.

The models are useful in modelling various aspects of the processes, however it was realised that the DFDs (in Appendix B) were not as beneficial as the RADs (Appendix C) and Rich picture (Figure 20) this is because the models show very little human involvement. Even though DFDs was easy to draw and understand, in the situation of HE in Egypt it was difficult to describe poorly defined data/information flows between processes inadequately defined procedures/processes. It has been difficult to illustrate the model because of two reasons.

On one hand the fuzziness of the processes and on the other hand the inability of the notation to show various aspects. In contrast, RADs and SSM were valuable in showing both the processes roles and activities as well as highlighting existing processes problems.

For the course design and delivery processes the processes and dataflow notations in DFDs can be substituted by the activities and interrelations in RADs. The nature of the processes was better illustrated using RADs and SSM. Therefore, RADs and SSM are both highly recommended for modelling processes in any educational settings because almost all activities in education are carried out by humans, which is supported by both RADs and SSM.

5.2.6.2 Modelling Sequence

The investigation of existing literature showed that there have been several attempts to combine SSM with other techniques such as UML and IDEF. However, there is no evidence of integrating SSM with RADs. Even though the course design and delivery processes have been carried out the same way for a long time, there has been no attempt whatsoever, despite the oral complaints, to improve them.

The researcher thought that it is essential to let the people understand the process first (using RADs) and then show them what problems were encountered (using SSM) as a result. It was important to let end-users realise how fuzzy the processes were, and how this led to many problems that need to be improved. Therefore, it is argued that on one hand the use of RADs will provide a holistic picture of the process presenting roles, activities and interactions while on the other hand illustrate quality issues using SSM. Given that RADs and SSM are concerned with showing human activities they are thought to be beneficial for illustrating the course design and delivery processes, which are mostly dependent on human factors.

Even though the literature emphasises the use of SSM first, the researcher argues that it was very practical to begin modelling the processes using RADs first and then derive the SSM. Starting with the RADs initially gave a holistic picture of the processes, in terms of who does what and how before trying to discover encountered problems. Allowing a full understanding of the process facilitated determining the pitfalls easily.

Subsequently, SSM will be used to demonstrate various perspectives of the processes in addition to respondents' opinion, which in turn revealed the current problems. Thus, having full understanding of the processes will in turn facilitate the realization of bottlenecks and their location. The SSM showed that there is a quality problem with course design and delivery; it highlights how students, lectures as well as TAs are dissatisfied of both course material and delivery.

5.2.6.3 Models Integration

Table 12 shows a list of aspects that were illustrated by RADs and SSM. While the RADs models were helpful in showing roles, activities, interactions, concurrent activities, decisions and sequence, SSM-Rich Picture represents actors, activities, perceptions and interpretations and quality of each role (see example in Figure 23).

Table 12: List of Aspect Illustrated RADs and SSM

RADs	SSM
• Roles • Activities • Interactions • Concurrent activities • Decisions • Sequencing	• Actors • Activities • Perceptions and Interpretations • Quality

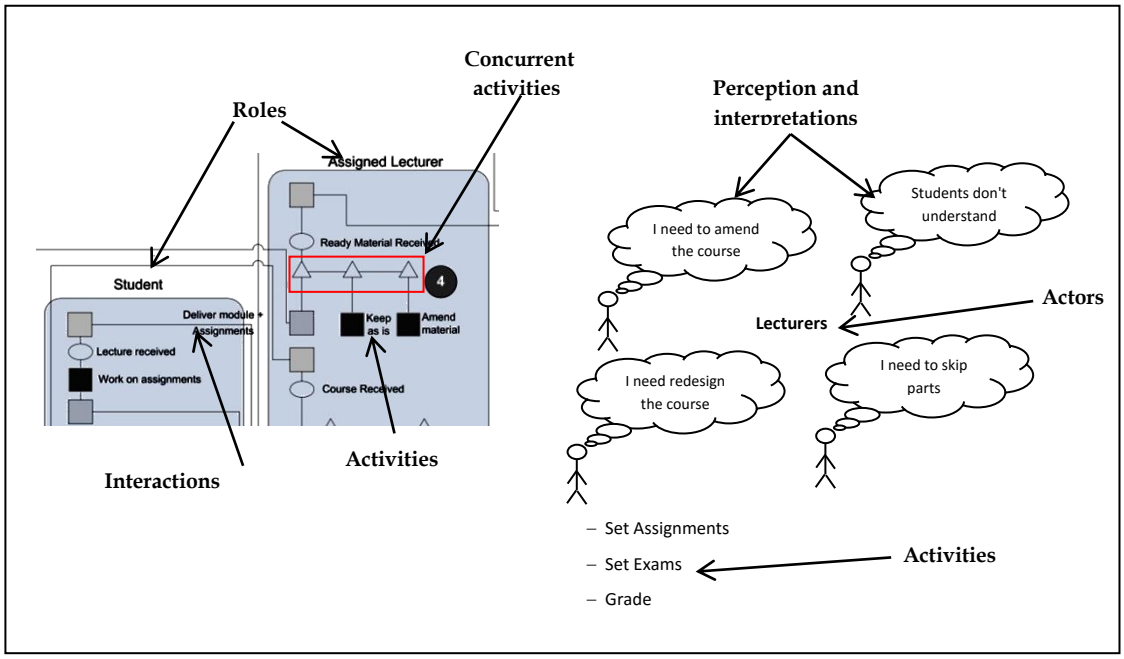


Figure 23: RADs vs. SSM

Therefore, each role identified in RADs can be linked to the actors in SSM. For example, in Figure 24, the teaching assistant role on RADs shows what activities are carried out by TAs and the interrelations with other roles, while the Rich Picture illustrates how the TAs think about what they are doing.

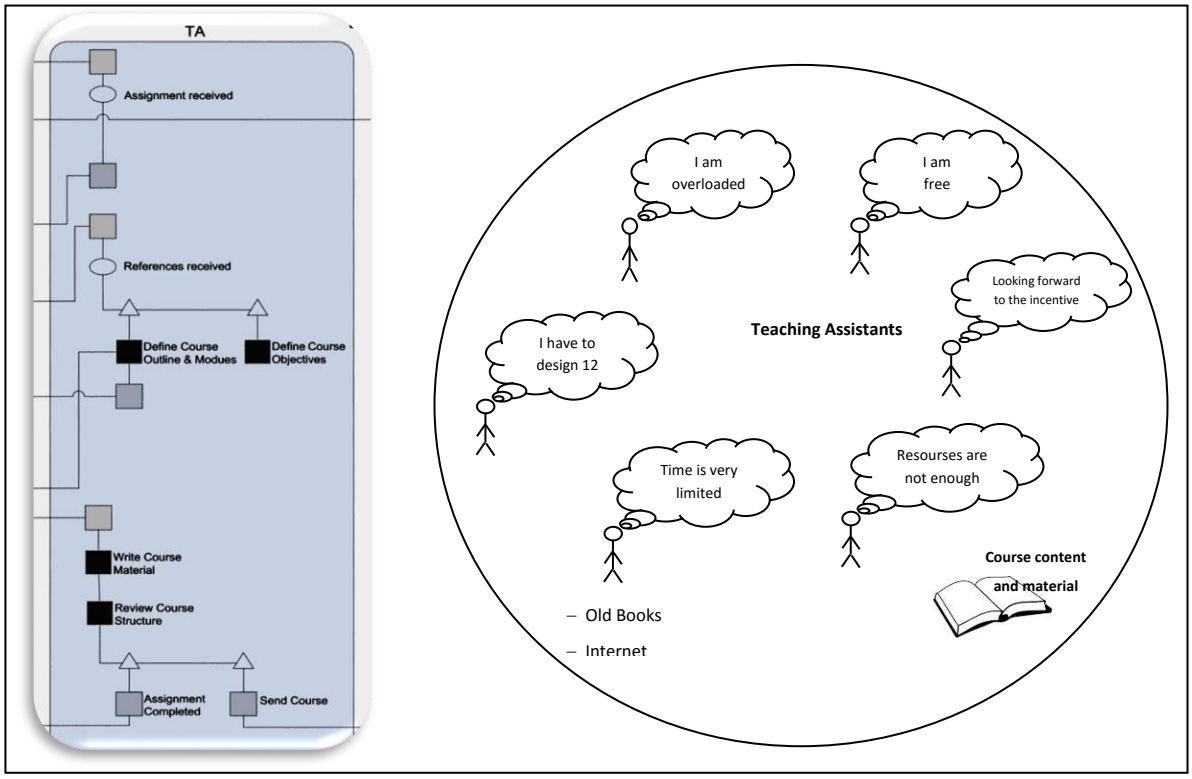


Figure 24: RADs 'teaching assistant Role' vs. SSM

Consequently, it has been easy to identify who does what, how and what in which order and what problems are encountered. Accordingly, it is suggested that RADs will be used in conjunction with SSM Rich Picture to illustrate course design and delivery processes. Thus, it is expected that a hybrid model of RADs and Rich Picture would combine the best of both worlds as introduced in Figure 25.

The researcher combined the rich picture with the RADs notation. The link was based on the actors of Rich Picture and the roles in RADs. Respondents' interpretations are included at the top each role representing their perception. As a result, the hybrid RADs-Rich Picture model each role would illustrate the carried out activities as well as the interpretation/perception of each role.
Also the model stresses that the courses are regulated according to the supreme council of higher education and that is illustrated by the 'watching eye'.

The researcher suggests that a hybrid model could be developed with no need to derive the SSM model. Since respondents' opinion can be illustrated on top of each role. It is expected that this hybrid approach of both techniques would be useful for modelling other processes of educational settings. Furthermore, it can be applied to any process modelling, analysis, improvement and change initiatives.

Merging the Rich Picture with the RADs saves the effort and cost to illustrate the whole 7 steps of the SSM. Therefore, the proposed integration is expected to save time, effort and cost of applying the whole SSM model steps.

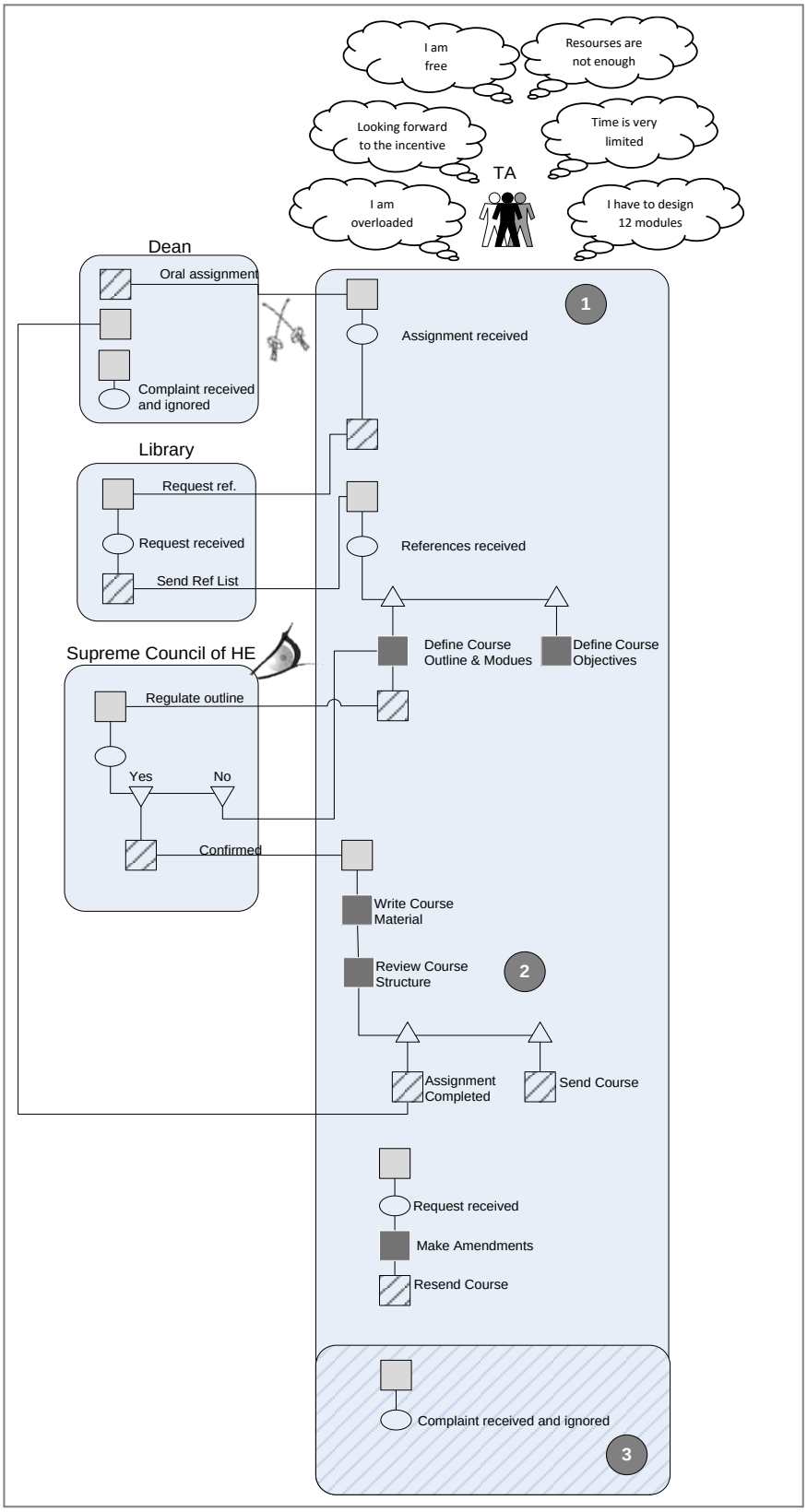


Figure 25: Hybrid RADs-SSM model

5.2.7 Proposed Hybrid Modelling Approach

After comparing the models and describing in which sequence the models should be implemented it is now important to propose a guide on how to implement the integrated model. The hybrid RADs-RichPicture modelling approach in Figure 26 shows the steps for modelling the processes.

In step 1: *Gather preliminary data about the processes*: search all the available information about the organisation. The aim is to understand everything needed to develop the models, such as the people who work there, the jobs they do, etc. **Step 2**: *Derive initial As-Is RADs model*: Derive a RADs model based on the initial information in order to get a basic understanding of the process. **In Step 3**: *Interview people involved in the processes*: design interviews and identify people linked to the processes, and conduct interviews with them to obtain the maximum amount of information possible about the processes that each undertakes. Finally analyse data and categorise it using template analysis. Afterwards, **step 4**: *Check respondents' answers and refine the RADs As-Is model*: refine a RADs models based on the interview responses. While interviewing people continue refining the RADs iteratively until there is no more new data, thus making sure all possible details are included. **Step 5**: *Final As-Is RADs*: Derive the final RADs model making sure that every single detail was included in the models. **Step 6**: *Integrate the rich picture of the SSM model*: Integrating the rich picture helps in showing people's perspective about encountered problems by each role identified in the RADs model. In **step 7**: *Analyse models and come up with improvements*: set out proposals for improvement. Finally, **step 8**: *Derive a RADs To-Be Model*: illustrate a RADs To-Be model to show suggested improvements.

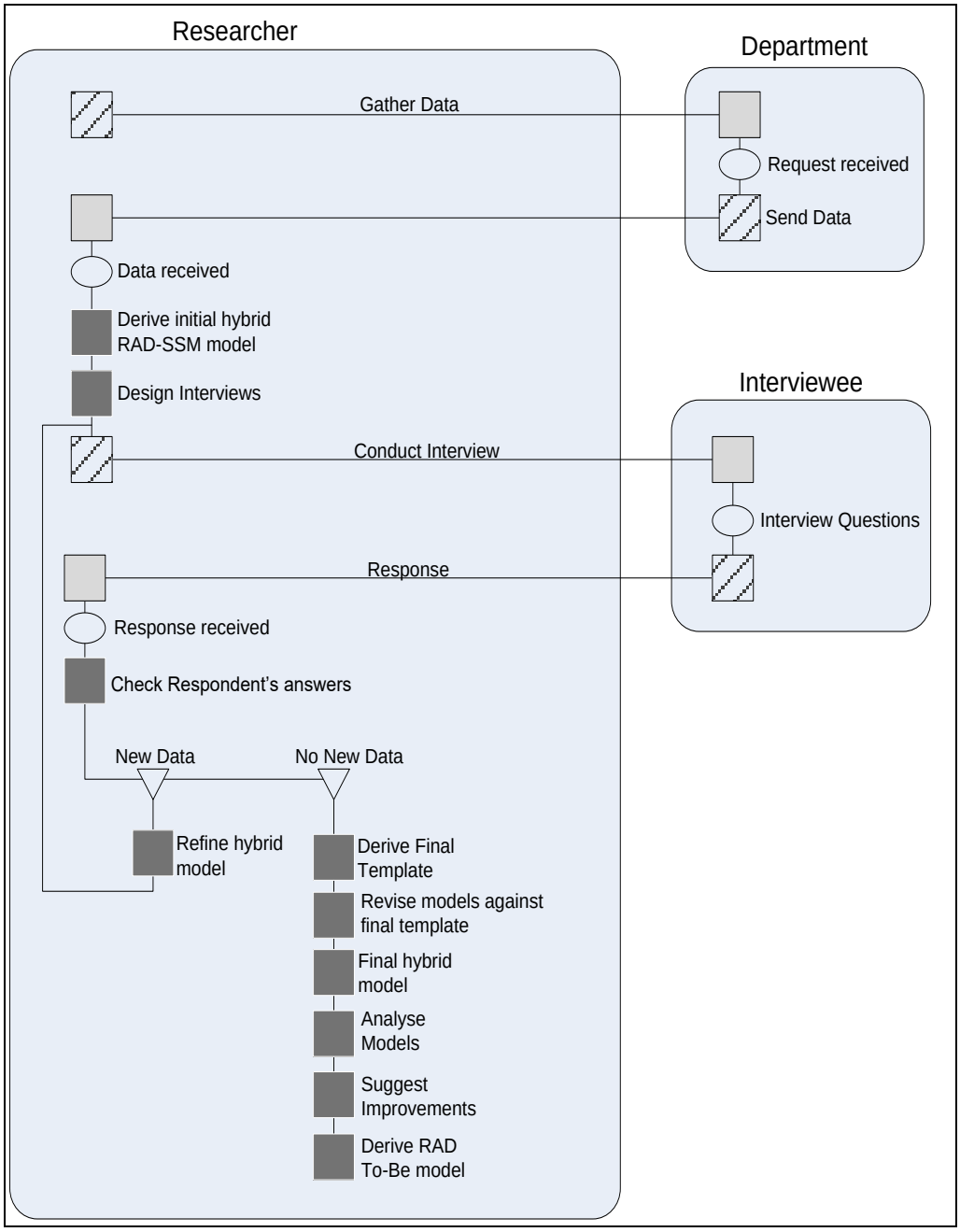


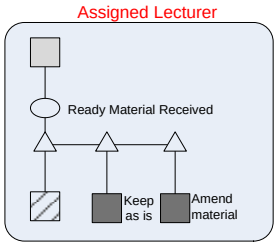
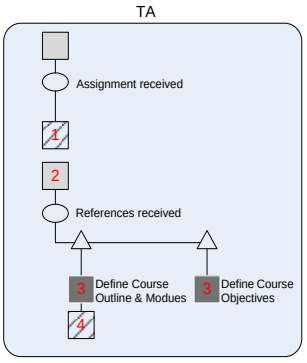
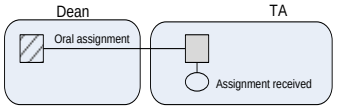
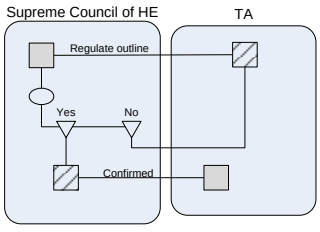
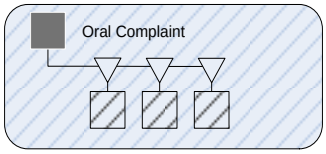
Figure 26: Hybrid RADs- SSM Modelling Approach

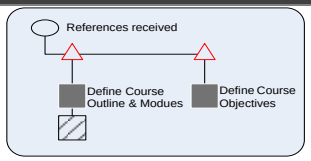
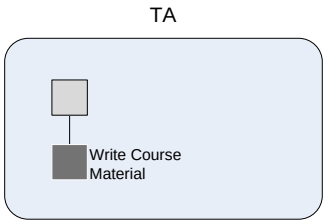
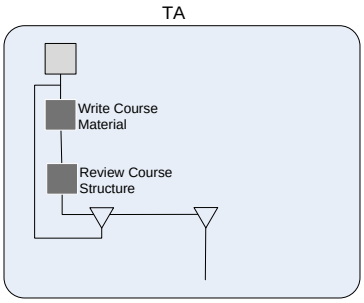
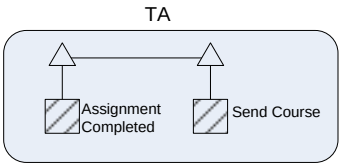
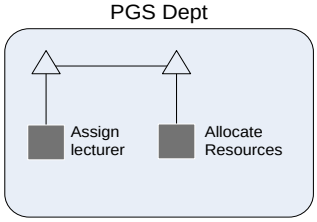
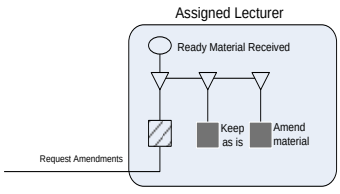
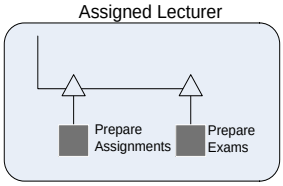
5.3 Pilot Study Findings

This previous sections detailed the conduct of the pilot study highlighting the modelling techniques used and template analysis as the means of data analysis as well as the reflections on modelling techniques, highlighting comparisons between techniques and finally introducing a hybrid RADs-RichPicture model.

Based on the analysis of the models, a list of issues provided in Tables 13 and 14 reflect the evidence for proposition one. The tables illustrate the list of benefits/ambiguities each model showed as well as a snapshot of the model. Thus, using RADs and SSM provides a better understanding of the course design and delivery processes and enables the discovery of existing problems. As a result, proposition was found to be true using combined techniques helped in finding greater number of issues then either one alone.

Table 13 : RADs Issues

No	RADs Benefits/Ambiguities	Model Snapshot
1	RADs helped in illustrating *roles* involved in the course design and delivery processes (Dean, TAs, Library, Supreme Council of Higher (SCOHE) Education, Students, Lecturers and Assigned lectures, post graduate studies department, and Financial and Registration Departments	
2	During interviews respondents' stated how they perform their activities, however they; sometimes remembered some details they forgot to mention in the right order. Using RADs facilitated the illustration the *sequence* of the following activities: a. How TAs prepare course material. b. The activities undertaken by lectures to deliver the course. c. Tasks performed by the post graduate studies department d. Activities carried out by students.	
3	The dean assigns the teaching assistant orally to design the course. There is no formal method of communication.	
4	The teaching assistants regulate the course outline according to the regulations of the SCOHE, however the interaction between teaching assistant and Supreme Council of higher education may be interpreted as a direct contact between both roles, which is not the case.	
5	Complaints are orally placed; the researcher highlighted the interactions are shown in a hashed box, because there is no formal complaint process.	

No	RADs Benefits/Ambiguities	Model Snapshot
6	Teaching assistants define course outline and modules while defining course objectives in parallel before looking at the requirements of the SCOHE.	
7	TAs prepare the course material including handouts, presentations, assignments and workshops and sometimes even exams. I have assumed that this is done under the same action of 'Write Course Material'.	
8	After producing course material teaching assistant reviews the course material against the previously created outline. The teaching assistant will make a decision as to whether the course is complete or needs to be changed. If the course does not match the outline, then they go back and produce material or make changes.	
9	At the completion of the course teaching assistant sends the course material to post graduate studies department and orally informs the Dean that task is completed. There is no formal communication method.	
10	In addition, post graduate studies department assigns lecturers to courses while allocating resources for each course. It is ambiguous how post graduate studies department allocate resources at same time they assign lecturers, without considering lecturers needs.	
11	After the assigned lecturer receives the material, he/she has three choices to keep the readymade course as is, make their own amendments or ask teaching assistant to make amendments (this is only the case with internal lecturers only because they can easily contact teaching assistant).	
12	It is assumed that lecturers prepare assignments and exams in parallel after receiving the course material from the post graduate studies department based on the readymade material.	

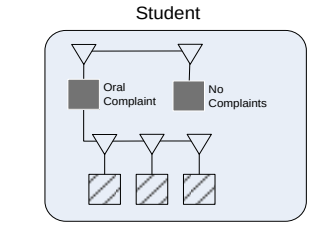
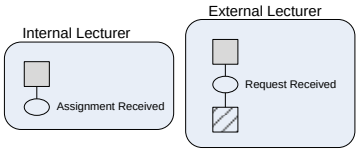
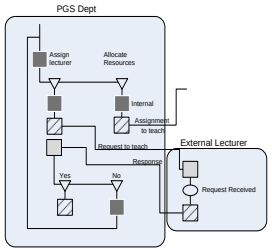
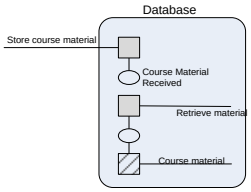
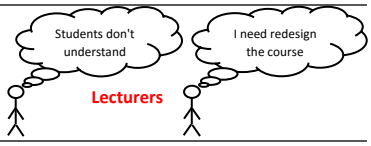
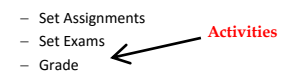
No	RADs Benefits/Ambiguities	Model Snapshot
13	Students and lecturers are either happy or unhappy with the course. In case they want to complain they have the choice to complain either to TAs, the post graduate studies department or the dean. However, complaints are only orally and ignored because there is no formal procedure.	
14	The post graduate studies department assigns either external or internal lecturers to teach. This choice provides the '*Assigned Lecturer*' role, however there is no database for searching for suitable lecturers. Lecturer role was separated into two different (external and internal) roles due to the way in which they are assigned the course.	
15	The post graduate studies department sends external lecturer a request to teach, and then they have to wait for the response. External lecturers have the choice to accept or refuse to teach. If they accept to teach they are sent the course material, if not another lecturer is assigned.	
16	In addition, it is assumed that post graduate studies department stores the course material in a data store and retrieves it back in order to send it to the assigned lecturer.	

Table 14: SSM Issues

No	SSM Benefits/Ambiguities	Model Snapshot
1	SSM rich picture illustrated the actors involved in the processes especially the following three actors who were interviewed.	• Lecturers • TAs • Students
2	Rich picture highlighted interpretation and perceptions of each actor, in particular Lecturers, TAs and Students.	
3	Actions are briefly shown, however not in their sequence. Moreover, it does not identify parallel activities or choices.	

Taking into consideration the above mentioned problems an enhanced process is suggested in the following sections in order to improve the course design and delivery processes.

5.4 Proposed Course Design and Delivery Processes

This section will introduce a proposed improved model in order to enhance course design and delivery processes based on the findings and outcomes of the models highlighted previously as well as the current state at PQI after undertaking some improvement initiatives. It also discusses how mature the processes are as well as the available system constraints. The following sections provide more detail about the proposed improvements. The suggestions are made clear by annotating the RADs using a numbered key.

5.4.1 Proposed Course Design

This section describes the suggested improvements for the course design process. The proposed RADs in Figure 27 suggests the following improvements for enhancing the design of master courses:

1. Instead of assigning the whole process to the teaching assistant with no follow up, the dean will assign an educational committee to design master courses. The educational committee will start by conducting a pre-design analysis before actually designing courses, in order to have a clear idea of target students (number of students, major.. etc), the available resources (Classrooms, library, available technology…etc), the general curricular requirements (course level, prerequisites, required/elective), and the most important skills that students should develop in the programme.
2. After having a clear idea of students and the context of the course, the educational committee searches the teaching staff database to form the course developers' team. The team consists of a group of academics (teaching assistants and lecturers) specialised in the subject matter. The chosen team is marked as unavailable for any further search unless they complete their task.

3. Course developers are assigned to design a course file summary which includes course aims, intended learning outcomes, course structure in 12 modules according to the supreme council of higher education, grading criteria, and suggested assessment and evaluation methods.
4. Afterwards the course file summary is sent to the educational committee for review and approval.
5. If the course file summary is approved, it is sent to the post graduate studies department and kept in a database. If amendments are required it is sent back to the course developers.
6. The post graduate studies department is responsible for allocating resources, preparing time table, preparing courses list and assigning lectures - whether internal or external - to teach. All lecturers have to stick to the course file summary during course delivery.
7. Courses list is sent to both the registration and financial departments.
8. Time table and lectures list are approved by the post graduate studies coordinator and lecturers are assigned to teach. Internal lecturers are assigned automatically to teach. However, external lecturers are sent a request to teach subject to acceptance or rejection.
9. Once the all lecturers are assigned post graduate studies department requests the course file summary from the database in order to send it to the lecturer.
10. Post graduate studies department also searches for a suitable teaching assistant from the teaching staff database and assigns them to their subjects. When a teaching assistant is chosen a mark is set on his profile as unavailable for other tasks until the job is completed. This way it is guaranteed that no one is overloaded.

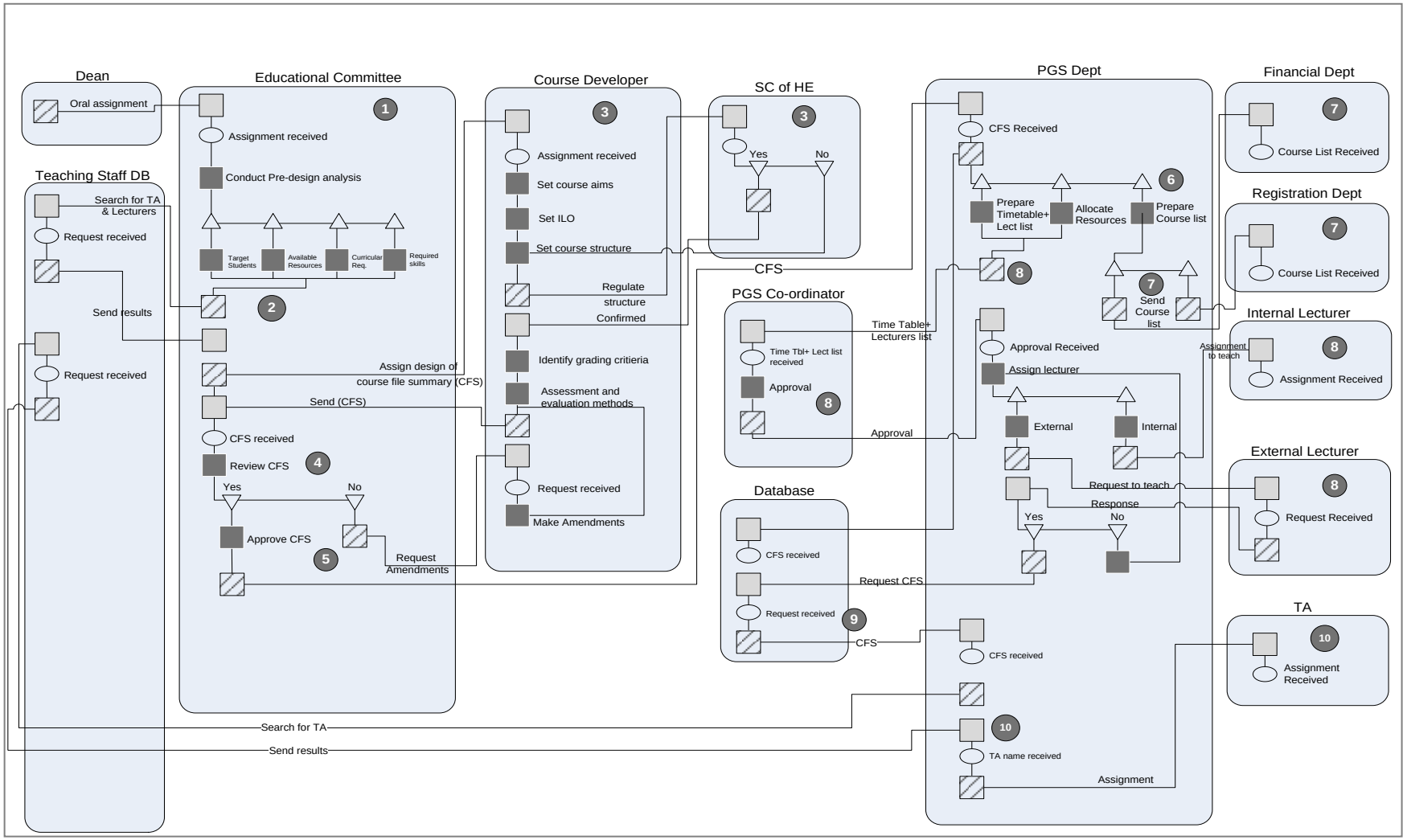


Figure 27: Proposed Improved Course Design Process

5.4.2 Proposed Course Delivery

Every aspect of the course should focus on defined educational goals, the most important of which is the level of learning you expect students to achieve. Figure 28 introduces the suggested improved RADs for enhancing the course delivery process. Moreover, a feedback and complaints procedures are introduced.

1. Lecturers will be responsible for preparing the course material based on the course file summary. They should choose instructional strategies (lecture, discussion, lab, individual presentations, group projects, one-on-one consultation, etc. or a combination), and select appropriate materials (texts, handouts, films, videotapes, etc.) to achieve course aims and encourage interactive teaching. (IT: Course material is uploaded online and is available for students any time). The lecturer is also responsible for preparing assignments and exams (IT: assignments are sent to students online).
2. During the first class the lecturer should start by explaining the course aims and intended learning outcomes to students. Also an introduction to the sequence of the course subjects should be introduced.
3. Each lecture should start by giving an overview about the topic to be covered highlighting its importance to the overall course.
4. Teaching assistants attend lectures and help the lecturer filling out attendance sheets. They are also responsible for conducting sections/seminars for students.
5. Lecturers send the exams to teaching assistants for grading. teaching assistants are responsible for grading exams.
6. Afterwards lecturers review grades and fill a course progress sheet in order to monitor their progress and how far they stick to the course file summary. They are also responsible for evaluating student understanding and evaluate the extent to which students have mastered intended skills. Students are assessed and evaluated based on their participation, assignments as well as exams.

7. Documents are handed over the post graduate studies department. (IT: Grades are entered on electronic sheets and signed off by the lecturer. It is sent to the post graduate studies coordinator for initial approval and for a final approval by the dean. Also attendance sheets are sent electronically to the post graduate studies department).
8. Post graduate studies department send the documents to the post graduate studies co-coordinator for approval. Once the approval is ready, students' transcripts are prepared (Students are not allowed to take their transcripts unless they have submitted a complete feedback questionnaire).

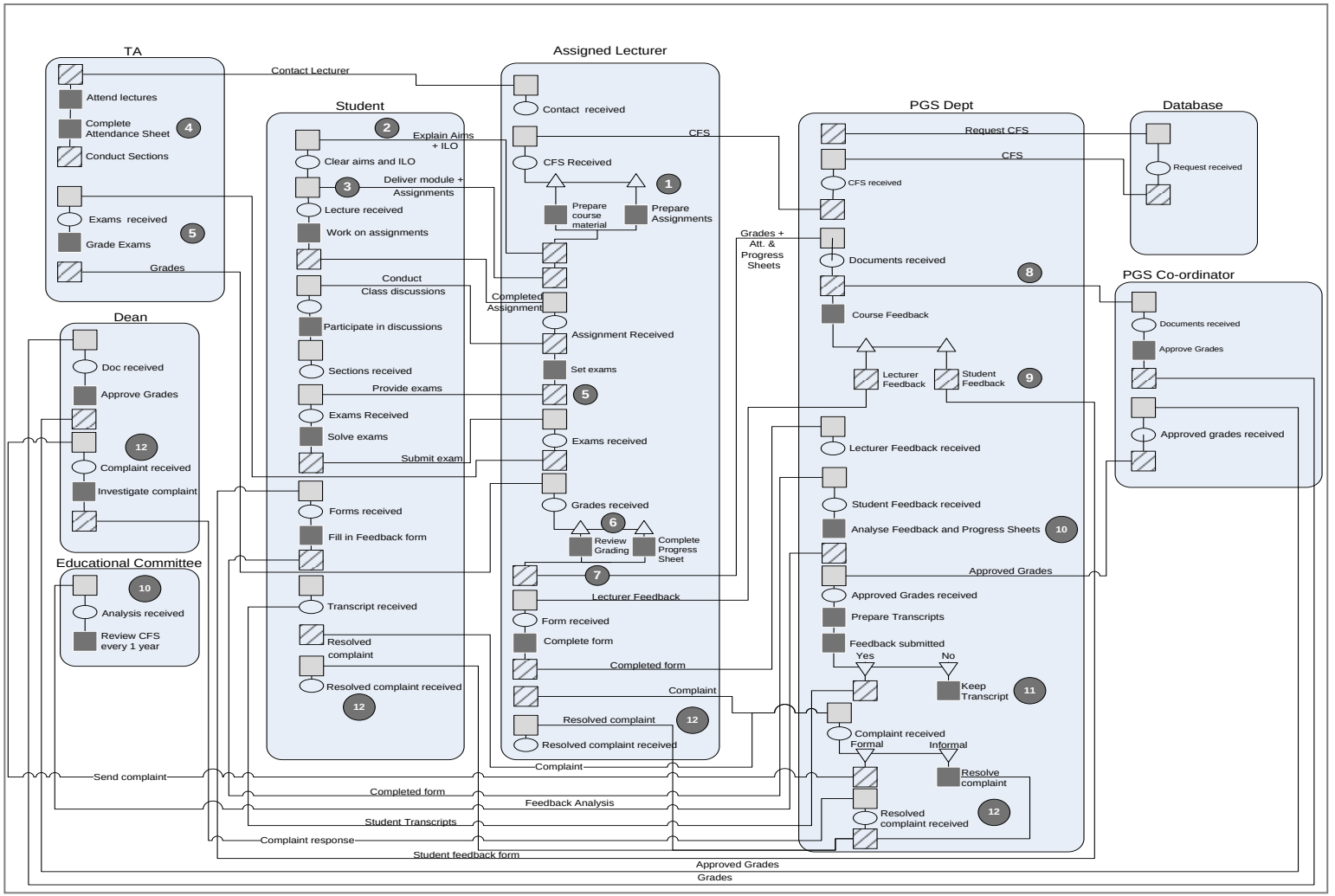


Figure 28: Proposed Improved Course Delivery Process

5.5 Current State at PQI Egypt

During the conduct of this research it has been realised that the institute recognised the need to improve in order to overcome students' and lecturers' complaints, thus providing better service. As a result, PQI Egypt undertook some changes to the course design and delivery processes. Therefore, the researcher thought it would be interesting to also map the current state at PQI in order to match it with the AS-IS and the improvements proposed in this research.

5.5.1 Current Course Design

The RADs for the current course design process is illustrated in Figure 29 and shows the following changes undertaken by PQI for enhancing the design of master courses:

1. The dean assigns post graduate studies co-coordinator to identify experienced lectures in order to create the course file summary.
2. Lecturers are assigned to design course file summary which includes course aims, intended learning outcomes, course structure in 12 modules according to the supreme council of higher education, grading criteria, and suggested assessment and evaluation methods.
3. Course file summaries are sent to the post graduate studies co-coordinator for review and approval.
4. If the course file summary is approved it is sent to the post graduate studies department and kept in a database. If amendments are required it is sent back to the lecturer.
5. The post graduate studies department is responsible for allocating resources, preparing time table, preparing courses list and assigning lectures - whether internal or external - to teach. All lecturers have to stick to the course file summary during course delivery. Courses list is sent to both the registration and financial departments and time table and lectures list are sent for approval by the post graduate studies coordinator.

6. Afterwards lecturers are assigned to teach. Internal lecturers are assigned automatically to teach. However, external lecturers are sent a request to teach subject to acceptance or rejection.
7. Once the all lecturers are assigned post graduate studies department requests the course file summary from the database in order to send it to the lecturer.

5.5.2 Current Course Delivery

Figure 30 illustrates the RADs for the current course delivery process. The following shows changes undertaken by PQI for enhancing the delivery of master courses:

1. Lecturers are responsible for preparing the course material based on the course file summary. They should choose instructional strategies (lecture, discussion, lab, individual presentations, group projects, one-on-one consultation, etc. or a combination), and select appropriate materials (texts, handouts, films, videotapes, etc.) to achieve course aims and encourage interactive teaching.
2. During the first class the lecturer should start by explaining the course aims and intended learning outcomes to students. Also an introduction to the sequence of the course subjects should be introduced.
3. Each lecture should start by giving an overview about the topic to be covered highlighting its importance to the overall course.
4. Lecturers grade exams and complete grading and attendance sheets. Students are assessed and evaluated based on their participation, assignments as well as exams.
5. Documents (grading and attendance sheets) are handed over the post graduate studies department.
6. Post graduate studies department send the documents to the post graduate studies co-coordinator for approval. Then the grades sheets are sent to the dean for approval as well. Once the approval is ready, students' transcripts are prepared.

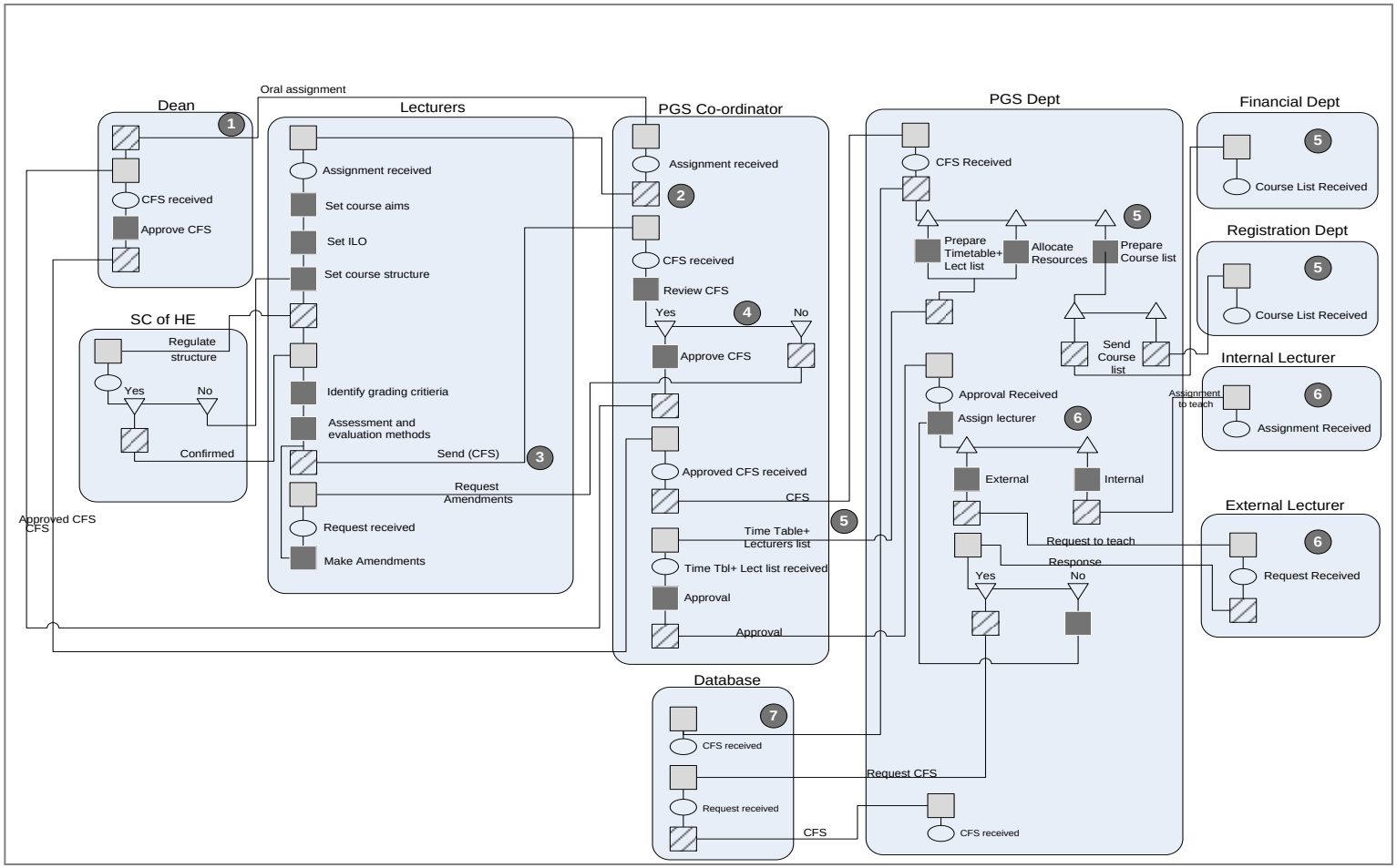


Figure 29: Current State for Course Design Process

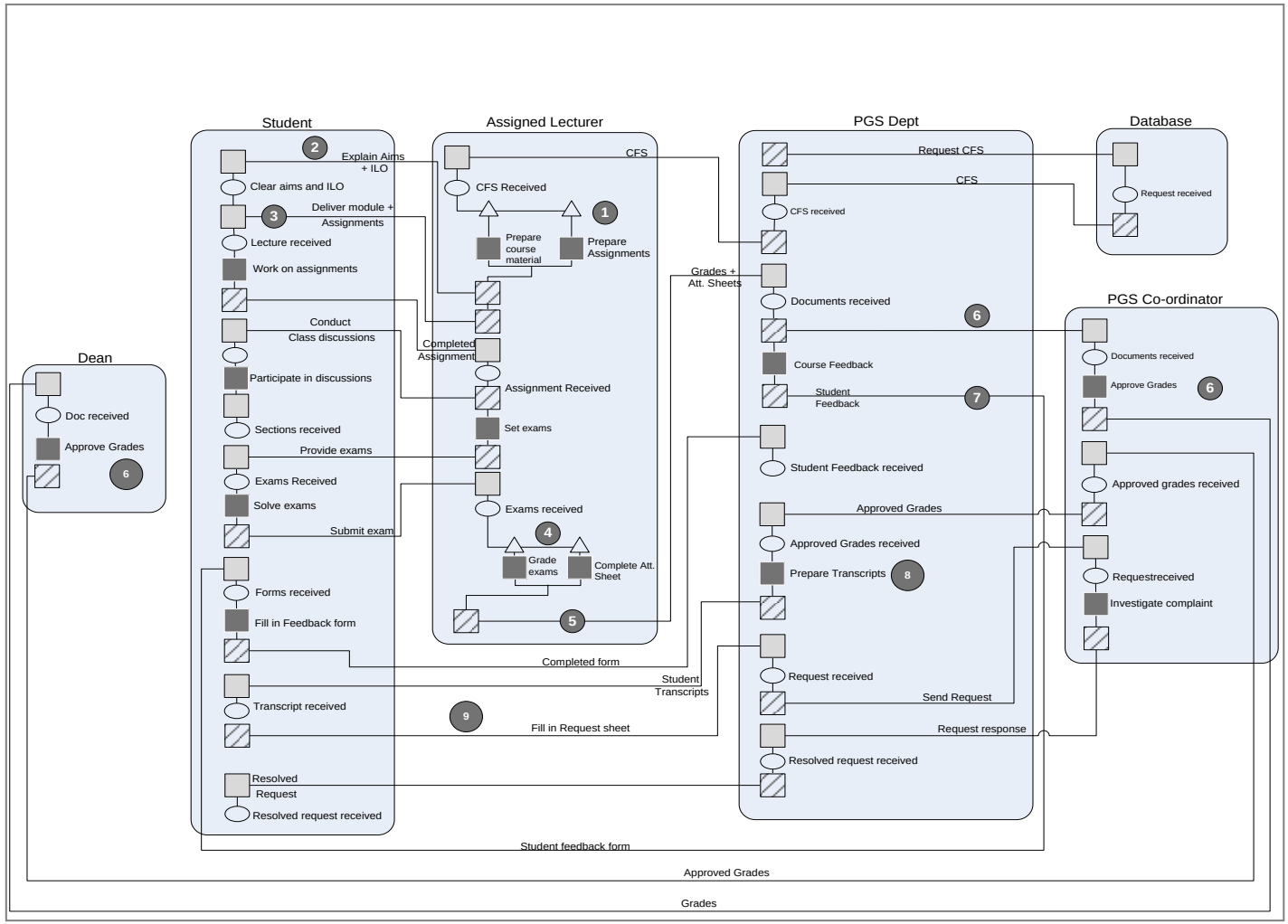


Figure 30: Current State for Course Delivery Process

5.6 Comparison of As-Is, Proposed and Current State Models

Table 15 illustrates some examples of the differences between the As-Is, proposed and current state models.

Table 15 : Differences Between the As-Is, Current State and the To-Be Models

As-Is	Proposed Model	Current State
• Dean assigns teaching assistant to design master courses without any support	• Dean will assign an educational committee to design master courses	• Dean assigns post graduate studies co-coordinator to choose appropriate lecturers in order to prepare course file summary
• No previous criteria for preparing courses	• Course developers will prepare a course file summary. Educational committee reviews the course file summary	• Lecturers prepare course file summary.
• Teaching assistants prepare course material	• Lecturers will prepare course material based on course file summary	• Assigned lecturers prepare course material according to course file summary
• Teaching assistants are overloaded	• Equal load for teaching assistants	• Teaching assistant is not involved during design or delivery of courses
• Teaching assistants don't have background and knowledge	• Teaching assistants will be chosen based on background and knowledge	• Lecturers are chosen according to background
• Teaching assistants do not take part during delivery	• Teaching assistants will assist lecturers	• Teaching assistants do not take part during delivery
• No Feedback procedure	• There will be lecturers' and students' feedback questionnaire	• Students' feedback only no lecturers' feedback and no analysis
• No complaint procedure – only oral complaint which were ignored	• Formal and informal complaint procedures will be established	• Request sheet are completed by students in case they have a complaint or any request.

As shown in Table 15, using the models enabled the illustration and identification of problems and changes in the course design and delivery processes.

Accordingly, the improved model is proposed to enhance the course design and delivery processes. The current state models in Figures 29 and 30 show the changes initiated by PQI in order to improve the processes. However, the comparison of the current state and the proposed model in Table 15 highlights that not all problems have been resolved.

Thus it is expected that by applying the changes illustrated in the proposed model, better improvements will be achieved, whereas the limitations shown in the following section should be taken into consideration.

5.7 System Constraints

One of the characteristics of successful organisations is the aim to achieve perfection. This can be attained through frequent implementation of improvements. Since HEIs are keen to improve their systems and delivery processes they aim to integrate the technology gradually.

Therefore, it is suggested that an online system can be used to upload the course materials or any additional material to be stored and to allow students to access the course material to use for their studies, hence facilitating the access of course material to students, reducing paper and ensuring availability for students.

Students can access the materials by requesting access, using their username and password to login they can then select the material they need and the portal will allow access to the materials. The portal can also allow students to submit their assignments and make easy for lecturers to comment on it, thus allowing students to have feedback on their progress more easily. The benefit of using a portal is that it is quick and simple to use, materials are all in one place all students will be uploading their assignments in the same way reducing the risk of students failing to submit their assignment due to not knowing the procedure. The lecturer will then view the assignment and mark it following the agreed marking criteria within the specified time frame also in the assessment criteria.

Once feedback has been written the lecturer then uploads the feedback onto the portal. The advantage of submitting the feedback onto the portal is that all students can receive their feedback promptly; feedback allows students to identify their strength and weaknesses. Also attendance sheets and grades can be filled in on the system.

Moreover, questionnaires and complaint forms can be filled online. Lecturers and students should fill in a questionnaire every semester. The questionnaire can be accessed via the portal and is a chance for lecturers and students to express their opinions on the course and suggest ways the course can be improved.

The students can also be allowed to access their grades only after they fill in the questionnaire. This way it is guaranteed that feedback is gathered. Once completed, the questionnaires are analysed and the results are considered to suggest possible improvements. At any time, lecturers or students can formally issue a complaint on the portal. Once a complaint has been logged on the portal the complaint is investigated and resolved as fast as possible and the response is sent back to the concerned person. The response time of the complaint will be reduced, thus making it more flexible to deal effectively and promptly with complaints.

However, the problem would be that the system could crash or become overloaded because of inappropriate hardware or software, which is the real case. The portal has been applied in the past; however, it did not function properly for the following reasons:

1. The trouble to enable secure users access on the system. All users should have a username and password.
2. The system crashed and prevented lecturers' and students' access.
3. Some lecturers and students were resistant because they were not experts with using IT system.

5.8 Conclusion

This chapter highlighted the pilot study which presents the application of various models to the course design and delivery processes in order to identify their suitability in revealing problems.

Based on the literature review of modelling techniques in Chapter 3 various techniques were investigated. As a result, the researcher has chosen to implemented DFDs, RADs and SSM to the course design and delivery processes with the following proposition 'Using combined techniques is necessary to illustrate the Course Design and Delivery Processes.'

Although DFDs and RADs were successful in providing different aspects of the processes, DFDs was not found suitable in this case. Hence, sometimes it may not be possible to identify all process modelling tools and techniques required prior to a modelling process. As the researcher gained insight into the processes being modelled and problems to be solved, appropriate techniques can be introduced. In this case the application of SSM was not pre-planned, it was introduced when the limitations of RADs in illustrating the social aspects of the system and the inability to perform precise analysis. As a result, a modelling approach was introduced integrating RADs and SSM Rich Picture. Therefore, the proposition - Using combined techniques is necessary to illustrate the Course design and Delivery Processes (in page 67) - was found to be true. Although RADs has been very beneficial in showing most of the process problems there has been a need to complement it by roles perception of their work.

After analysing the models, improvements were suggested to enhance the course design and delivery processes. It is expected that implementing the proposed improvements would lead to undertaking the processes in a more efficient way thus leading to providing better service.

While the research was in progress, PQI decided to undertake some change to the course design and delivery processes. The researcher thought it would be interesting to map the current state at PQI and compare it with the suggested

improvements. However, the processes at P&Q are considered immature. The processes need to be improved first before introducing any IT projects. It is important to identify the current state then decide on possible improvements. The main concern here is to improve the key activities of both processes and at a later stage IT can be introduced.

The proposed (To-Be) model will serve as a guide for operating course design and delivery in a better way. However, process maturity and system constraints will be taken into consideration, in order to be able to improve the processes.

Chapter 6
Second Case Study

6.0 Introduction

A further study was carried out in order to test the feasibility of applying the hybrid RADs-RichPicture model to a larger process/project. The student journey processes at the same the Productivity and Quality Institute in Egypt will be used to verify the hybrid model and validate its steps and capability in capturing all process aspects in order to provide an improved method for guiding enhancements of educational processes.

6.1 Unit of Analysis

The unit of analysis for this study will be the mater programme of the Egyptian HEI. However, the entire student journey processes will be modelled from application and admission, through all of the phases of the student journey to project supervision and completion.

6.2 Proposition

The proposition of the second study will validate the hybrid model and its ability to capture all process issues and problems and facilitate the suggestion of improvements. The following propositions will be tested.

P2: The integrated modelling approach shows areas where processes can be improved

P3: The modelling approach suggests how processes can be improved

6.3 Data Collection

Data is gathered mainly from three sources: Interviews, observations, and documentation in order to provide a more comprehensive insight into the area under investigation.

Again being an employee at the same location where the research is undertaken, provided to opportunity to observe the processes under investigation. Moreover, process procedures are examined to identify how activities are carried out.

Semi-structured interviews are conducted with 3 out of 4 of the post graduate studies admin staff in order to illustrate the RADs-RichPicture. Respondents' were given the opportunity to freely express their own views in order to gain in depth data. All interviewees were interested in contributing to the research by emphasizing their point of views especially concerning improvement suggestions.

Interviews were conducted at a convenient time and place to the respondents and were limited to 20-30 minutes duration. Three tape recorded interviews were carried out and were fully transcribed for later analysis. All personal data has been made anonymous and all material gathered was considered confidential. Transcripts were presented back for verification by each respondent.

The student journey processes are mapped twice. The first time based on the documented procedure and another time based on the conducted interviews. The reason for that is to highlight the difference between the written procedure and what is carried out in reality.

6.4 Students' Journey based on Procedures

The students' journey process was initially illustrated using the postgraduate studies procedures. Some parts of the procedure were unclear however; the researcher clarified vague parts through asking the junior administrative staff in order to have a full understanding of the processes. Each process is demonstrated individually into a RADs model. Appendix D shows the detailed RADs models for each process. The following sub-sections provide an overview on all the findings of the RADs.

6.4.1 Admission and Registration

The first process 'Admission and Registration' revealed various aspects. The first interaction shows that the applicant requests an application form from the postgraduate admission officer, who sends back a list of required documents for admission. The RADs interaction failed to show the data flowing between both roles. The details of the documents list could not be shown using RADs.

The researcher suggests an extension for the RADs interaction (see Figure 31). Instead of using a small hashed rectangle, which implies sending the documents to the applicant, a hashed document symbol (a rectangle with a wave-like base) could be used to imply list of documents. This symbol will have an ID which will then relate to a data dictionary describing the full detail of the documents list. The same applies for the student data file, which should include all documents related to the student starting with the application form and all documents related to students until graduation. So in order to show any interaction that carries an amount of data on the RADs, the suggested extension can be used.

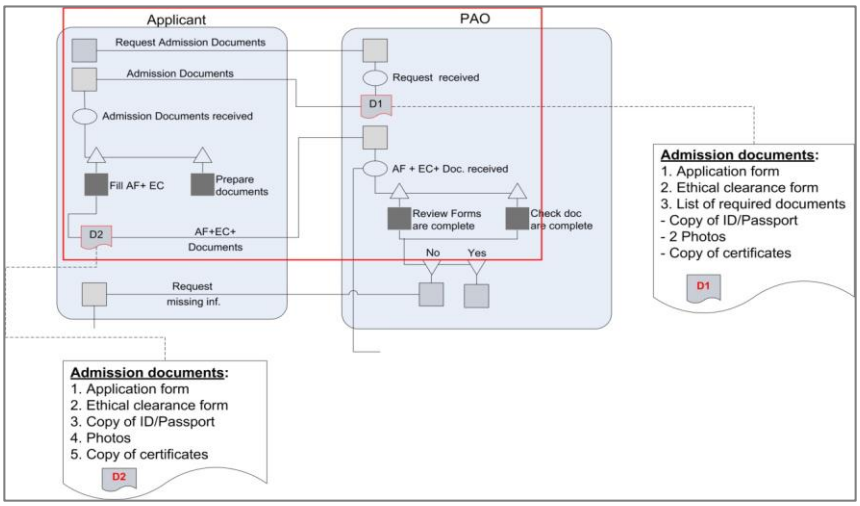


Figure 31: RADs Interaction Extension

Furthermore, the procedure does not show what happens if the applicant is rejected. It only describes the process in case of acceptance. Another finding from the process is that all activities are carried out manually; there is no IT system for admission and registration. There is a huge amount of paper work which ends up with the online registration by the postgraduate admission officer. The administrative staff carries out most of the activities.

6.4.2 Timetabling and Loading

The second process 'Timetabling and Loading' in Figure 32 shows that the timetable is set by the coordinator according to the student data file together with the programme structure/courses list. This is then revised by the vice dean for postgraduate studies who reviews the inconsistencies in staff loading in coordination with the dean if necessary. After rectifying all problems, the final time table is send back to the coordinator, who sends a copy to both lecturers and students. The coordinator also prepares and attendance list and issues the assignment letter for each lecturer. The final finding is that by investigating the RADs, there is no implemented IT system that facilitates communication between roles. All activities are completed manually.

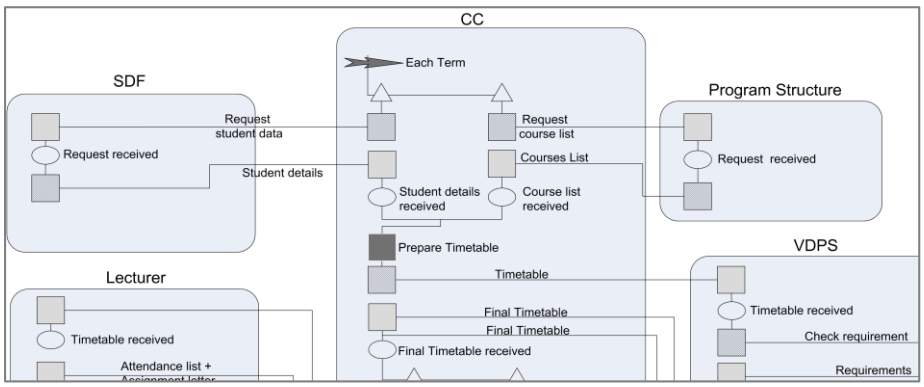


Figure 32: RADs Timetabling and Loading Snapshot

6.4.3 Student Appeals

The researcher found out that the 'Student Appeals' process is very complicated. Many roles are involved in the process, however not all of them are adding value. For example, Figure 33 shows that the only thing the dean has to do is to sign the Student Appeal Form; he/she does not take any decision concerning student appeals, which is waste of time for the dean. The vice dean for postgraduate studies can be authorized to investigate and deal with student appeals instead.

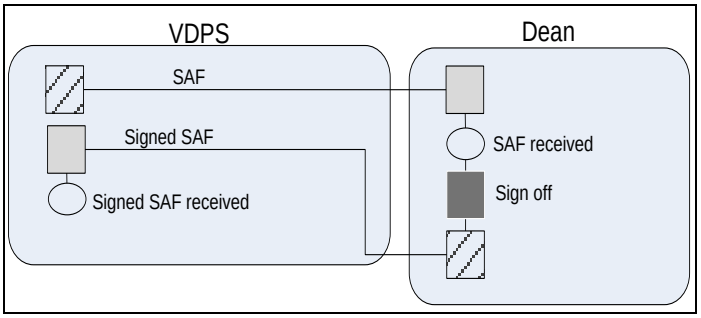


Figure 33: RADs Student Appeal Snapshot

Furthermore, the lecturer only decides whether or not to accept grade modification. There are no rules that limit the lecturers' decisions. Moreover, the role of the academic advisor does not add value at all. The grade modification form is filled in by the vice dean for postgraduate studies and sent together with the student appeal form to the academic advisor who in turn forwards it to the AASTMT registration department. Again like other processes there are roles that carry out activities which do not exist, for example, the PG-secretary, and the academic advisor. Though it was not clear in the procedure the researcher assumed that the decision, whether accepted or rejected, is sent back to the PG-secretary, who forwards it to the student. Students who are dissatisfied with the outcome may complain.

Also, it was not evident in the procedure whether there are any rules/regulations on how many times the student can appeal. Furthermore, by asking one of the junior administrative staff, the researcher discovered that the student appeal process does not exist. Students who wish to appeal are asked to submit a written request to the postgraduate admission officer, however most students hesitate to take this action.

6.4.4 Student Complaints

The procedure states that students who wish to complain will fill in a complaint form and submit it to the vice dean for postgraduate studies directly. Unlike the student appeal form the complaint form is directly sent to the vice dean for postgraduate studies not through the PG-secretary. Also the dean is involved in the process for only receiving unresolved complaints by the vice dean for

postgraduate studies. The dean undertakes no activity for resolving the complaint. He/she just assigns it to a member of staff, who investigates and completes the complaint form with a resolution. Then the complaint form is sent back to the dean (see Figure 34), who forward it back to the vice dean for postgraduate studies, therefore the dean acts only as an intermediate person between the vice dean for postgraduate studies and the member of staff.

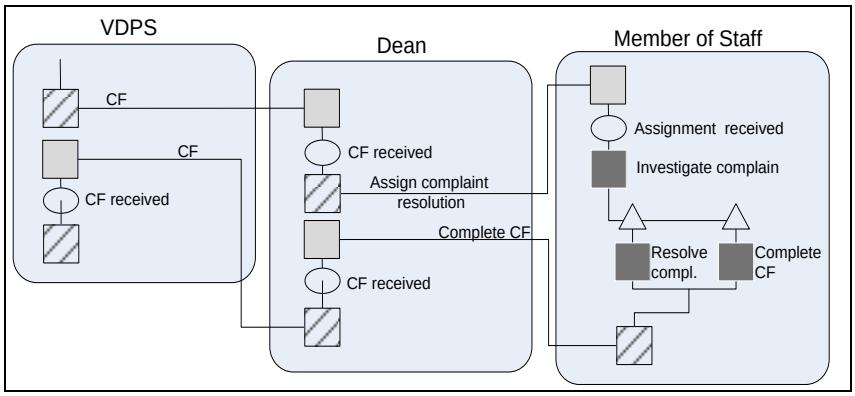


Figure 34: RADs Student Complaint Snapshot

As shown in the procedure the vice dean for postgraduate studies periodically reviews student complaints and student appeals for trends and repetitive problems. However, the activity is not carried out at all.

6.4.5 Research Supervision

The 'Research Supervision' in Figure 35 is the biggest process in the students' journey, including several roles and enormous amount of interactions. Illustrating the process using RADs revealed various issues. Since the procedure was unclear in some bits the researcher had to introduce various assumptions. In the procedure it is stated that the vice dean for postgraduate studies allocates research supervisors in consultation with the postgraduate admission officer and the coordinator. The researcher assumed that all three meet together at the same time to carry out the activity. They also ensure that there are sufficient library resources, supervisory team have correct skills and expertise and that resource capacities are sufficient. Though it is not mentioned in which order these activities are carried out, it would be more efficient to assume that checking library resources and resource capabilities are performed in parallel. Afterwards

students submit their proposals to the research committee. Once the proposal is accepted, the research committee prepares the supervision letters; in this case it is assumed that the letters are sent in parallel for both lecturers and students.

In addition, the process for appointing the examiners does not show what happens if the examiner does not accept the task. It was suggested that the postgraduate admission officer contacts the research committee back for nominating another examiner. Furthermore, the procedure did not mention any communication between students and supervisors. The researcher presumed that there is an iterative interaction between students and their supervisors to complete the thesis. Also another interaction is added to show that students submit the final thesis to their supervisors for revision. The supervisors may ask for amendments; which students should undertake before final submission. Once students finish their thesis they are required to submit one electronic copy and two hard copies of the thesis, however it was not clear to whom to submit them. It was assumed that students submit the copies to postgraduate admission officer who in turn sends them to examiners. After the vice dean for postgraduate studies sets the viva date, it is not obvious that they contact students and examiners to notify them about the examination date. The researcher assumed that the vice dean for postgraduate studies interacts with students and examiners through postgraduate admission officer to inform them about the date.

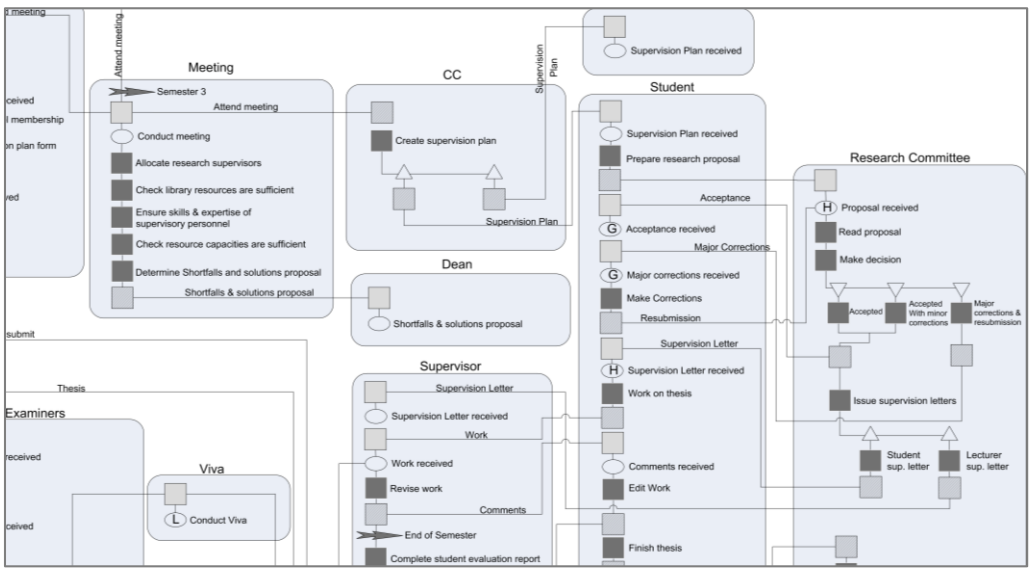


Figure 35: RADs Research Supervision Process Snapshot

6.4.6 Postponing of Study

The 'Postponing of Study' process in Figure 36 illustrates the steps that a student should follow to postpone their study. First students who wish to postpone their studies should contact the postgraduate admission officer who in turn completes the postponing form. Then a copy is kept in the student data file and the original is sent to the AASTMT admission and registration department. The researcher assumed that both activities are done in parallel. Once students decide to resume the study, they will complete the re-entry form. It is assumed that they request the form from the postgraduate admission officer to fill it in and then return it back. The postgraduate admission officer then sends the form to the vice dean for postgraduate studies for investigation and approval; however, it is not stated in the procedure on which basis the vice dean for postgraduate studies makes his decision. No criteria/rules are shown for postponing studies, for example, for how long are students allowed to postpone their studies? Moreover, there is no rule for re-entry, what are the reasons for rejecting the re-entry of students (as highlighted in red in Figure 36). Finally, once the approved re-entry form is sent to the AASTMT admission and registration department it is assumed that the necessary action they take is to re-register the student.

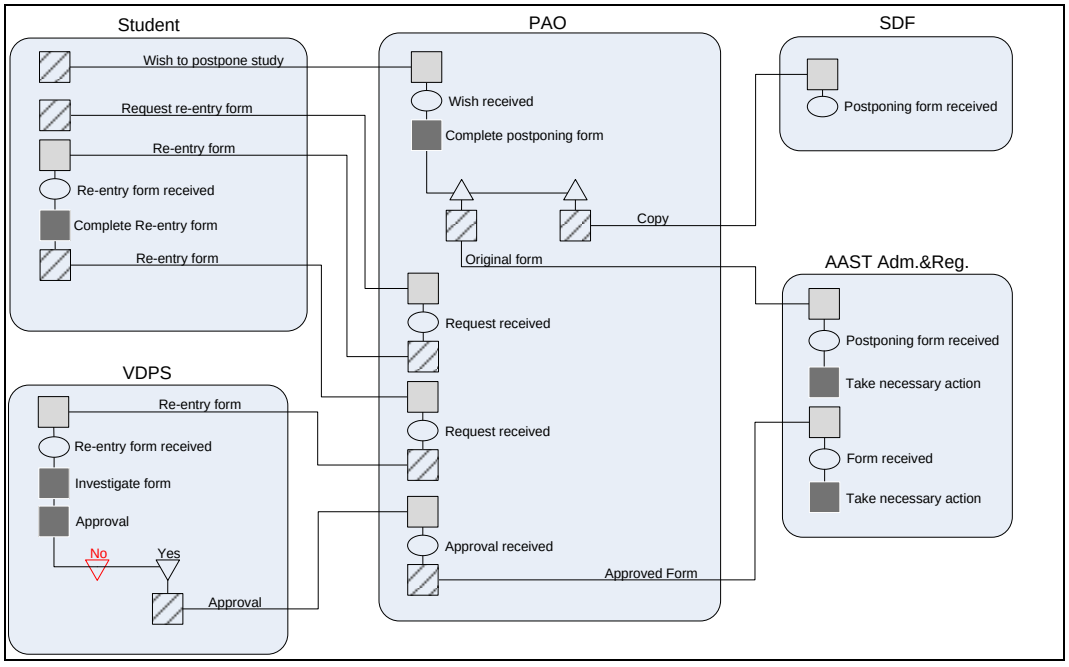


Figure 36: RADs Postponing of Study Process Snapshot

6.4.7 Withdrawal of Study

The 'Withdrawal of Study' process (see Figure 37) illustrates the withdrawal steps. Unlike the postponing process, students request the withdrawal form from the postgraduate admission officer, fill it in themselves and hand it over to the vice dean for postgraduate studies directly. The vice dean for postgraduate studies investigates the form and either approves or disapproves; however, again it is not mentioned in the procedure what happens in the case of disapproval. There are no criteria for disapproval, for example, the effective date of withdrawal as it might affect the amount of student tuition fee liability.

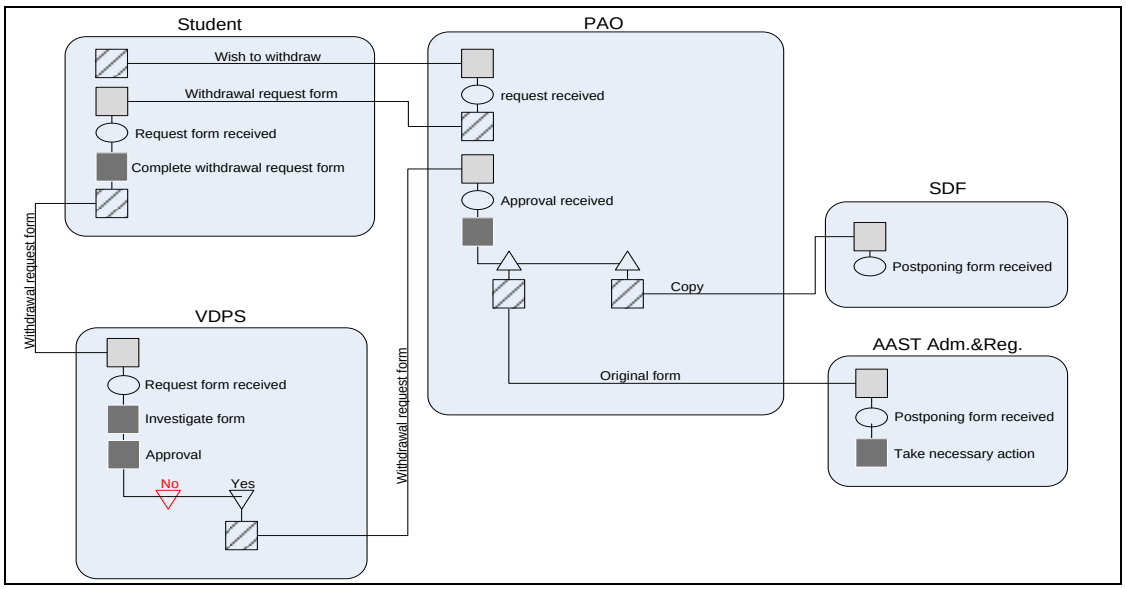


Figure 37: RADs Withdrawal of Study Snapshot

6.4.8 Collecting Feedback

At the end of each academic semester, student feedback forms and lecturer satisfaction surveys are distributed (see Figure 38). As it is not mentioned in the procedure, who is responsible for carrying out this activity, the researcher assumed the postgraduate admission officer are responsible for this job. The returned forms are analysed and then results are reported to the vice dean for postgraduate studies. Afterwards the vice dean for postgraduate studies compiles an executive summary and recommendations which are sent together with the analysis report to the dean. However, it is not clear in the procedure what improvement actions are taken based on the feedback.

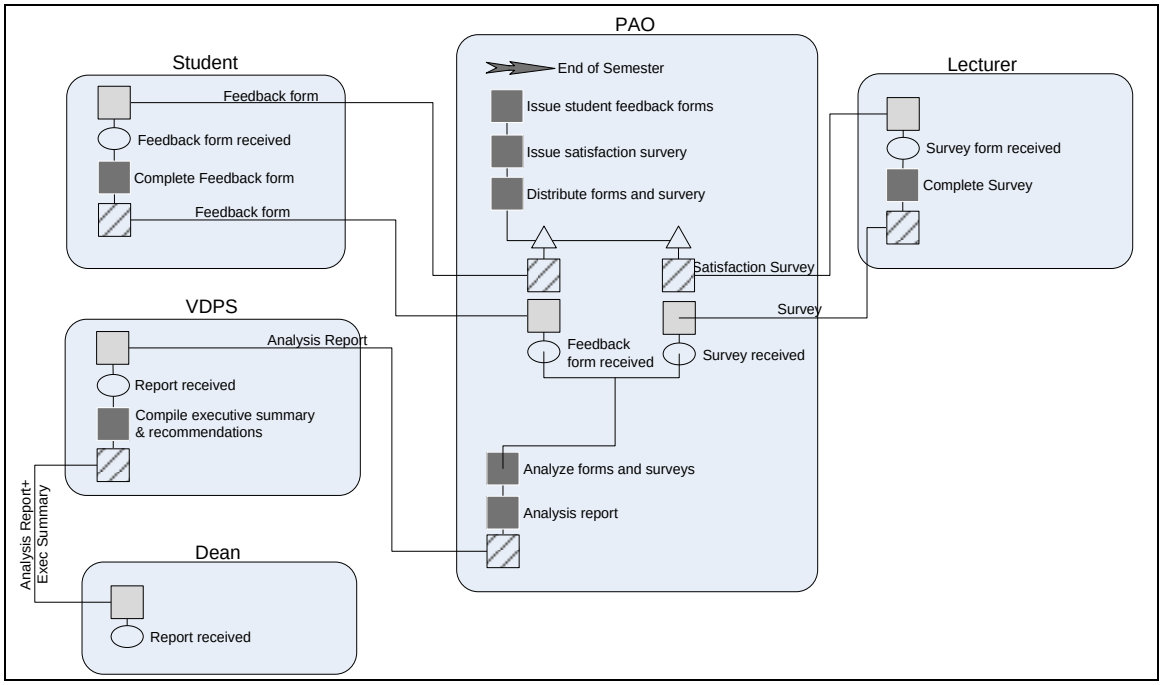


Figure 38: RADs Collecting Feedback Process Snapshot

6.5 Summary

This section introduced the RADs as implied by the written procedure. Mapping the processes provided an understanding of each individual process of the Students' Journey and enabled the finding of various issues and aspects about each individual process. The next section will outline the students' Journey RADs based on the conducted interviews. Thus being able to discover the differences between the documented procedures and the activities carried out in reality.

6.6 Students' Journey after Conducting Interviews

After mapping the processes using the documented procedure all RADs were refined after interviewing people involved in each process. The following sections will introduce the differences between the procedures mapping and the interview mapping for each individual processes. Thus, showing the dissimilarities between the written procedure and what happens in reality. Semi-Structured Interviews were conducted with two PAOs out of three. Appendix E shows the RADs models after interview refinement.

6.6.1 Admission and Registration Process

The first process, which is the Admission and Registration in Figure 39, is mapped based on postgraduate admission officer's interview responses. The process is carried out almost like stated in the procedure. The only difference is that the vice dean for postgraduate studies role is not involved in reality. As previously implied in the procedure the vice dean for postgraduate studies examines the applicant's qualification and decides whether to accept or reject. However, what actually happens as stated by the interview is that the postgraduate admission officer "*.. check the documents and make sure that the university grade is not less than good*".

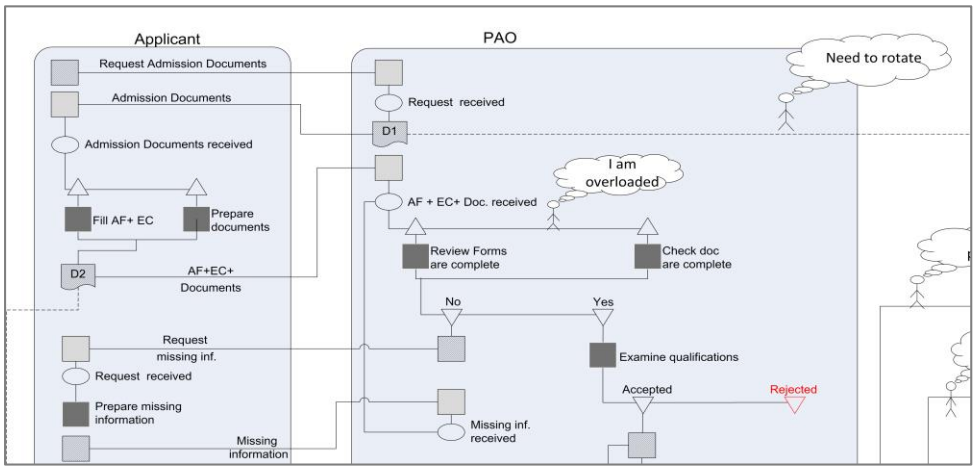


Figure 39 : RADs-RichPicture Admission and Registration Snapshot

6.6.2 Time Tabling and Loading Process

As stated in the procedure the coordinator is responsible for preparing the timetable (Figure 40). However, as stated by one of the interviewees "... *coordinators do not exist"* as an actual role. The coordinator role activities are performed by the postgraduate admission officer. The respondents suggested that timetabling and loading should be *".. according to the program structure so that there would be no conflicting lectures across terms*."

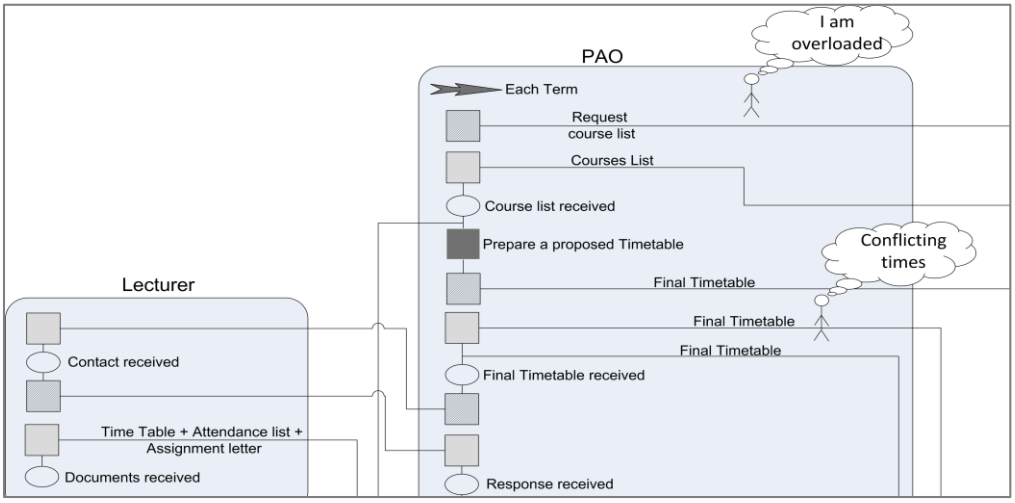


Figure 40: RADs-RichPicture Timetabling and Loading Snapshot

6.6.3 Student Appeal Process

In the procedure, the Student Appeal process appears to be very complicated and involves lots of roles. However, in response to the interview question 'How do students appeal?, one respondent mentioned that "*..there is no student appeal process"*, while another stated "*...I don't know*". One of the interviewees stated that students "*...back off*" if they are unhappy with their grades because they are asked to write a request letter, however they are anxious to proceed.

6.6.4 Complaint Process

As implied by the procedure, students who which to complain will fill in a complaint form and submit it to the vice dean for postgraduate studies directly. However, according to the conducted interviews one postgraduate admission officer mentioned that "*..there is no formal*" complaint procedure while another stated that "*..vice dean for postgraduate studies get oral complaints from students*". The PAOs also highlighted that they find out about complaints "*.. by coincidence*" and that there is "*..no rule to deal with complaints*". Therefore, according to respondents' answers it is clear that the complaint process described in the procedure is not implemented.

6.6.5 Research Supervision

As stated earlier the Research Supervision process is the biggest and most complicated in the students' journey, including several roles and enormous amount of interactions. Illustrating the process based on the interviews (see Appendix E, Figure E5) revealed various differences in comparison with the procedure. Initially the researcher observed that there are also different roles involved in the process, for example there is no research committee.

Unlike the procedure, the process in Figure 41 starts when the student prepares a proposal and submits it to the postgraduate admission officer instead of the research committee. Therefore, there are no criteria for reviewing the proposal. As stated by one of the postgraduate admission officer interviewees "*.. we keep a copy in the student data file and the vice dean for postgraduate studies uses it to assign a suitable supervisor depending on the topic*." Another postgraduate admission officer respondent mentioned that "*Mainly the vice dean for postgraduate studies is responsible..*" for assigning supervisors. Thus, it is obvious that the vice dean for post graduate studies prepares the supervision plan on his own with no coordination with the coordinator or postgraduate admission officer as revealed in the procedure.

Afterwards the supervision plan is sent to the postgraduate admission officer from the vice dean for postgraduate studies, in order to contact the supervisors and check their availability. In case supervisors are not available, the postgraduate admission officer informs the vice dean for postgraduate studies, who reassigns another supervisor.

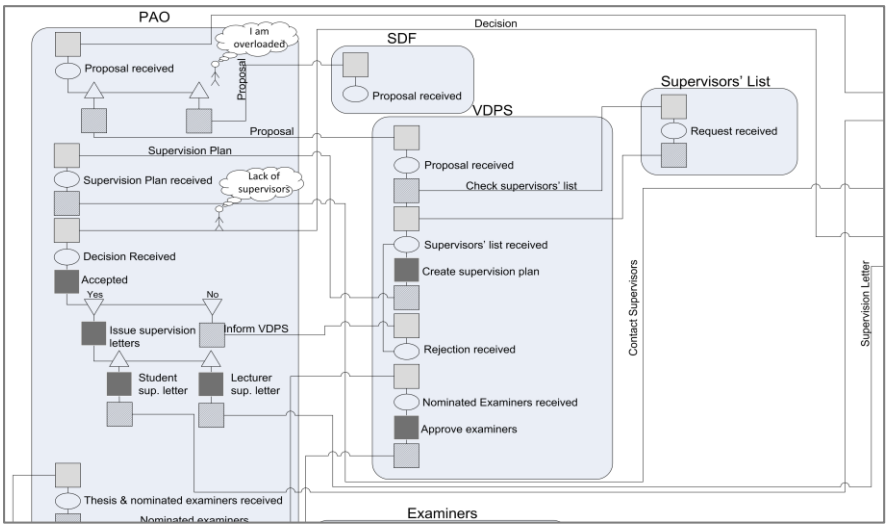


Figure 41: RADs-RichPicture Research Supervision Snapshot

The following step is to issue the supervision letters. It is assumed that the letters are sent mutually to both students and the supervisors. Even though the interviews did not mention any communication between students and supervisors, the researcher assumed that the student starts working on the thesis in coordination with the supervisors. The researcher presumed that there is an iterative interaction between students and their supervisors to complete the thesis.

Once students finish their thesis, the supervisors complete a thesis validation report and nominate examiners and submit them to the postgraduate admission officer. The vice dean for postgraduate studies approves the examiners and sends the approval back to the postgraduate admission officer. Unlike the procedure, the supervisors carry out the activity of setting the viva date in coordination with examiners and students. Consequently, both postgraduate admission officers declared that they prepare resources like a room, projectors and reports that need to be filled in by examiners after the viva.

As assumed by the researcher the viva is conducted on the selected date. Afterwards examiners have to provide their decision and recommendation in the viva evaluation form. Based on their decision the student may be asked to make corrections to the thesis. After submitting the corrections, the thesis is revised by "*..one of the examiners*" as both PAOs stated. Once approved, the postgraduate admission officer is informed and they start issuing the graduation letter, which is sent to the AAST registration department in order to issue the certificate.

6.6.6 Postponing of Study

This process illustrates the steps that a student should follow to postpone the study (Figure 42) (For whole model see Appendix E, Figure E6). First students who wish to postpone their studies should inform the postgraduate admission officer of their wish to postpone their studies. As a result, the postgraduate admission officer starts by checking whether the student is allowed to postpone or not.

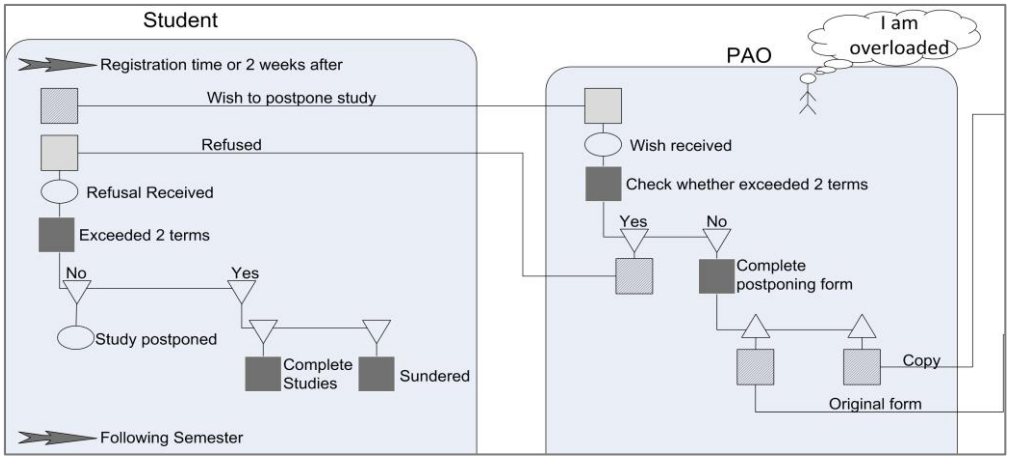


Figure 42: RADs-RichPicture Postponing Study Snapshot

Though the procedure does not contain any criteria/rules are shown for postponing studies, for example, for how long are students allowed to postpone their studies?, both postgraduate admission officers mentioned that students are only allowed to postpone for "*..maximum 2 terms*". If the student is allowed to postpone the study the postgraduate admission officer completes a postponing form, keeps a copy in the student data file and send the original to the AAST

registration department. The researcher assumed that both activities are carried out in parallel. Students who already postponed for 2 terms will complete their studies or they are considered as "*..sundered*". Once students decide to resume the study, the postgraduate admission officer check their status, if sundered then they have to re-register as new student and if not, PAOs mentioned that they "*.. get back automatically on track*" and are allowed to start the registration process. However, this is different from the procedure which states that the student needs to fill in a re-entry form which is approved by the vice dean for postgraduate studies. The vice dean for postgraduate studies is not involved in the real process.

6.6.7 Withdrawal of Study

The 'Withdrawal of Study' process (see Appendix E, Figure E7) illustrates the withdrawal steps. Figure 43 illustrates a snapshot of the process. As stated by the postgraduate admission officer interviewees, there are "*..2 cases for withdrawal*". The student can request to withdraw a course after attending maximum 3 lectures, in order to be able to refund the fees. As revealed by the respondents "*..the course is withdrawn if the student was absent for 3 times consecutively*" or as one postgraduate admission officer stated that the lecturer can request withdrawal if the students showed bad behaviour.

Furthermore, the real process does not involve the vice dean for postgraduate studies. Unlike the procedure where the vice dean for postgraduate studies needs to investigate the withdrawal form and either approves or disapproves.

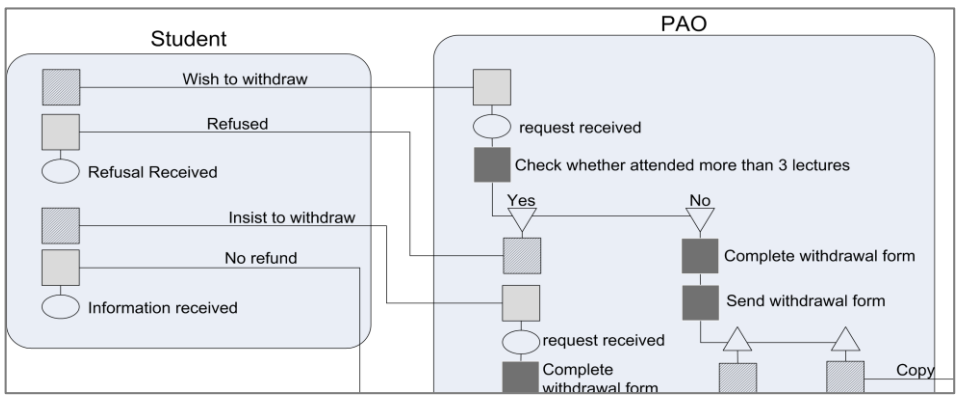


Figure 43: RADs-RichPicture Withdrawal Snapshot

6.6.8 Collecting Feedback

As stated in the procedure, student feedback forms and lecturer satisfaction surveys are distributed at the end of each academic semester. Nevertheless, the postgraduate admission officer respondents stated that they have a *"..ready questionnaire"*, however it is not actually in use. Thus, the researcher did not map the process, since it does not exist.

6.7 Summary

Section 6.6 illustrates the RADs after conducting the interviews. All processes were mapped based on respondents' answers. The resulting RADs-RICHPICTURE show the dissimilarities between the written procedure and the real activities and interactions. For Example, one issue that has been recognized amongst almost all processes is that there are roles in the procedures, which do not exit. Furthermore, some activities are carried out by roles other than the ones implied by the procedure.

6.8 Proposed Improvements for Students' Journey Process

The researcher introduced some straightforward enhancement proposals including some minimal IT solutions. In order to verify the suggested improvements, final year students, in a UK university, were given an assignment to model the same set of processes. They produced some excellent work and successfully modelled the processes. The most obvious finding to emerge from this study is the variation between the proposed improvements suggested by the researcher and the students. However, the students proposed more significant and ambitious IT solutions particularly in terms of fully automating more of the processes. The students worked on the premise that by eliminating manual work the activities can be completed more quickly and thus improve process efficiency. Whereas the researcher (who works within the processes) is aware of what efficiencies it will be possible to introduce into the current environment.

6.9 Second Study Findings

The second proposition 'The integrated modelling shows areas where processes can be improved'. This study confirmed that the hybrid RADs-Rich Picture model revealed issues which would not have been uncovered using either of the existing notations alone, and proved to be suitable in terms of accessibility, for modelling higher education processes.

On the other hand, the third proposition 'The modelling approach suggests how processes can be improved' was found to be false. The second study has thrown up findings in need of further investigation. The differences between the researcher's and students' suggestions for improvements identified a number of important issues, such as which improvements should be considered for a given situation and how may they be identified?

6.10 Conclusion

This chapter illustrate the second case study, which tested the possibility of applying the hybrid RADs-RichPicture model to the students; journey processes. Although the models reflect the current processes and provide a guide to the management of the educational institution, thus helping them to understand the problem areas. However, the models were limited in identifying suitable improvement proposals. Therefore, further work is needed to investigate the practicality of creating a method for adopting improvements initiatives that are suitable for an organisation. The following chapter will illustrate a fusion method.

Chapter 7
Higher Education Process Improvement Method

7.0 Introduction

Chapter 6 illustrated the student's journey processes in an Egyptian HEI, in order to identify possible areas for improvements. Modelling the processes (using the integrated RADs-RichPicture model) allowed the illustration of activities, their interrelationships, the roles responsible for the activities, thus providing a clear understanding of processes. Moreover, it enabled revealing process problems and helped the identification of possible suggested improvements.

This chapter starts by showing that HEI environment can be related to services. It defines services and highlights what HEIs need to help with process improvement. It also investigates the practicality of creating a method for adopting improvements initiatives that are suitable for a higher education organisation. From a number of options, benchmarking and maturity models taken from the business world are proposed to increase knowledge about process enhancements that could be used in higher education environment.

However, whilst the models provided/lead to solutions for improvements the suggested improvements were proposed in order to overcome raised problems. It is recognized that in business a good proportion of improvement are based on best practice. Therefore, benchmarking and maturity models are chosen to complement the shortcoming of the modelling. The following sections will show why both approaches integrating with the modelling will facilitate process improvement.

7.1 Higher Education as a Service

"*A service is an activity or benefit that one party can offer to another that is essentially intangible and does not result in the ownership of anything. Its production may or may not be tied to a physical product*" (Kotler and Armstrong, 1991).

Gruber et al. (2010) suggests that HEIs possesses all the unique characteristics (Table 16) of a service. The reason for that is that HE service varies from one situation to the next, making HE difficult to standardise. Therefore, for the purposes of this study higher education could be considered as a "service".

Table 16: Difference between HEIs and Industries

Characteristics	HEIs	Industries
Intangibility	Intangible	Tangible
Heterogeneity	Considerable variability in service delivery as it depends on humans	Some variation
Inseparability	Simultaneous production and consumption (co-creation between producer and consumer)	Consumption and production at different stages

Many researchers have compared industry with education and discovered that although they share some of their outcomes such as focusing on building flexibility and improving customer satisfaction in a dynamic environment (Stensaasen, 1995, Lundquist, 1998, Srikanthan and Dalrymple, 2003), industry and education are different from business process perspectives.

7.2 Higher Education Environment

Every HEI has different goals which are part of its unique selling point to students, the research community and industry. They are internally differentiated because each institution has these unique goals, along with the aims and expectations which are clearly specified to fulfil its mission. Consequently, each institution is unique and can be distinguished from the others. To create a method of process improvement, the factors that make HEI different, and each individual institution unique, need to be taken into account.

1. Intangible outputs

   Whilst industry produces physical goods that customers can see and touch however the outputs of HEIs are intangible in that whilst results can be measured, much of the process of learning is not measurable. Therefore,

measures of student results are not necessarily a good indicator. Accordingly, industry can easily measure, monitor and improve products whereas HEIs service quality is concerned with people, time to deliver courses, intangibility and the complexity of measuring outputs (Harvey, 1995, Owlia and Aspinwall, 1998, Venkatraman, 2007).

2. Heterogeneity

   Heterogeneity leads to differences from one institution to another, or variation in the same service from day-to-day or from student-to-student. The reason for this is that HEI are human centric (activities are conducted by humans), which makes the management much more complex and quality standardization more complicated. Moreover, processes are not clearly defined, i.e. education processes are abstract – defined at a higher level whereas they are implemented by humans (lecturers and admins) at lower level, which makes the provision of the service heterogeneous.

3. Inseparability

   Services entirely compose of a delivery experience, cannot be produced at one time and place and then stored for later use at another place. Services like HE are produced and consumed at them same time. The processes of production and consumption cannot be separated. Lecturers provide lessons during the presence of the students. The inability to produce services before they are consumed means that there is no way to produce a service, check it for defects, and then deliver it to a customer.

It is clear that each of these HEI environmental issues poses significant requirement implications for HE management regarding the delivery of its processes. Therefore, it is difficult to evaluate academic processes because of their intangibility, inseparability and heterogeneity.

7.3 Improvement Approaches for this Research

Following the success of improvement approaches in manufacturing, academics have begun to study the potential to transfer and apply these approaches and

practices to service organisations. Various approaches such as benchmarking, maturity, Business Process Modelling, improvement methods, measurement approaches and even such aspects as experiments are available to improve HEIs'. However, although there has been research concerning this subject there is no general agreement how to best apply quality management within HEI (Becket and Brookes, 2005, Cheng and Tam, 1997, Mehralizadeh et al., 2007, Owlia and Aspinwall, 1996, Srikanthan and Dalrymple, 2003)

The requirements identified in section 7.2 have contributed to the selection of the improvement approaches for this research. Processes can be analysed based on measures, such as students' results, or by comparing them to similar processes in order to identify how well processes are performing. However, the aim of this study is to investigate the processes in detail and look at them into depth in order to be able to discover the inefficiencies.

Best practice is a possible choice to integrate with the RAD/SSM approach because, according to the aim of this research, it provides a guide for improving processes based on comparing them to applied practices not based on performance measures, but on detailed analysis of processes. Businesses use benchmarking as a way to compare their performance against businesses in the industry. This allows companies to evaluate how well they are performing and recognize ways to become more competitive in the industry.

By observing how other companies are performing, they can identify areas of underperformance. Therefore, organisations are able to improve their own operations because they have models from other companies in the same industry to help guide changes.

However, Taylor (2001) declared that currently used performance indicators are unable to reflect academic work. The reason for that is that there is no agreement concerning the establishment of classification criteria for performance indicators (Garcı´a-Aracil and Palomares-Montero, 2010). Accordingly, Stella and Woodhouse (2007) stated that benchmarking is not considered effective if it depends only on gathering data and focusing on statistical comparison of

numerical outcomes to identify best practice. Moreover, there is a focus on numbers to highlight performance assessments instead of improvements (Garlick and Pryor, 2004, Stella and Woodhouse, 2007).

On the other hand, applying measures does not provide accurate outcomes because of the unique requirements of HEIs. The highlighted characteristics of HEIs show that it is difficult for service providers to control the quality of the outputs before delivering them to customers, as is normally done with manufacturing products. As a result, HEI need to consider their capabilities while undertaking change in order to be able to apply suitable improvements. Therefore, maturity models are considered in order to represent stages or levels of process maturity and capability, as well as each stage's characteristics and relationship to other stages (Röglinger et al., 2012, p. 4). Therefore, maturity assessment should be able to facilitate identifying the suitability of best practice to the context of HEIs.

The reason for integrating benchmarking and maturity is that the former can be measured in terms of maturity which helps institutions to apply improvements gradually through undertaking certain steps, by building on the practices that have been recognized at each stage. Thus, being able to effectively manage continual improvement in HEIs.

However, because best practice does not always imply getting the most recent improvements, HEIs need to have good understanding of their own environment, competition, processes and operations, and thus being able to align the practices with the processes in order to constantly achieve continuous improvement and accordingly increase customer satisfaction. Therefore, modelling the processes will provide an in depth understanding of processes and facilitate the identification of issues and improvement opportunities. The maturity models help in assessing initiation's maturity while benchmarking provides a baseline for how mature the processes are. Thus being able to select and implement practices that are best suited to institutions' capabilities.

As a result, institutions can focus on improving their processes according to their capabilities because institutions know what is needed to improve their processes and overcome their unique requirements. The following subsections emphasize and explain the concepts of benchmarking and maturity models.

7.3.1 Benchmarking

Although the derived models have distinctive benefits in facilitating explicit analysis of educational processes, they are inadequate for identifying appropriate improvement initiatives. To overcome this problem, the researcher recommends that a benchmark is needed to identify the current state of the Institute in relation to the best practices. This can be done through undertaking benchmarking, which is useful to achieve robust enhancements concerning the quality of educational processes. A benchmark can be very helpful in identifying improvement actions as it aims to identify best practices in certain business and improve the organisation by applying those practices (Marwa and Zairi, 2008).

Chen et al. (2007) stressed the importance of benchmarking for HEIs. Moreover, Dattakumar and Jagadeesh (2003) conducted a comprehensive literature review on benchmarking and stated that it is a widely used tool for continuous improvement of quality.

Nevertheless, several authors (Dattakumar and Jagadeesh, 2003, Amin and Nafeez, 2003) claim that academic benchmarking "*is not receiving much attention*". Nazarko et al. (2009) also highlighted that in the literature there is a lack of description of education benchmarking particularly about the outcomes of projects.

Even though benchmarking can help educational organisations discover opportunities for improvement that will give them a competitive advantage in their marketplaces, it does not address processes in details, i.e. it does not provide process descriptions. Processes are chosen based on performance indicators. However, measures may imply good performance and problems can still exist. Several authors described performance measures as rigid and lack flexibility to change. They highlight that measures can be difficult and

misleading, therefore, inconsistent with continuous improvement as they might provide false results (Anderson and McAdam, 2004, Nelson, 2005).

Organisations assess their strengths and weaknesses based on documentation of working process steps and practices (Juran and Godfrey, 1999). However, in this research, PQI documentation was totally different than the AS-IS modelled processes. The procedures imply different activities. Thus, if they are considered for defining strengths and weaknesses they would result in false indicators about performance.

Therefore, modelling the AS-IS processes based on interviews provides a description of the current state of processes and would in turn offer a better understanding of the activities carried out in reality. As a result, better improvement proposals can be identified.

The literature review also revealed a great number of benchmarking models describing the steps that should be carried out for performing the benchmarking process (Jetmarová, 2011, Andersen and Moen, 1999, Fong et al., 1998, Freytag and Hollensen, 2001, Yasin and Zimmerer, 1995, Longbottom, 2000, Andersen and Pettersen, 1996, Anand and Kodali, 2008, Nazarko et al., 2009).

Meek and Lee (2005) stressed that '*one must be careful that the development and implementation of performance measures for the purpose of benchmarking in higher education does not undermine the very responsiveness and quality that they may be intended to enhance*' (Meek and Lee, 2005). The reason for that is that there is no agreement concerning the establishment of classification criteria for performance indicators (Garcı´a-Aracil and Palomares-Montero, 2010)

There has been a difficulty in finding best practice reference/indicators for student journey processes. As stated by Stella and Woodhouse (2007) '*there is no indication of which institutions would be considered appropriate benchmark partners*.' They also declared that benchmarking is not considered effective if it depends only on gathering data and focusing on statistical comparison of numerical outcomes to identify best practice. Moreover, there is a focus on numbers to

highlight performance assessments instead of improvements (Garlick and Pryor, 2004, Stella and Woodhouse, 2007).

After identifying process issues through the developed models, there is a need to derive solutions for problems. The basic improvements suggested by the researcher are only solving those issues that were raised by the modelling. However, this might not lead to enhancing efficiency and effectiveness and achieving customer satisfaction. Undertaking benchmarking through applying best practice will complement the benefits of BPM in terms of adopting better improvements. Using the advantages of both approaches will lead to enhanced process improvements. Accordingly, it is expected that combining the benefits of modelling and benchmarking will overcome the shortcomings of both approaches.

7.3.2 Maturity Models

Maturity models can assist HEIs in evaluating their methods and processes in association with best practices (Garg, 2009). They can enable the identification of the maturity level of an organisation and facilitate the development of a plan for improving process capabilities (Duarte and Martins, 2013).

The Quality Management Maturity Grid (QMMG) was the first model developed by Crosby in 1979 to assess maturity. Its aim is help management and employees understand and plan for quality improvement. The QMMG consists of five levels of maturity - Uncertainty, Awakening, Enlightenment, Wisdom, and Certainty.

In the 1980s, the software process maturity concept was developed by the Software Engineering Institute (SEI) to assess the capability of US government software subcontractor organisations (Thompson, 1993). Therefore, process maturity models originally come from the software and IT area.

The most common maturity model is the Software Capability Maturity Model (SW-CMM) (Paulk et al., 1993). Paulk et al. (1993) defined maturity levels as "… *a well-defined evolutionary plateau toward achieving a mature software process. Each maturity level provides a layer in the foundation for continuous process improvement*."

While Duarte and Martins (2011) stated that maturity models are "… *evolutionary roadmaps to the implementation of certain practices that are vital for one or more areas of organisation's processes*."

Therefore, CMM is used to guide organisations in order to develop a path for improving their processes. Organisations identify their current state of maturity and prioritize improvements based on the five categories of the CMM. Thus, leading to continuous improvement which depends on undertaking small evolutionary improvements rather than radical innovations (Paulk et al., 1993).

Maturity models consist of five levels as shown in Table 16 (Humphrey, 1988). Each level provide a staging of processes for improvement across the organisation from maturity level 1 to maturity level 5 and offers a new ground of practices on which consequent levels are built (Persse, 2001).

Table 17: Capability Maturity Model Levels

1. Initial	The software process is characterized as ad hoc, and occasionally even chaotic. Few processes are defined, and success depends on individual effort.
2. Repeatable	Basic project management processes are established to track cost, schedule, and functionality. The necessary process discipline is in place to repeat earlier successes on projects with similar applications.
3. Defined	The software process for both management and engineering activities is documented, standardized, and integrated into a standard software process for the organisation. All projects use an approved, tailored version of the organisation's standard software process for developing and maintaining software.
4. Managed	Detailed measures of the software process and product quality are collected. Both the software process and products are quantitatively understood and controlled.
5. Optimizing	Continuous process improvement is enabled by quantitative feedback from the process and from piloting innovative ideas and technologies.

Source: (Humphrey, 1988)

Whilst the maturity model was initially developed for assessing software capability, various maturity models have been constructed based on the CMM in order to address other business needs. In the scope of higher education, Marshall and Mitchell (2002, 2005) address e-learning, Neuhauser (2004) online course design and Garg (2009) improving people practices in higher education while Thong et al. (2012a, 2012b, 2012c) addressed curriculum design.

Garg (2009) explored a Higher Education Capability Maturity Model (HE-CMMI) suitable for the education sector to improve people practices and education level processes. Also, Thong et al. (2012a) constructed a CDMM-1 model based on reviewing current CMMs related to curriculum design, the authors' experience and the literature analysis. Moreover, Baig et al. (2006) modified the basic process areas of CMM and translated them into a proposed E-CMM model.

The proposed or modified models in the educational field ignore other academic institution areas and focus only on isolated divisions or very explicit business area such as e-learning, curriculum design, improving people practices.

Furthermore, most of the suggested educational maturity models do not provide process areas and their related goals. In reviewing the literature there is also a lack of a comprehensive maturity model to support management and teaching practices that are present in academic institutions.

7.4 Fusion Method

This section discusses the proposed fusion method (Figure 44) for continuous improvement. Organisations may not be ready for undertaking major change or transformation of their processes. Therefore, Don and Dennis (2006) stress that organisations need to be more proactive while undertaking constant change.

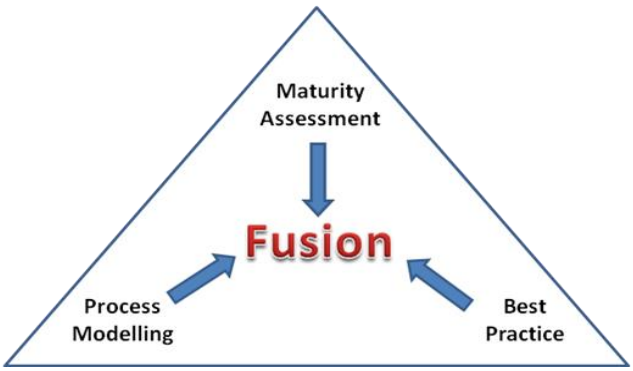


Figure 44: Initial Fusion Method

The Fusion Method aims to assist with this. The modelling approach facilitates detection of problems and enables institutions to continually analyse their processes for indications of current change in order to improve their performance. However, it does not help in coming up with the best improvement solutions.

This method will enable HEIs to have a development strategy that leads to continuous improvement, thus, being able to maintain high quality processes and in turn customer satisfaction. Figure 44 shows the initial proposed Fusion Method for HEIs. The combination of Process modelling, Maturity Assessment and Best Practice is expected to improve HEIs processes. The integration of the 3 methods merges the benefits, and compensates the limitation of each of them.

Process Modelling allows the understanding of the processes and discovering of existing problems or opportunities for improvement. Analysis of process models may also suggest specific changes, e.g., it might be clear where there are processes, which add little value, or where process efficiencies can be gained. However, uncovering issues, whilst helpful does not necessarily lead to what solutions might be adopted, particularly where there is a need to ultimately consider, perhaps sophisticated, IT systems as part of the change. In simple terms, the problem might be identified, but there is no clue how to fix it.

For this reason, adopting best practice will complement the modelling. Looking at the best practice in other institutions, or even other domains can provide an indication of the kinds of solutions that might be adopted. That is, one way to know what to do is to look at what is successful elsewhere.

As an aside, within software engineering, this idea of best practice has been developed well within the discipline and, through such initiatives as CMM, there is a good deal of guidance as to what particular practices are considered to be helpful. In contrast, there is little guidance of this nature within education, rather, as noted later, bodies such as the UK QAA tend to provide statements of intent

(indicators), at best they might be considered as requirements, and there is little to suggest how one might provide operational processes to meet such intention.

Hence, by combining process modelling and best practice it is possible both to identify problems and a range of possible solutions. However, an important consideration, and one which is clear from both the studies, is that suggested improvements, whether they be merely process improvements or suggestions for new systems, should be appropriate for the context, and fit within the organisational culture.

The contention is that in order to ensure that appropriate suggestions are made for process change, the fusion method should utilise these three pillars of process modelling, best practice and maturity.

7.5 Application of the Fusion Method

This section will illustrate the application of the fusion method. It provides and illustration of the admission, complaints and appeals processes.

7.5.1 Admission process

The following subsections highlight the indicators/principles for the admission and the complaint and appeal processes. These indicators are extracted from the code of practice of the Quality Assurance Agency (QAA) as well as other reports emphasising good practices for the processes.

Table 17 shows the indicators and principles of admission process according to the Quality Assurance Agency (QAA, 2006) UK Quality Code for Higher Education Chapter B2: Admissions and the principles of fair admissions, and the report prepared by Professor Steven Schwartz and his group: Fair Admissions to Higher Education: Recommendations for good practice (Schwartz, 2004). This report highlighted the need to have a source of knowledge that offers a guide for HEIs in providing quality in admissions.

The first two columns show the indicators and principles which provide a guideline for how to improve the admissions process; however, they do not give a concrete advice on how to measure efficiency and effectiveness. Nevertheless, the researcher uses them as guide to propose improvements to the admissions process at the Productivity and Quality Institute (PQI) in Egypt. The third column provides a suggestion that matches each principle/indicator to the maturity levels of CMM. Finally, the last column highlights the admission problems, as discovered from the AS-IS RADs models, in relevance with the mentioned indicators. For example: As emphasised by the first QAA indicator 1, institutions should have policies and procedures that are fair, clear and explicit and are implemented consistently. At PQI there is a documented procedure for the admission process, however, it is not implemented. Moreover, it needs to be more explicit and clear.

Table 18: Admission Indicators/Principles

QAA Indicators (QAA, 2006)	(Schwartz, 2004)	Indicators Maturity Level	PQI Egypt
Indicator 1: Institutions have policies and procedures for the recruitment and admission of students to higher education that are fair, clear and explicit and are **implemented consistently**.		3	• Procedures are available, however not implemented. Procedures need to be revised.
Indicator 2: Institutions' **decisions regarding admissions to higher education are made by those equipped** to make the required judgements and competent to undertake their roles and responsibilities.			
Indicator 3: Institutions' **promotional materials and activities are accurate, relevant, current, accessible** and provide information that will enable applicants to make informed decisions about their options.			

QAA Indicators (QAA, 2006)	(Schwartz, 2004)	Indicators Maturity Level	PQI Egypt
Indicator 4: Institutions' selection policies and procedures are clear and are followed fairly, courteously, consistently and expeditiously. **Transparent** entry requirements, both academic and non-academic, are used to underpin judgements made during the selection process for entry.	Principle 1: A fair admission system should be **transparent**	4	• No clear entry requirement. • No assessment criteria available (no interview or assessment)
Indicator 5: Institutions conduct their **admissions processes efficiently, effectively and courteously** according to fully documented operational procedures that are readily accessible to all those involved in the admissions process, both within and without the institution, applicants and their advisers.	Principle 5: Admissions system should be **professional** in every respect and underpinned by appropriate institutional structures and processes.	3	• There are no identification of responsibilities and authority. • Roles that are mentioned in the procedures do not exist in reality. • PAOs do all the jobs - no one is responsible for certain tasks. • Delays in processing applications.

QAA Indicators (QAA, 2006)	(Schwartz, 2004)	Indicators Maturity Level	PQI Egypt
Indicator 6: Institutions inform applicants of the obligations placed on prospective students at the time the offer of a place is made.	Principle 4: admissions system should seek to minimise barriers for applicants	3	• Students are not aware of their obligations. • There are no academic advising
Indicator 7: Institutions inform prospective students, at the earliest opportunity, **of any significant changes to a programme** made between the time the offer of a place is made and registration is completed, and that they are advised of the options available in the circumstances		3	• No clear communication of changes. • Website exists but not used to communicate graduate program information, especially in case of changes.
Indicator 8: Institutions explain to applicants who have accepted a place arrangements for the **enrolment, registration, induction and orientation of new students** and ensure that these arrangements promote efficient and effective integration of entrants fully as students.		3	• No consistent information related to the institution.

QAA Indicators (QAA, 2006)	(Schwartz, 2004)	Indicators Maturity Level	PQI Egypt
Indicator 9: Institutions consider the most effective and efficient arrangements for **providing feedback to applicants who have not been offered a place**.	Principle 2: Select students who are able to complete the course as judged by their achievements and their potential	3	• No feedback to applicants who are rejected. • Selection is only based on certificates/grades
Indicator 10: Institutions have policies and procedures in place for **responding to applicants' complaints** about the operation of their admissions process and ensure that all staff involved with admissions are familiar with the policies and procedures.		3	• Oral complaints. • No response to complaints
Indicator 11: Institutions have **policies in place for responding to applicants' appeals against the outcome** of a selection decision that make clear to all staff and applicants whether, and if so, on what grounds, any such appeals may be considered.		3	

QAA Indicators (QAA, 2006)	(Schwartz, 2004)	Indicators Maturity Level	PQI Egypt
Indicator 12: Institutions regularly **review** their policies and procedures related to student admissions to higher education to ensure that they continue to support the mission and strategic objectives of the institution, and that they remain current and valid in the light of changing circumstances.		4	• No review of admission procedures and criteria.

7.5.2 Complaint and appeal processes

Table 18 shows the indicators of complaint and appeal processes according to the Quality Assurance Agency (QAA, 2007) code of practice and the best practice guide of complaint and handling (Commonwealth-of-Australia, 2009).

The first two columns show the indicators and principles which provide a guideline for how to improve the complaint and appeal process; however also there is not concrete advice on how to measure efficiency and effectiveness. Nevertheless, the researcher uses them as guide to propose improvements to PQI complaint and appeal process. The third column shows a suggestion that matches each principle/indicator to the CMM. Finally, the last column highlights the complaint and appeal problems, as discovered from the AS-IS RADs models, in relevance with the mentioned indicators.

Table 19: Complaints and Appeals Indicators/Principles

QAA Indicators (QAA, 2007)	(Commonwealth-of-Australia, 2009)	Indicators Maturity Level	PQI Egypt
Indicator 1: Institutions have **fair, effective and timely procedures** for handling students' complaints and academic appeals. Indicator 2: Institutions' complaints and appeals procedures are approved and overseen at the highest level.	• Improve the agency's accountability and transparency • Seven stages in complaint handling should be described in internal procedures: - A complaint should be acknowledged promptly. - The complaint should be assessed and assigned priority. - If investigation is required, it should be planned. - The investigation should resolve factual issues and consider options for complaint • resolution. - The response to the complainant should be clear and informative. - If the complainant is not satisfied with the response, internal review of the decision should be offered and information about external review options should be provided. - Any systemic issues that arise as a result of the complaint should be considered and acted on.	3	• Complaint and Appeal written documentation that is not implemented.

QAA Indicators (QAA, 2007)	(Commonwealth-of-Australia, 2009)	Indicators Maturity Level	PQI Egypt
Indicator 3: Institutions ensure that those studying at all levels have the opportunity to raise matters of concern without risk of disadvantage. (the need for institutions to state who has access to their complaints and appeals procedures.)		3	• Complaint process dealt with on an ad-hoc basis. • Appeal process does not exist
Indicator 4: Institutions make **publicly available easily comprehensible information** on their complaints and appeals procedures.	• Reassure clients that the agency is committed to resolving problems, improving relations and building loyalty	3	
Indicator 5: Clear design of institutions' complaints and appeals procedures enables them to be conducted in a **timely, fair and reasonable manner**, and having regard to any applicable law.	• A complaint handling system must be modelled on principles of **fairness, accessibility, responsiveness and efficiency**	3	• Only oral complaints, most of them are ignored. • Students fear to appeal.

QAA Indicators (QAA, 2007)	(Commonwealth-of-Australia, 2009)	Indicators Maturity Level	PQI Egypt
Indicator 6: Institutions ensure that **appropriate action** is taken following a complaint or an appeal.	• The **staff** who handle complaints must be skilled in their role and have a positive attitude when dealing with complainants. • Responsibility for handling complaints should be allocated to staff who are identified, well trained and supervised.	3	• No staff for handling complaints
Indicator 7: Institutions satisfy themselves that appropriate guidance and support is available for persons making a complaint or an appeal, including those taking advantage of learning opportunities provided away from institutions and/or through flexible and distributed learning. (provide opportunities for those involved with a complaint or an appeal to seek informed and impartial advice and guidance.)		3	
Indicator 8: Institutions make provision in their procedures for those making a complaint or an appeal to be accompanied at any stage, including formal hearings.		3	

QAA Indicators (QAA, 2007)	(Commonwealth-of-Australia, 2009)	Indicators Maturity Level	PQI Egypt
Indicator 9: Institutions have effective arrangements to **monitor, evaluate and improve the effectiveness** of their complaints and appeals procedures and to reflect on their **outcomes for enhancement** purposes.	• All agencies should set both **qualitative and quantitative measures for assessing their complaint handling.** There should be regular reporting to the agency executive about the subject matter of complaints, how the complaints have been managed, and the steps taken to resolve systemic problems.	4	• No review of procedures • No assessments
Indicator 10: Institutions ensure that **suitable briefing and support** is provided for all staff and students involved in handling or supporting complaints and appeals.	• Staff should receive **effective supervision** and **regular feedback** about their work.	4	No complaint staff available

7.6 PQI Improvement Proposal

This section will show how the indicators/principles will be utilized to guide improvements at PQI. The researcher believes it is essential to categorize these indicators in terms of maturity levels, thus being able to introduce suitable step by step improvements. As a result, the institute will be able to move gradually towards the highest maturity level, thus being able to gain control over their processes and maintain continuous improvement.

7.6.1 Admission Process Proposed Improvements

The PQI admission process is considered at the 'Initial' level of the CMM. The admission processes were illustrated using the RADs models once according to the documented procedures and the other based on interview results. Thus, the models not only facilitated revealing areas for improvement but also showed that the admission process is neither carried out based on policies nor on documented procedures. As the CMM level describes, the success of the admission process depends on individual '*effort*' and '*heroics*' (Paulk et al., 1993).

In order to overcome the problems stated in Table 17 and be able to move to the next maturity level 'Repeatable', the institute should derive a policy to guide the admission process. Basic level documentation should exist. The admission process is stable and earlier success can be repeated.

Afterwards, aiming to reach the subsequent maturity level, the institute should start by generating an admission procedure. According to QAA indicator 1, this procedure should be '*fair, clear, explicit and are implemented consistently*'. Moreover, QAA indicator 4 as well as principle 1 in Schwartz's report (2004) imply that the procedures should be '*transparent*' and include all information about entry requirements. This in turn, would provide a guide for staff as well as students, as the procedures gives detailed information about roles, activities and interactions.

All staff involved in the admissions process will have clear and explicit defined roles and responsibilities (QAA indicator 3). The most important concern after generating the procedure is to ensure that it is clearly understood and implemented. Hence, assuring that the work is carried out depending on a defined process not based on individual's capabilities.

Accordingly, the admission process can be conducted efficiently and effectively according to a full documented operational process which is accessible to all those involved in the admission process (QAA indicator 5).

QAA indicator 6 as well as principle 4 highlight the importance of informing applicants of their obligations and seek to minimize barriers for applicants. At PQI there is no clear description of students' obligations. There is nothing to guide students of the actions they should follow. Moreover, the role of the Academic Advisor does not exist. It is also essential to keep applicants updated of any changes that may occur during the admission process (indicator 7). In order for PQI to convey timely information to prospective applicants, the researcher suggests that their website needs always to be up to date so it can be utilized to communicate any changes that might arise. Furthermore, all information concerning students' obligations, entry requirements, enrolment, registration, induction and orientation (indicator 8) can be clearly defined on the website. In addition, PQI should activate online admission, in order to facilitate the process for both international and national applicants.

Currently at PQI, they only contact students who are offered a place. Rejected students are not informed or given any feedback. QAA indicator 9, institutions should provide feedback to applicants who have been rejected. This can be achieved by identifying clear and defined acceptance criteria. Additionally, applicants should not be assessed based on their background or certificates. As stated by Schwartz (2004) "*applicants should be given an equal opportunity to provide relevant information or demonstrate relevant skills*."

It is important that the institute maintains policies and procedures for complaints and appeals (QAA Indicators 10 & 11), in order to be able to respond to admission appeals and complaints.

The researcher thinks that all the above mentioned indicators and principles will lead to upgrading the maturity of PQI to level 3 the 'Defined' level, which means that there will be a documented and defined process. The process capability of this level implies that the organisation has a defined process which is understood through the whole organisation (Paulk et al., 1993).

Finally, in order to achieve the next level, which is the 'Managed' level, the institute should set quantitative measures. The process capability of this level is characterized as 'predictable'(Paulk et al., 1993). By reviewing the policies and procedures as highlighted in QAA indicator 12, the institute can monitor retention rates, withdrawal and transfer, and reasons for non-completion, which in turn can give an indication of the effectiveness of the overall admissions procedures (QAA, 2006).

7.6.1.1 Admission Process Step-Driven Improvements

The following Table 19 summarizes the suggested improvements for the admission process. The Proposed enhancements are categorized according to the maturity level in order to guide the institute how to undertake gradual improvements. Step-driven improvements are expected to enable PQI to move step by step towards highest maturity levels. Thus, achieving continuous improvement.

Table 20: Admission Process Step-Driven Improvement

Indicator	Suggested Improvements	CMM level
-	Basic rules for admission process. A common infrastructure for quality is established. Basic level of documentation exists.	2
QAA 1-11 (QAA, 2006)	Prepare a clear and explicit procedure for admission process. The following section shows a proposed suggestion for the admission process: a. Students checks postgraduate entry requirements online (how	3

Indicator	Suggested Improvements	CMM level
	to apply and requested documents) b. Student has 2 options: i. Download a copy of the application, fill it in, prepare requested documents and mail it ore submit it to PQI. Application fees should be paid at the bank. The payment receipt should also be sent to PQI. ii. Complete online application, and then print the confirmation receipt. Pay application fees online and print payment receipt. Mail the confirmation receipt, payment receipt and the supporting documents to postgraduate department (PG). c. Application will not be processed until the confirmation and all supporting documents are received. In case of missing documents, PG contacts the applicant and requests additional information. d. When PG reaches a decision, students will receive one of the following: i. Unconditional offer – student has met all the entry requirements for the course and have been offered a place ii. Conditional offer – making an offer based on some conditions. Very often the offer is based on achievement in your current qualifications, such as obtaining an English Language qualification or equivalent iii. Rejection – application has been unsuccessful. e. Once an offer has been made, students should accept as soon as possible. Once accepted PG sends students a student ID. f. Students can track application progress at any time using the website. g. Train admission staff and make sure procedures are implemented consistently.	
QAA 12 (QAA, 2006)	• Set measures and collect data (for example: intake assessment measures, retention rates, withdrawal and transfer, reasons for non-completion) • Regular review of admission procedures to ensure their validity.	4
-	Continuously change process to improve quality by changing "*common causes*" of inefficiency to prevent defects from recurring. (SEI, 1993).	5

7.6.2 Complaints and Appeals Process Proposed Improvements

The PQI complaints and appeals processes are considered at the 'Initial' level of the CMM as well. The complaint and appeal processes were also illustrated using the RADs models once according to the documented procedures and the other based on interview.

According to the conducted interviews, respondents stated that "*..there is no formal*" complaint procedure while another highlighted that they only receive oral complaints from students and that there is "*..no rule to deal with complaints*". Moreover, students get no feedback to their complaints. Therefore, according to respondents' answers it is clear that the complaint process described in the procedure is not implemented. Furthermore, the existing Student Appeal procedure shows that it is very complicated and involves lots of roles. However, the response of the interview revealed that there is no student appeal process. Therefore, as highlighted by the CMM initial level, the process is described as '*ad hoc*' and the success of the processes depends on individual '*effort*' and '*heroics*' (Paulk et al., 1993).

In order to overcome the problems stated in Table 18 and be able to move to the next maturity level 'Repeatable', the institute should derive a policy to guide the complaints and appeals processes. Basic level documentation should exist. The complaints and appeals processes are stable and earlier success can be repeated. Afterwards, aiming to reach the subsequent maturity level, the institute should start by generating a complaint and appeal procedure. According to QAA indicator 1, institutions should have '*...fair, effective and timely procedures for handling students' complaints and academic appeals*' (QAA, 2007). Thus, maintaining an accessible and transparent complaint handling system that assist students to make complaints as well as provides staff with guidelines to resolve complaints as specified by QAA indicator 2 (QAA, 2007).

As stated in the Ombudsman (2006) publication complaints are considered as an opportunity for service improvement. Dissatisfied students convey their frustration to many other people. Therefore, problems that are promptly

resolved provide a reliable and supportive impression of the institution and facilitate the prevention of future customer dissatisfaction (Ombudsman, 2006). For this reason, as stated by QAA indicator 3, institutions should ensure that students always have the chance file a complaint or an appeal. In addition, as implied by QAA indicator 4, it is important to make complaints and appeals procedures available to those who are interested to know about them (QAA, 2007). PQI can convey timely information to students; the researcher suggests that a website/portal can be used. It is important to keep it up to date so it can be utilized to emphasize the complaints and appeals processes and facilitate submitting complaints and appeals.

In order to guarantee commitment in resolving problems, QAA indicator 5 and 6, state that institutions should assign skilled and trained staff to handle complaints and appeals. This will ensure that appropriate actions are taken to resolve any issues to the satisfaction of the customer (QAA, 2007).

The researcher thinks that all the above mentioned indicators and principles will lead to upgrading the maturity of PQI only to level 3 which is the 'Defined' level. The process capability of this level implies that the organisation has a defined process which is understood through the whole organisation (Paulk et al., 1993).

Finally, in order to upgrade to the next level, which is the 'Managed' level, the institute should set quantitative measures. The process capability of this level is characterized as 'predictable' (Paulk et al., 1993). PQI should maintain an effective monitoring and evaluation system for complaints and appeals (QAA, 2007). There should be qualitative and quantitative measures for assessing complaint and appeals handling. Staff responsible for handling complaints and appeals should also be closely supervised (QAA, 2007, Commonwealth-of-Australia, 2009).

7.6.2.1 Complaints & Appeals Step-Driven Improvements

The following Table 20 summarizes the suggested improvements for the complaints and appeals processes. The Proposed enhancements are categorized according to the maturity level in order to guide the institute how to undertake gradual improvements. Step-driven improvements are expected to enable PQI to move step by step towards highest maturity levels. Thus, achieving continuous improvement.

Table 21: Complaints and Appeals Process Step-Driven Improvement

Indicator	Suggested Improvements	CMM level
-	Basic rules for complaints and appeals process. A common infrastructure for quality is established. Basic level of documentation exists.	2
QAA 1-8 (QAA, 2007)	Prepare fair, effective and timely procedures for handling students' complaints and academic appeals **Suggested Appeals Process** a. Students enter their ID to log on to the system. Then they should complete the online appeal form. During the appeals process, students respond to a series of questions about their situation and states in writing why he/she is submitting an appeal. b. After submitting an appeal, a notification is sent to PG, who access the student appeal form and forwards it to the vice dean for postgraduate studies. c. The vice dean for postgraduate studies will attempt to resolve the appeal in consultation with the lecturer and make a decision about the request. Throughout the process, and once a decision is made, students can track the status of their appeal online. d. Students are informed of the final decision online. e. Students who are dissatisfied with the outcome of an appeal may complain using the student complaints process. **Suggested Complaint Process** a. In case of informal complaint (oral complaint), it must be drawn to the attention to PG immediately where possible and normally not later than five working days after the incident giving rise to the complaint in order that a complaint can be dealt with effectively and efficiently.	3

Indicator	Suggested Improvements	CMM level
	b. At this stage, the relevant member of staff will discuss the complaint with the student and the involved person, to determine whether it can be resolved without recourse to more formal procedures. c. There will normally be a written record of the outcome. d. If the student is not satisfied with the outcome he/she will complete the formal online complaint form online. e. The Complaints Form requires details of: the nature of the complaint; the informal steps taken to resolve it; a statement as to why the student remains dissatisfied; and the reasonable steps that the student would wish to see taken to resolve the matter. f. The PG are notified by the system. g. The complaint is passed to the Dean to deal with. h. The Dean of School or Head of Service will investigate the complaint and a written response is issued which will explain any actions to be taken to resolve the complaint or explain why it is considered that no action is necessary. i. Train admission staff and make sure procedures are implemented consistently.	
QAA 9-10 (QAA, 2007)	• Maintain an effective monitoring and evaluation system for complaints and appeals. • Set qualitative and quantitative measures for assessing complaint and appeals handling. • Staff responsible for handling complaints and appeals should also be closely supervised	4
-	Continuously change process to improve quality by changing "*common causes*" of inefficiency to prevent defects from recurring. (SEI, 1993).	5

7.7 Summary and Conclusion

The most interesting finding was that there are no defined best practices for HEIs. The QAA quality code includes indicators or principles to ensure HEI's show good intentions but do not state what HEIs should do in order to have improved processes. Those indicators/principles are considered as guidelines that institutions use in order to design processes in their own way in order to achieve better outcomes.

Therefore, there are no agreed practices that HEIs can undertake to improve their processes. There is also a lack of literature that describes agreed best practice. As an example, one of the first QQA indicator of the complaints and appeals processes state that procedures should be fair, effective and timely. How are fair, effective and timely measured, what is the expected outcome to successfully achieve them?

The researcher also discovered a lack of indicators/principles for most of the students' journey processes in the literature. Therefore, in order to adopt best practice for the whole students' journey processes, the step driven improvement concept will be applied as with the admission and appeals and complaints processes. Although no indicators/principles exist, improvements will be undertaken gradually, i.e. step by step based on the maturity level. Thus, ensuring regular enhancement of the processes until the highest maturity level is reached.

After applying the fusion method to both the admission and complaints processes, there is a question that needs to be investigated, what are the aspects that influence process improvement? Is it only maturity? What if best practice is not suitable for adoption? Therefore, there has been a need to further investigate the literature for other aspects that can affect improvement initiatives determine the suitability of the proposed improvement to the organisational context. The following Chapter 8 shows how the fusion was further developed to consider other important aspects.

Chapter 8

Revised Fusion Method

8.0 Introduction

The previous Chapter indicates that there is a need to further investigate other aspects that may have an effect on process improvement. Therefore, a further study focused on determining the aspects that may affect improvement initiatives with respect to organisational context.

8.1 Fusion Method Further Developed

The initial Fusion Method integrated 3 pillars, modelling, best practice and maturity. While the modelling pillar remains the same, maturity was changed to be organisational context and best practice to be alternative improvements. The reason for this is that organisational context is the higher level which includes various important aspects, such as culture, employee resistance, management commitment, resource and maturity. In addition, changing best practice to alternative improvements is because best practice is not always suitable. Some organisation may not be ready to undertake best practice, rather they need to move towards it. The following Figure 45 illustrated the revisited fusion method.

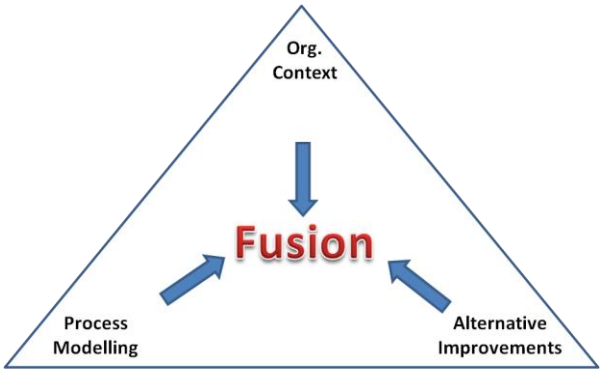


Figure 45: Revised Fusion Method

The mind map technique was used to brainstorm relative aspects between the pillars of the revised fusion method. Therefore, the main branches of the mind

map (see Appendix F) are modelling, alternative improvements and organisational context. Based on the literature and experience, every branch has been broken down into detail in order to investigate which aspects are involved.

The first branch identified the elements involved in modelling a process. First a process need to be identifies for investigation. Then data should be collected to gather more information about the process. After mapping the process, the model should be analysed in order to identify problem areas. The models can help in showing the process culture through the performance of individuals and processes. Also the legacy system can be identified through checking the system roles. In addition, resources can be identified through the roles involved in the process. Finally, maturity of the process can be estimated. (Further details are shown in section 8.2.1)

The improvement alternatives branch highlight various options that may help improve the process. The process can be directly fixed by removing redundant roles, eliminating non-value adding activities or reducing interactions. Another option is to automate the process by introducing new software applications, new hardware or mobile systems (Each sub branch is discussed in more details in section 8.2.2).

Finally, the organisational context which is divided into maturity, culture, resources and change management. The maturity branch shows that maturity has different levels and that it depends on people and process maturity, i.e. finding out the current maturity level in order to know which improvements are more suitable for an organisation (More details are illustrated in section 8.2.3).

The approach proved to be successful as it provides a holistic, overall picture showing various other aspects. Moreover, it revealed that the Fusion method was too low level and that the higher context needs to be considered. It showed various aspects that could possibly affect process improvement; therefore, there has been a need to modify the initial version of the fusion method. Furthermore, it provided an understanding of inter-relationships between different aspects of the as it shows the commonalities between them.

In order to summarize the mind map, Figure 46 was derived to show the common aspects and highlight the relation between modelling, organisational context, and alternative improvements. The Figure shows that the common aspects are culture, maturity, resources and legacy system. However, an interesting observation is that common aspects have different meanings to each pillar.

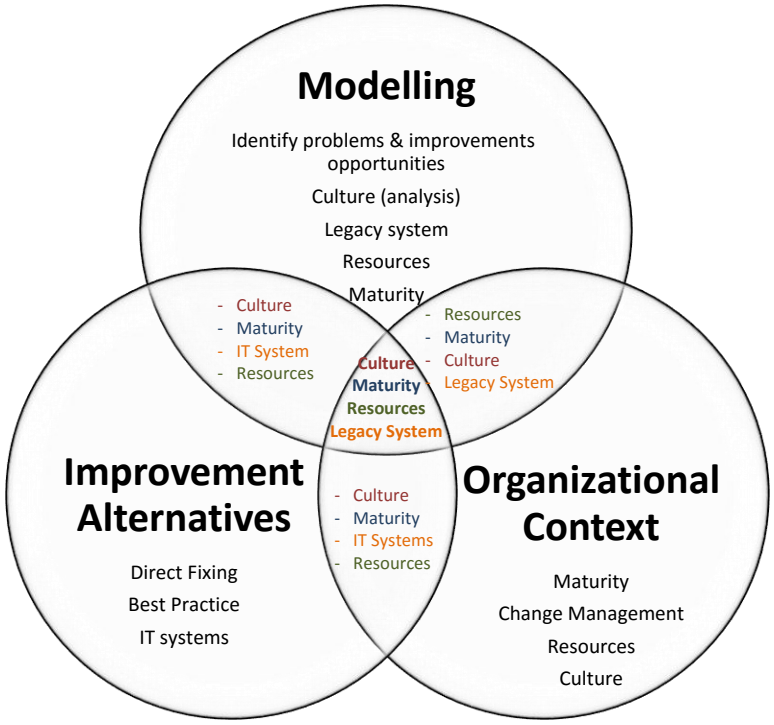


Figure 46: Common Aspects between Approaches

For example, culture under modelling shows the current process culture, however, under organisational context, culture may imply a barrier depending on readiness to change. Table 21 shows further examples of the different aspect meaning.

Table 22: Aspects Comparison

Aspects	Modelling	Organisational Context	Suggested Improvements
Culture	Driver	Barrier (Readiness to change)	Change Culture
Resources	Current (HR+IT)	Available (Fin+IT+HR+Time)	Required (Fin+IT+HR+Time)
Maturity	Current process level	Suitable/current capability	Suitable improvements
IT system	Legacy System	- Legacy System - Readiness to change	Suggested/improved IT

It is thought, however, that those aspects though having different meanings are the core aspects that affect process improvement.

As a result, Figure 47 was derived to illustrate a broader overview. The model is illustrated as a loop to imply continuous improvement. Applying the modelling and identifying the organisational context will aid in choosing suitable improvements amongst the various alternatives. This in turn will lead to making the appropriate improvement decision and achieve continuous improvement. However, this framework does not show how the method should be applied.

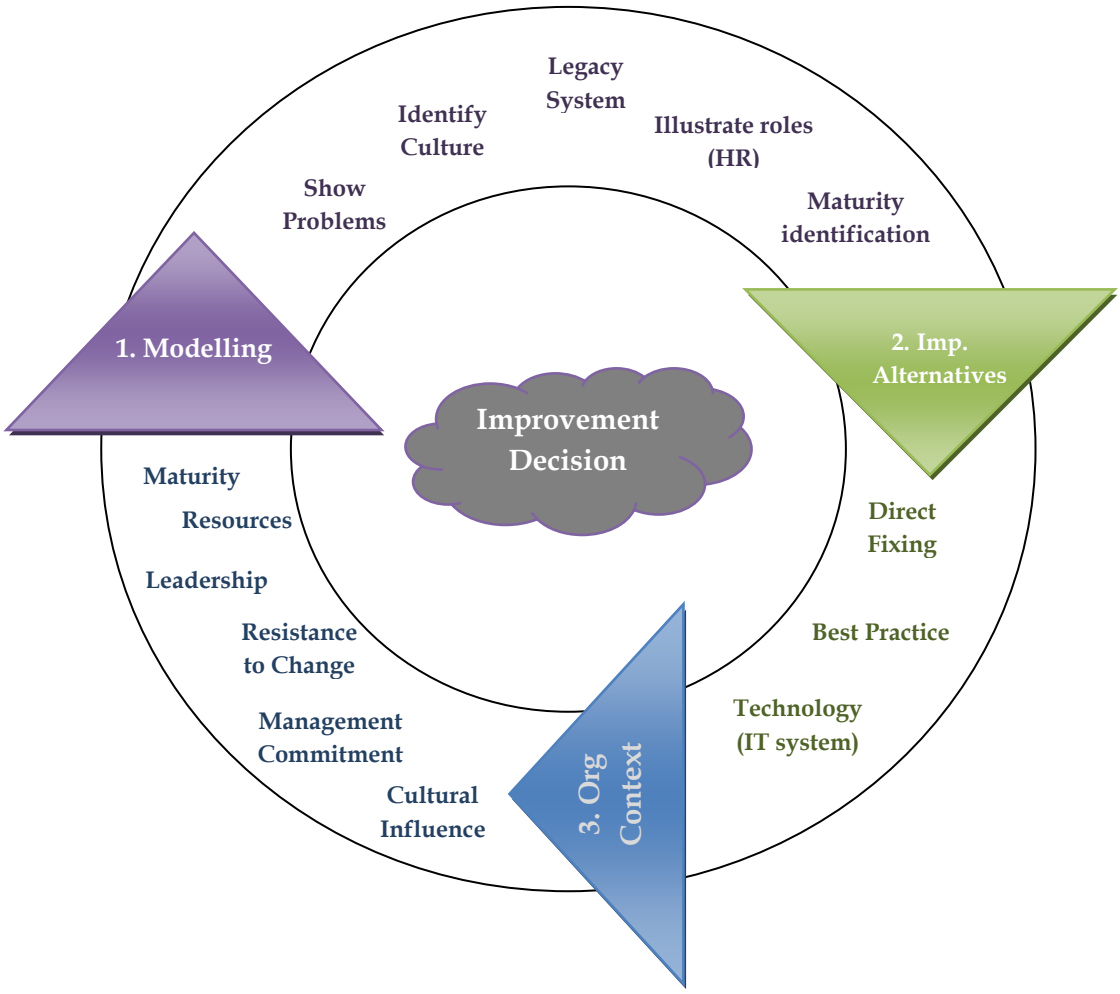


Figure 47: Continuous Improvement Decision

The final method was then developed based on the previous framework. Figure 48 illustrates various aspects that, when considered, will lead to the identification of suitable improvements and overcoming barriers to change.

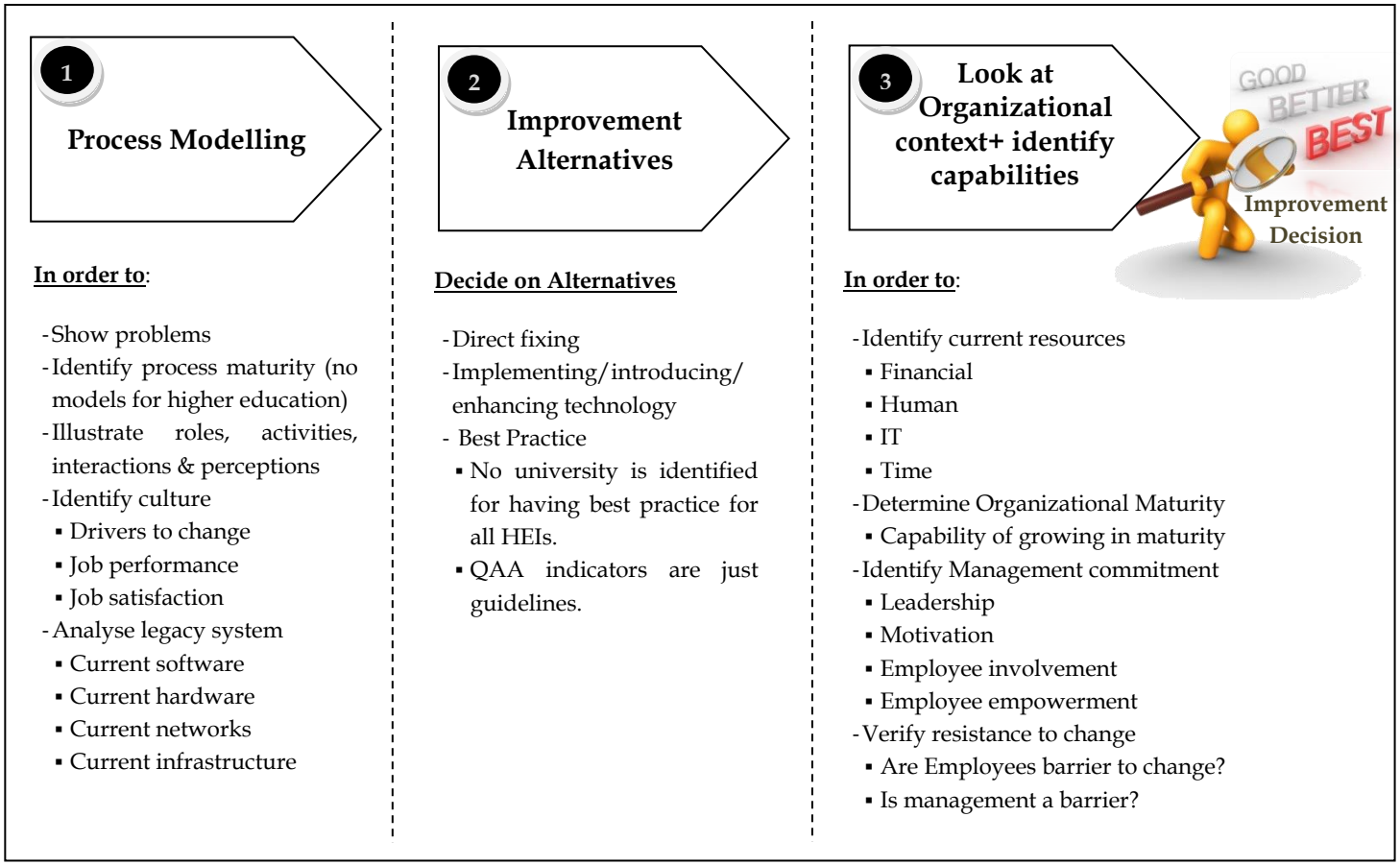


Figure 48: Revised Fusion Method (High Level)

8.2 Method Rational

This section presents a description of the process improvement method at a high level as shown in Figure 48. It will highlight the importance of each pillar and how those pillars complement each other to reach the suitable improvement decision.

8.2.1 Process Modelling

Srinivasan and Murthy (2010) stated that the aim of most organisations is to improve the quality of their processes in order to gain competitive advantage and that they fail to achieve their goal as they only focus on some business functions not the business processes as whole. They highlighted that it is essential to improve the whole business process in order to attain the required competitive edge.

The revised fusion method starts with process modelling, in order to provide a full understanding of the organisation's processes and allow the discovery of existing problems and opportunities for improvement. Therefore, it provides a complete understanding of business processes and thus facilitates achieving improvement goals.

As highlighted in the literature review in Section 3.3, various modelling techniques, sometimes integrated, are used to model business processes. Therefore, it is important to identify the purpose of the modelling techniques in order to choose the most suitable one for the identified scope. This research is undertaken in HEIs, which are mostly dependant on human driven processes. The researcher examined various modelling techniques that might fit this scope. Role Activity Diagrams and Rich Pictures, amongst many other techniques, were found the most suitable for the scope of this research. As a result, this study introduced an integrated RADs-RichPicture model which has proven to be successful in capturing higher educational processes.

First it is necessary to determine a process that needs improvement by looking for signs of process inefficiencies. Once the process is identified, the second step is to start collecting data about the process through conducting interviews and examining relevant written procedures in order to be able to model the AS-IS process.

The AS-IS model is then analysed to reveal problems and potential opportunities for improvement. However, uncovering issues, whilst helpful does not necessarily lead to knowing the solutions that might be adopted. Therefore, the problem may be recognized, but there is no suggestion how to fix it.

The modelling also will facilitate the identification of individual culture by showing how activities are carried out and how people/roles think and perceive their work. Imam et al. (2013) stated that the awareness of change and culture can lead to better performance. The RADs-RichPicture model provides process details as well as people's perception of their work. Therefore, modelling the processes provides greater awareness of possible changes as well as people's readiness to change.

Moreover, as the models provide an assessment of current practices, which is used to identify shortcomings and guide improvements. Thus mapping the process shows how it is performed in reality. In the case of student journey processes, all process sets were mapped twice as there has been a difference between the documented procedures and the applied ones.

Therefore, if the maturity level is assessed based on the documented procedure it would provide a fake estimate as it is not fully applied. Mapping the AS-IS process illustrated the process flows and how the activities are carried out and thus enables a real assessment of the maturity level. As a result, more realisable improvements could be identified and implemented to enhance the process. Finally, the modelling allows the analysis of the current legacy system; shown by system roles therefore, it shows how much the process relies on IT systems.

8.2.2 Possible Improvement Alternatives

The second phase is to look for a range of possible improvements. This may include straight forward solutions, IT systems or best practice.

- ***Direct Fixing***. This kind of improvement will consider straight forward solutions to current problems. It is expected that they will reduce processing time and enhance the efficiency of the process, without undertaking any radical changes. If there are redundant roles, they may be combined by moving activities between roles.

  Activities can be fixed by eliminating non value-added activities or increasing the number of concurrent activities. Finally, interactions can be reduced or automated.

- ***Introducing/Implementing/Enhancing an IT system***: The modelling will help in analysing the legacy system of a process in order to identify current software, hardware, networks and infrastructure. Thus being able to determine where they may enhance performance. As a result, it can facilitate introducing IT solutions that will help in enhancing processes and facilitating the provision of a better service thus achieving customer satisfaction. However, there are challenges associated with implementing IT-enabled change. As stated by Manzoni and Angehrn (1997) some of these challenges are based on adaption of technologies and others are related to the idea of change. From their point of view, process redesign entails changing working habits and threatens the existing social patterns.

  Technology is often used to facilitate improvement of organisational processes as it is considered vital for organisational change (Bayerl et al., 2013). However, it is important to consider the term Business-IT alignment, which implies applying IT in a suitable and well-timed manner, in synchronization with business strategies, goals and needs (Luftman, 2000, Leida Chen, 2010). Luftman (2000) states that it is important to align business functions and IT systems together. He added that identifying the maturity enables organisations to recognize improvement opportunities in harmony with their needs and capabilities.

- ***Best practice***: Another way to improve a process is to search for best practice in other institutions, or even other domains by exploring what is successful elsewhere. Otherwise look for indicators of best practice that are provided by quality agencies such as the Quality Assurance Agency for Higher Education (QAA).

  However, an interesting finding of the literature review is that there is a lack of sources describing best practice for HEIs in terms of action to be carried out, i.e. "What to do?". The documents that were cited include indicators or principles that show good intentions but not stating what HEIs should do in order to have improved processes. The QAA indicators/principles are considered as guidelines that institutions use in order to design processes in their own way in order to achieve better outcomes. There are no defined best practices for HEIs and no agreed practices that higher education can undertake to improve their processes.

8.2.3 Organisational Context

The final section of the revised fusion method is to look at the process context in order to identify an organisations' capability to change. Institutions have different needs and abilities when it comes to continuous improvement. Therefore, it is important to adapt improvement initiatives to the organisational context, considering maturity, available resources, and commitment to change. Improvements must be lead in the right direction, thus ensuring the adoption of the most suitable improvements and institutions should have a plan to move towards best practice.

A key aspect of the organisational context is the process *maturity* level. Determining maturity, or capability, provides two distinct advantages. First, as suggested above it allows contextualising the organisation and, therefore, choosing or adapting the suggestions for process changes, so that they will match the culture of the organisation.

Second, enabling the proposal of a series of steps towards further improvements, the equivalent of suggesting that the process will gradually improve, i.e. move from level one maturity to level two, before it jumps to three.

Another main aspect of organisational context is the organisations *culture* which is considered the way things are carried out (PMI, 2013). For the scope of this study culture will only be discussed in terms of employees' readiness to change as it has been considered as one of the most important factors that affect the success of organisational changes (Yuh-Shy, 2006).

Angehrn and Maxwell (2008) believe that the distinctive culture of HEI hinders rapid change and limits their readiness to change. Therefore, classifying the improvements based on the readiness of the institution will enable the institute to generate a plan for continuously enhancing processes.

As highlighted earlier in Table 21, culture is both a barrier as well as a driver to change. Although culture may be considered a barrier to change, the modelling process is expected to overcome this barrier by facilitating the understanding of the processes. Modelling the change will allow users to see the whole picture and the individual components in that process. They will be able to see their roles and thus be more comfortable that they will not lose their jobs as a result of change. Accordingly, employees and management will have a greater understanding of their working environment. This is turn is expected to prepare institution members to change.

Moreover, change management is important when undertaking improvements. (PMI, 2013) define change management as an inclusive, recurring and prearranged way for changing people, groups and organisations from an existing state to an improved state. Change can be either due to external sources through technological advances, social, political or economic pressures, or it can arise due to internal sources as a management response to a range of concerns (PMI, 2013, QueenslandGovernment, 2012).

Irrespective of the way the change originates, people need to understand the benefits of change in order to be able to contribute to its success. In order to avoid resistance to change, the revised fusion method through the step driven improvement (see section 7.5.1.1. and 7.5.2.1) is expected to control the employee resistance. Having a long term improvement plan will facilitate providing an explanation regarding the rationale and details of the change.

In addition, management commitment to change is important. The literature highlights the importance of leadership and employee involvement in the change plan as it will help in undertaking improvement initiatives (PMI, 2013, Diefenbach, 2007, Abbas and Asghar, 2010).

Therefore, the revised fusion method provides a mechanism/methodology how the change will be managed based on the identification of existing problems and the organisational needs and capabilities through matching the suggested improvements to the organisational context.

Organisations should also be aware of their resources in order to be able to plan for change. Resources like technology, people, or financial are valuable to organisations, therefore they need to be allocated effectively. Again the importance of the modelling arises here as it can help in illustrating the current human resources as well as IT/legacy system. Being aware of the available resources will facilitate its management and allocation, thus leading to undertaking suitable improvements.

Finally, finding out issues and problems using the modelling techniques introduce managers and employees to the problems they are facing. Although the modelling does not help in finding out solutions to the discovered problems or provide suggestions for improvement, understanding the current state of the organisation helps in figuring out the most appropriate changes needed. Thus, having a clear and full understanding will make it easy for employees to understand how the fixing of these changes will facilitate their jobs rather than harm them by any means. Moreover, it guides institutions towards the suitable

change plans through the identification of the maturity level which helps in categorizing various improvement alternatives. As a result, organisations will attempt to move step by step from their current states in order to upgrade to better work practices.

8.3 How the method works

The following Table 22 shows how the method works by introducing its steps and providing a description of how each step would be implemented. It also presents the expected deliverables of each step.

Table 23: How the method works

1. Process Modelling		
Steps	**Description**	**Deliverables**
1.1 Identify Process for improvement	1.1.1 Look for signs of inefficiencies such as: - Student/Staff complaints - Student/Staff dissatisfaction	Process that needs improvement
1.2 Collect Data	1.2.1 Conduct interviews with key process participants - Ask what they do and how they do it. - Find out what information and other inputs are needed to perform each task. - Identify the deliverables of each task. 1.2.2 Examine process documented procedures 1.2.3 Observe the process (if possible)	Process data
1.3 Model AS-IS process	1.3.1 Derive the process models based on gathered data from various sources	Set of illustration models of the AS-IS process
1.4 Analyse As-IS process	1.4.1 Look for inconsistencies such as: redundant roles, non-value added activities. Identify maturity through examining how work is undertaken 1.4.2 Determine process culture: SSM bubbles will help in showing how people perceive their work. 1.4.3 Identify resources: such as human resources, shown as roles. Are there sufficient process resources? 1.4.4 Is there a need for more resources to improve the process? 1.4.5 Analyse legacy system: illustrated as system roles.	Document identified problems, opportunities for improvement, culture, resources

2. Improvement Alternatives		
2.1 Direct Fixing	2.1.1 Are there straight forward solutions to current problems? 2.1.2 This fixing is an initial direct solution for problems and should start right after identifying issues/inconsistencies.	Straight forward options for fixing the problems such as trying to eliminate inconsistencies
2.2 Technology	2.2.1 Investigate various IT solutions to enhance/introduce IT systems	A range of IT options that can be applied to the process
2.3 Best Practice	2.3.1 Search for best practices where similar processes exist in order to improve processes.	Best practice processes.
3. Organisational Context		
3.1 Identify organisational Maturity Level	The common way to identify organisational maturity is to undertake an assessment which is conducted through a questionnaire. However, reviewing the literature revealed that all available questionnaires are software oriented. No assessment method has been derived for higher education or even business organisations for evaluating the maturity level.	Current maturity level
3.2 Determine Organisational Culture	3.2.1 Are managers and employees ready to change? 3.2.2 Use a scale to identify resistance to change - Resistance to Change Scale (RTC) (Oreg, 2003) - The Change Resistance Scale (CRS)	Organisational readiness to change

3.3 Identify Current resources	3.3.1 Investigate current organisational resources. - Identify organisational financial, human, IT and time resources. - Are there sufficient resources to implement change? - Try to reallocate resources effectively for example reassign activities, add roles or merge them. - Is there a need for more resources?	List of available resources and required resources to improve.
3.4 Management Commitment	3.4.1 Identify current management commitment - Are they willing to improve processes? - Are Leaders ready to change? 3.4.2 Effective communication – managers should share their ideas of change with all levels in order to make them aware of the objective and purpose of change. Thus, gaining their support for the change. 3.4.3 Empower employees – allow employees to take improvement decisions within their function's responsibility. 3.4.4 Employees' involvement – employees need to identify and clarify the need for change and participate in the change planning. Highlight the importance and benefits of change to employees. (this can be done by comparing AS-IS and suggested TO-BE models). Show how improvements would benefit them in the first place.	- Managers commitment to change - Communication within the organisations - Employee involvement

8.4 Method Implementation Guide

After providing a detailed description of the method rational, the researcher thought that it would be useful to introduce a summarized version that can serve as a guide for users/ managers. Figure 49 illustrates a summary of the process improvement method. It describes three phases, which provide a continuous iterative process of the steps necessary for process improvement. It offers process improvement managers with a generic description of a sequence of recommended steps for implementing the method. Full details are given in Table 22.

The first stage to start the improvement process is to model the process. The user at this stage needs to identify a process for improvement. Afterwards, start to collect data by interviewing people who actually work on the processes, look at relative documentation and observation. Subsequently, the user can start modelling the AS-IS process including all collected information. The final step in the modelling process is to analyse the AS-IS Model in order to identify problem areas, determine process maturity, analyse any legacy system, identify culture, and possible areas for improvement. As highlighted previously, even though modelling the process is the base of this method as it reveals all process issues and may highlight areas for improvement, however, it does not help in finding suitable improvements for a process.

Users/managers need then to consider a range of possible improvements. Improvements may be only direct fixing, introduction/adoption/ implementation of new technology or seeking best practice. Based on the identified problems and organisational context the most appropriate improvement should be undertaken.

The final phase is to look at the organisational context in order to identify capability to change. It is important at this stage to identify the available resources in order to be able to effectively allocate them. Also, determine organisational maturity identify its capability to change. In addition, identify organisational culture and management and employee commitment to change.

Are managers and employees ready to change? Would they form a barrier to change? Employees who are conscious of the business processes within their organisation, who are motivated to undertake their job, and who share lessons learned among business processes will be less resistant change.

Finally, after deciding on improvement alternatives, it should be implemented to the process and a TO-BE model should be derived. This model will serve as the AS-IS model and the improvement process starts all over again. Therefore, it is an iterative process that is expected to guide continuous improvement in organisations.

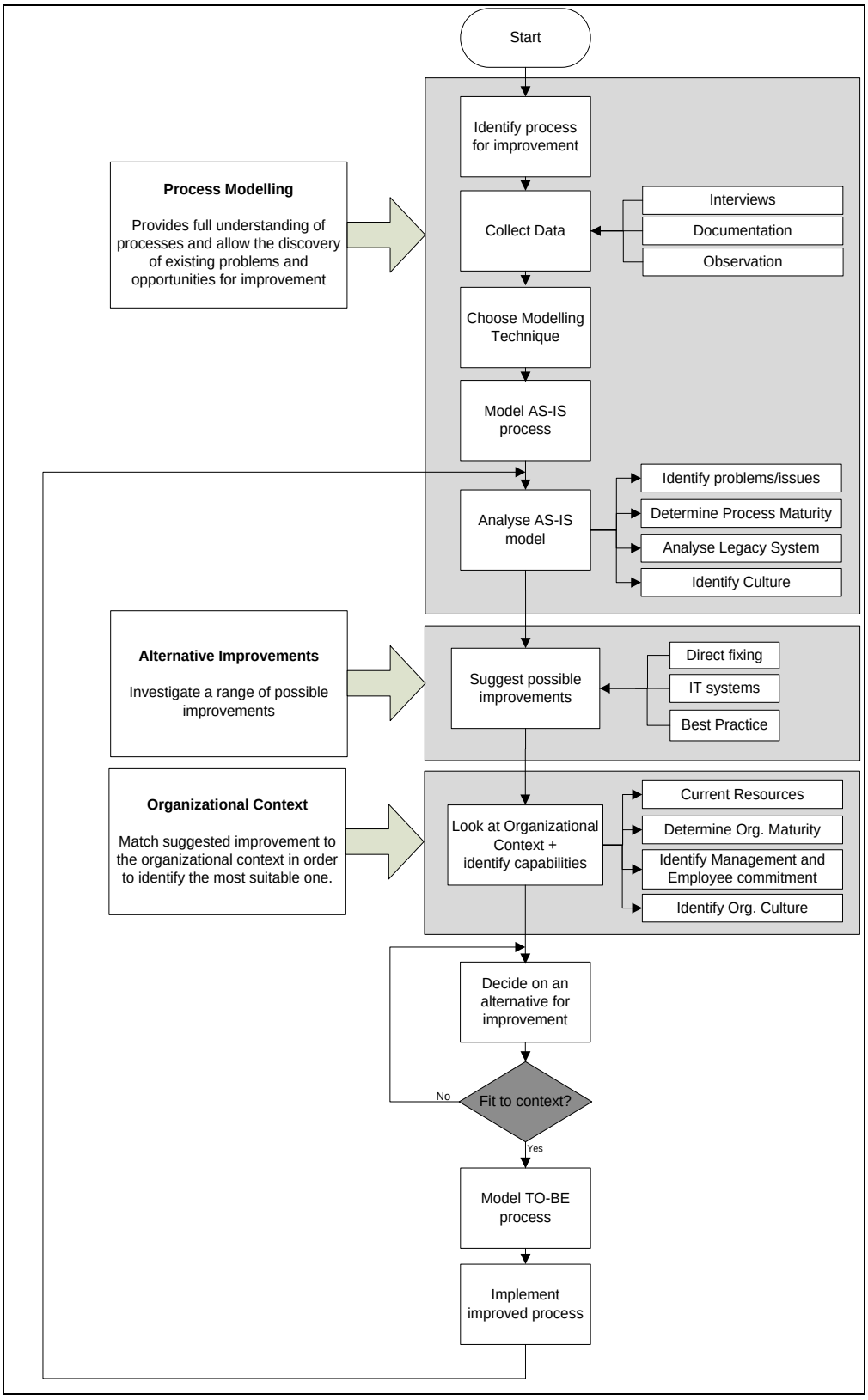


Figure 49: Summarized Fusion Method

8.5 Summary

This chapter further investigates the aspects that may affect process improvement initiatives. The mind map approach was used to break down each of the revised fusion method pillars into details. Therefore, the three main branches of the mind map are process modelling, improvement alternatives and organisational context. This approach was useful in showing more in depth details of each main branch and thus enabled the researcher to correlate all the aspects.

As a result, the revised fusion method was further developed to provide a higher level of detail and scope. Section 8.3 illustrates the steps of the method in details. Finally, a summarised implementation guide is presented to help users/managers in implementing the method.

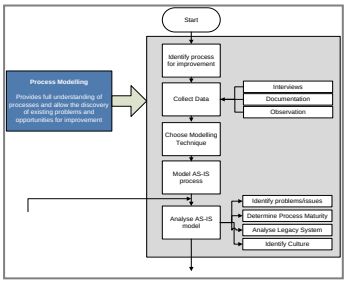
The next chapter will illustrate the implementation of the revised fusion method it in order to verify its steps and validate its capability of improving HEI processes.

Chapter 9
Revised Fusion Method Implementation

9.0 Introduction

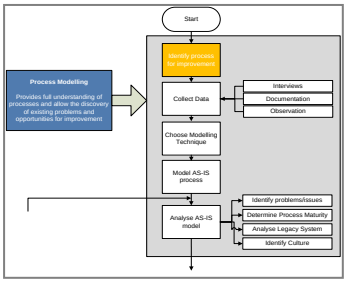
This chapter illustrates the implementation the fusion method to the FYP process in order to investigate its validity. As part of the final year at the Faculty of Science and Technology (FST) at Bournemouth University (BU), and in partial fulfilment of graduation requirements, undergraduate students in the Department need to carry out a Final Year Project (FYP).

9.1 Process Modelling



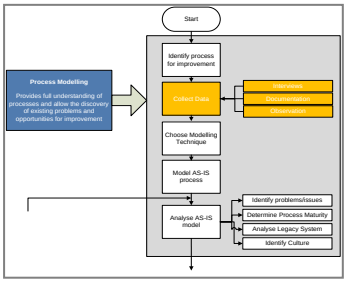
The first step of the improvement method is to model the AS-IS process. The following subsection will show how the FYP process is modelled in order to provide full understanding of the process and allow for the discovery of existing problems and opportunities for improvement.

9.1.1 Identify Process for Improvement



The BU-FYP process was chosen as project tutor highlighted that there are difficulties in managing the process and especially in allocating supervisors to students and scheduling.

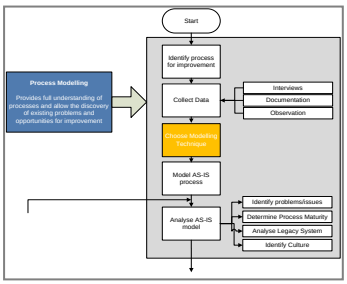
9.1.2 Collect Data



After identifying the process for improvement, the next step is to start collecting data about the process. In this study, the process handbook was considered as well as conducting a semi-structured interview with the Project Tutor. The reason

for selecting this method is to collect detailed data about the process and identify the project tutor's perception of the process. However, most of the data was gained through the interview as the handbook only provides high level of details about the process. It provides deadlines for students as well as details about the report structure not how the process is undertaken.

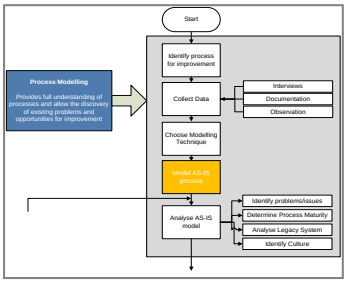
9.1.3 Choose Modelling Technique



As highlighted in the literature review in section 3.3, various modelling techniques exist to model business processes. However, it is essential to identify the modelling techniques' purpose in order to be able to choose the most suitable one for the identified scope.

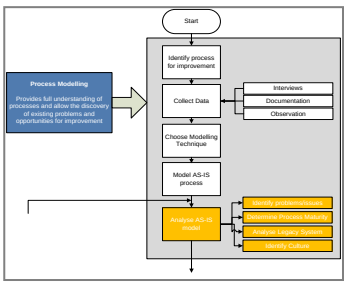
In this research various process models were examined to fit the scope of this study which is undertaken in HEIs, which are mostly dependant on human driven processes. RADs and RichPicture, amongst many other techniques, were found the most suitable the scope of this research. As a result, the integrated RADs-RichPicture model which has proven to be successful in capturing higher educational processes will be used to capture the FYP process.

9.1.4 Model AS-IS process



The process was then modelled using the RADs- RichPicture integrated model. Appendix G illustrates the FYP process. It shows the roles involved in the process, the activities that are carried out and the interactions between them.

9.1.5 AS-IS process Analysis



Afterwards, the process is analysed to identify problems and improvement possibilities as well as process maturity, analyse legacy system and culture identification. The following section shows the findings of the models.

a. Problems and Issues

1. The model shows that students become aware of the project process only shortly (6 months in advance) before the start of the final year (Figure 50). One problem is that some don't have enough time to pick a project topic. Therefore, some students may have delays to their start on their FYP.

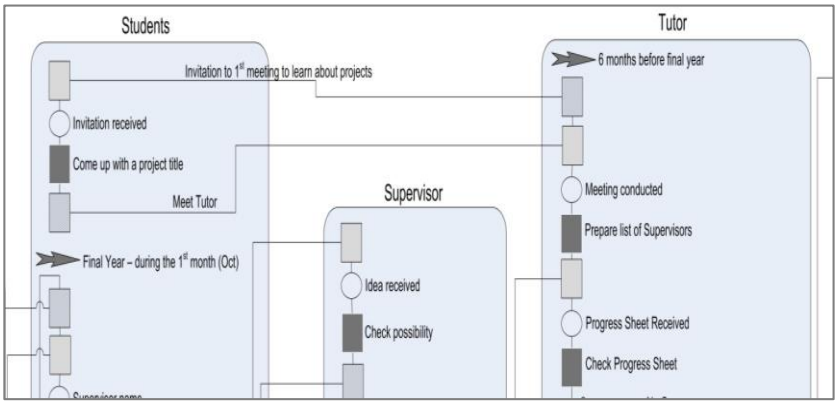


Figure 50: Problem 1

2. Figure 51 shows that students are responsible for choosing their supervisors on their own. There is no control on supervisors' selection which results in an unfair allocation of students to the number of available supervisors.

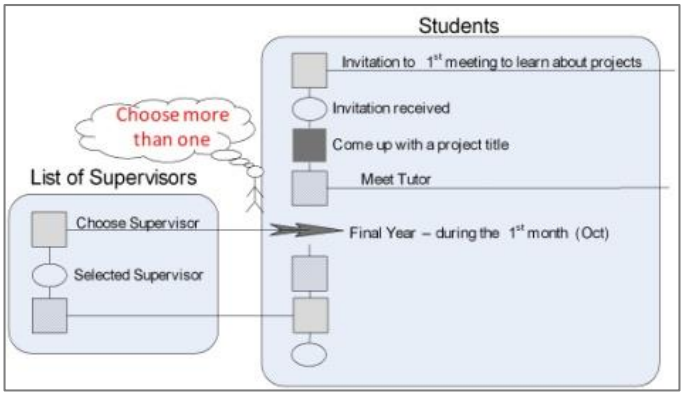


Figure 51: Problem 2

3. The model shows some supervisors are overloaded and some have few students and others are free (Figure 52) As a result, there is an unfair allocation of students to the number of available supervisors.

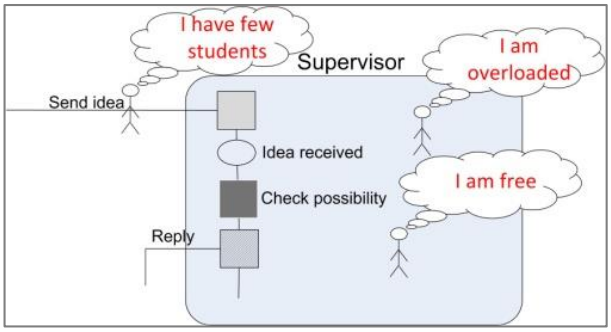


Figure 52: Problem 3

4. The project tutor has to manually prepare the supervisors, students and project titles list (Figure 53)

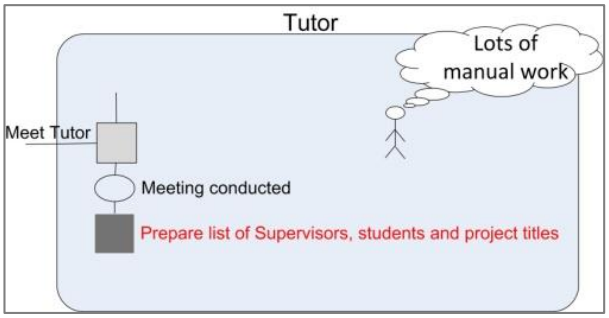


Figure 53: Problem 4

5. Figure 54 shows that the Project tutor also makes sure that each student is allocated a supervisor. Any student with no supervisor will have a supervisor assigned; that supervisor will assign a topic if the student has not already identified one.

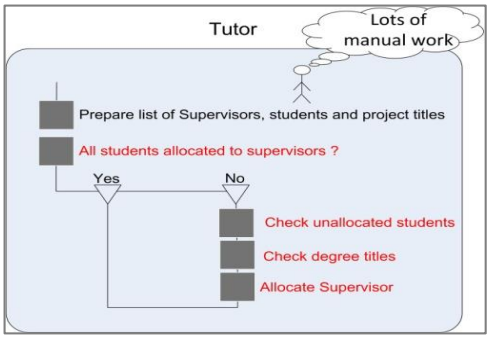


Figure 54: Problem 5

6. No follow up on weekly meetings (Figure 55). There is no follow up on students' for regularly attending weekly meetings.

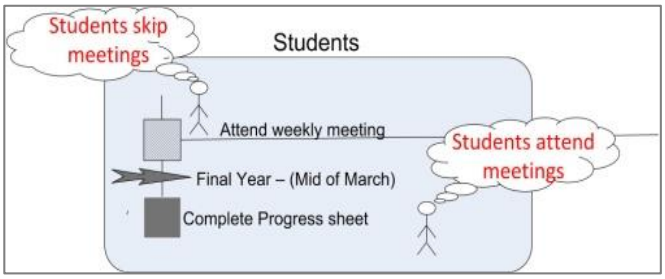


Figure 55: Problem 6

7. Half way through their projects, students fill in a progress sheet which is signed off by their supervisors (Figure 56). Afterwards, the sheet is sent to the project tutor for follow up. This process is also paper based.

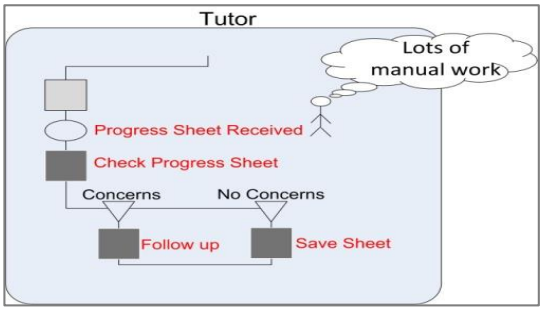


Figure 56: Problem 7

8. Figure 57 illustrates that students submit 2 copies of their project to the admin staff who ticks off the project in a list and orders the projects in alphabetical order. Afterwards the projects are sent in cardboard boxes to the project tutor.

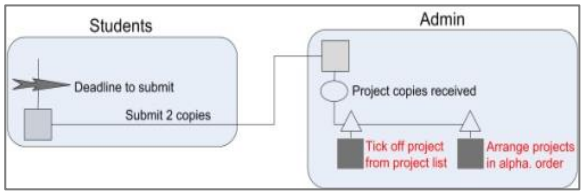


Figure 57: Problem 8

9. Students have a 30 minute project defence. For scheduling (Figure 58), the project tutor has to allocate rooms, time slots, supervisors and finally produce a time table. This process is undertaken using a spreadsheet.

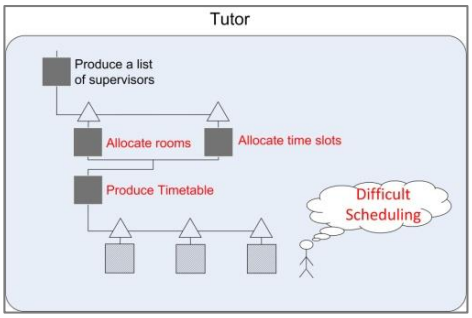


Figure 58: Problem 9

10. Figure 59 shows that supervisors mark the projects and enter the marks on a marking sheet then pass it on to the project tutor. The project tutor enters the marks in a spreadsheet in order to issue the results.

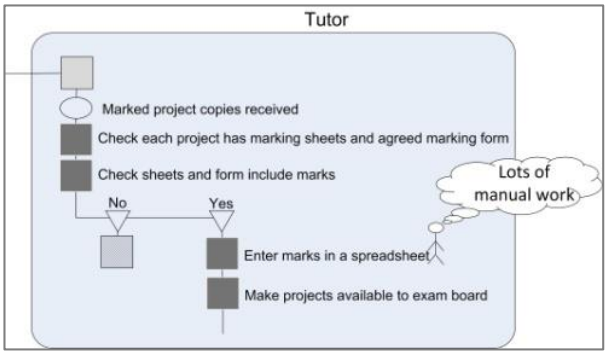


Figure 59: Problem 10

As realized from the model analysis the project tutor mainly carries out a lot of manual admin activities and has to follow up the whole process. Having identified the problems and issues of the FYP process, the next step is to assess the process maturity.

b. Process Maturity

This section will show the maturity assessment of the FYP process. The FYP process handbook only provides a high level detail of the process. It mainly

contains information about important deadlines as well as the structure of the proposal and the project report and the assessment criteria. Hence, it only presents a basic outline of the process; it does not show the process steps in details, such as, process activities, roles and interactions. As a result, it has been important to interview the project tutor to gather more detailed data and also know their perspective about the process; thus, being able to illustrate a detailed and complete process model.

After examining the handbook and the models the maturity level for BU process is estimated from two different perspectives which are students and staff. From the students' perspective the maturity level can be assessed between ad hoc and repeatable. Although the handbook serves as a guide to students it does not show them the process procedure. It only provides general guidelines on how to conduct their projects. It is the project tutor's main role to guide students thorough their project journey. Therefore, the process depends on the project tutor's effort

Also the project tutor believes that the handbook does not highlight certain procedures to follow in order to undertake the administrative part of the process, i.e. there is no established or official way of doing something. Therefore, the project process from the staff perspective may be also considered between ad hoc and repeatable. According to the Capability Maturity Model (Table 16), the success of the process depends on the project tutor's effort (ad hoc) and on earlier success in undertaking the process (repeatable).

Whenever the project tutor changes there is no written procedure to follow. Every project tutor manages the process based on previous experience. For example, during the interview the project tutor stated that a previous project tutor managed the process using minimal IT system. However, when the tutor left, the IT system was no longer available. The available project tutor managed the process in a different way.

Defining the process will synchronize its activities and make it more efficient and easier to manage even if the project tutor changes. It would also serve as a system for students and supervisors.

c. Legacy System

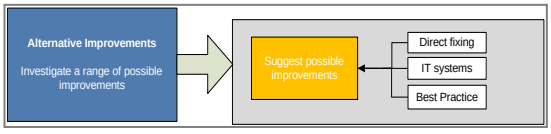
On analysing the models, it is apparent from the roles that there are no system roles involved in the FYP process. The process is carried out manually; there is only minimal use of IT system. For example, accessing the list of supervisors and accessing the ethical form. Otherwise the project tutor undertakes most of the activities manually, like preparing the list of student-supervisors, reviewing marking sheets and enter marks on a spreadsheet.

d. Culture Identification

Introducing improvements may require change in employees' values and beliefs and in the way they perform these values and beliefs. The interviewed project tutor stated that there is a need to improve the process in order to facilitate efficiency in the job. The models show that the project tutor is overloaded by lots of manual activities and follow ups.

As a result, it is expected that the project tutor will not oppose to process change in other words resistance to change will be minimal on the side of the project tutor. However, there may be resistance on the side of other parties involved in the process, such as supervisors or students. The reason for that is that supervisors may not be willing to change their work style or the way they carry out their jobs. For example, entering marks online instead of manually, as supervisors used to just fill in the marking sheets and then the project tutor enters the marks in a spreadsheet. Whereas the project tutor may embrace the notion of change and actively seek it out, supervisors and students may tend to avoid it when possible and to resist it otherwise.

9.2 Improvement Alternatives



The next step of the method is to investigate alternative improvements. The following subsections introduce proposed improvement alternatives for the

identified problems and issues. As illustrated previously in section 8.2.2, improvements can range from straightforward direct fixing to more sophisticated improvement proposals or best practice. Therefore, it is important to categorize the improvements in relation to the organisational context. The following Table 23 illustrates the identified issues and problems of the FYP process and the list of possible solutions. The straightforward solutions are marked as potential solutions in the third column of the table whereas the suggested IT improvements are marked as IT solutions.

Table 24: List of Improvement Solutions

No	Problems/Issues	List of Solutions	Derived From
1	Students become aware of the project process only shortly (6 months in advance) before the start of the final year.	The researcher suggests that students should be made aware of the project process earlier, for example by the end of their second year. This may offer them more chance to decide on a suitable topic.	Potential Solution
		At the end of the second year, make useful information/guidelines of the FYP available online and students should be encouraged to access that information before the first meeting.	IT solution based on best practice
		Create an online list of topics to show some project ideas	IT solution based on best practice
2	Students are responsible for choosing their supervisors on their own.	Supervisor/students will inform the project tutor when they agree to supervise a student.	Potential Solution
		Create a supervisors' **database**, which includes list of available supervisors.	IT solution based on best practice
3	The model shows some supervisors are overloaded and some have few students and others are free	The project tutor keeps a record of allocated supervisors, thus being able to control the supervisors' load in order to prevent overload.	Handbook
		Apply a maximum load restriction rule **online**.	IT solution based on best practice
4	The tutor	Retrieve **online** lists of supervisors, students	IT solution

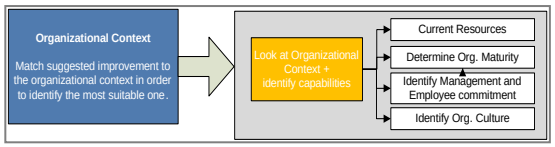
	manually prepares supervisors, students and project title list.	and project titles.	
5	The Project tutor also makes sure that each student is allocated a supervisor.	Project tutor monitors the allocation process **online**.	IT solution
6	No follow up on weekly meetings	Supervisors tick off an attendance list upon students' attendance, which indicates students' commitment and preserves universities right in case of appeals.	Potential Solution
		Whenever students attend their meetings their supervisors should tick off an **online** registry	IT solution
7	Progress Sheets	Students need to fill in the progress sheet form online and send it to their supervisor, who revises it and signs it off electronically. The system alerts the project tutor of progress sheet submissions.	IT solution
8	Admin staff help project tutor	The project tutor or admin ticks off online in order to confirm receipt of project copies. Project copies are kept in alphabetical order in the storage room.	IT solution
9	Demo Scheduling	Automate the time table process. Project tutor retrieves a list including first and second supervisors as well as students' name and project title of the system. Afterwards allocate a set of rooms and prepare a timetable to assign students to rooms and time slots.	IT solution based on best practice
10	Marking System	After assessing the projects, marks are entered on the system for each student by markers. The project tutor does not have to enter the marks manually for the whole students' group. It can be recalled easily from the system.	IT solution

In an attempt to find best practices for the final year project process, no standards or guidelines could be found in the literature. As previously described, even the indicators available for some processes are considered requirements and there is little to suggest how one might provide operational processes to meet such intention. There is little guidance of this nature within education, rather, as we will note later, bodies such as the UK QAA tend to provide statements of intent (indicators). At best they may be considered as requirements, and there is little to suggest how one might provide operational processes to meet such intention.

Therefore, the limitation here is the difficulty in finding other institutions or domains that can provide an indication of possible solutions. As a result, Universities need to agree on indicators and guidelines/standards that would assist in seeking benchmarks by developing a strategy for establishing benchmarking relationships with appropriate/international universities. Moreover, considering the outcome of the process models in identifying possible areas for improvement would enhance the selection of the benchmark. Finally, the analysis (in Section 9.1.5) of the FYP AS-IS model illustrates the issues that needs to be improved. Accordingly, a set of possible solutions were proposed in Section 9.2

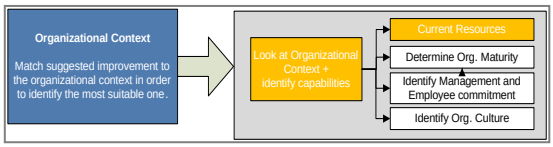
As previously discussed in section 7.1, best practice is learning from the experience of others in order to find the best way to undertake processes. After checking the alternative improvements, the IT enhancement proposal is expected to be suitable for improving the FYP process. The reason for that is that BU carries out most of their activities, such as learning, assessment, and administrative bits like admissions and registration, depending on an IT system, therefore, it is expected that replicating the university's success for automating the FYP process will enhance its efficiency and effectiveness. The following section will investigate BU context in order to identify the suitability of the suggested solutions.

9.3 Organisational Context



As shown in Figure 49 examining the organisational context is the last step of the improvement method. The BU context is examined starting with resources, determining organisational maturity to identify its capability to change, identifying organisational culture and management and employee commitment to change.

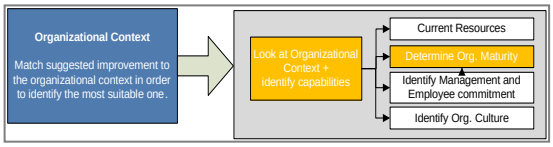
9.3.1 Resources



Section 9.2 shows the suggested solutions to improve the FYP process. The IT system was chosen in order to improve the FYP process and therefore it is essential to consider the resource availability and its allocation.

As observed and as shown on the university's website, the main infrastructure for building a system is available at BU since most of their activities depend on IT systems. Also BU is applying the Virtual Learning Environment (VLE), through which students can access course information and announcements, participate in learning communities and access other BU resources. Therefore, creating a new webpage is not expected to cause any problem in terms of resource availability and allocation.

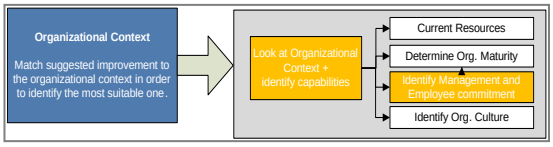
9.3.2 Organisational Maturity



For the scope of this research the FYP process was analysed in isolation. However, the environment around the process encourages process changes. As shown on the BU website the university has a quality assurance scheme and is keen on the development and maintenance of the system and processes of academic quality assurance and for facilitating quality enhancement throughout the University.

Therefore, the proposed suggestions are expected to be accepted for implementation as it would be aligned with BU strategy of enhancing process quality. Furthermore, as stated in the previous section, BU applies the VLE, which hosts online communities and resources for both staff and students. For this reason, BU is ready and capable to undertake process change in order to enhance its efficiency and effectiveness.

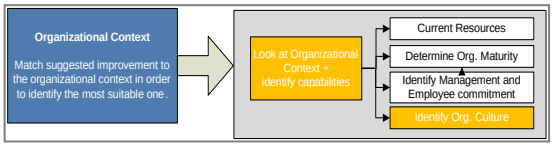
9.3.3 Management and Employee Commitment



Managers usually know that change can improve the processes although they are not the ones affected by it. Thus, it is important to convince the ones who are going to be affected by the change. Improving the FYP process could have an impact on working procedures and its people. Controlling the change process is important as it helps to reduce resistance. Therefore, if the benefits of change are highlighted and introduced to people involved in the process under change, they will understand why it is important. This can help motivate employees as they feel included in the process. It also encourages employees to look forward to the process of change as the benefits have been made clear.

In the case of the FYP process the main process stakeholders are the project tutor, supervisors and students. Improving the FYP process is expected to benefit all parties. The main gain is on the project tutor's side as automating will eliminate the manual work that the project tutor has to carry out and facilitate the administration of the process. On the other hand, it will provide students with easy access to process details. As for supervisors it would facilitate entering the marks on the system as well as monitoring weekly meetings. It is expected that all parties will be committed to the proposed change as they are used of using IT systems for learning as well as conducting activities.

9.3.4 Organisational Culture



Change can be a critical process as it can make employees rigid in their approach to their work which could create resistant to change if not managed effectively. As highlighted in Table 21 culture is interpreted in two different perspectives. On one hand, the modelling shows the current process culture which can be used as a driver to change. On the other hand, under organisational context, culture can be a barrier to change.

BU culture provides a good environment for improving processes as the organisational culture encourages process automation. As mentioned earlier in section 9.3.1 the main infrastructure and resources are available and staff are used to using VLE. Therefore, resistance to change is excepted to be minimal or even not available.

After examining the BU context, it is obvious that the suggested improvement alternative would be suitable and would help in enhancing the FYP process. The reason for that is that, as discussed in the previous sections, that BU is applying a virtual learning platform as well as having an IT system for most of its administrative activities. The following section will map the chosen improvement alternative in order to illustrate the suggested TO-BE process.

9.4 Chosen Improvement Decision

The IT alternative was chosen to improve the process. Automating the FYP process is expected to facilitate its activities especially the tasks carried out by the project tutor. Instead of carrying out lots of paper work and follow ups, the project tutor can extract any data at any time easily for example list of students and allocated supervisors, list of students with no supervisors, list of marks, or list of mismatching marks.

This section introduces the enhanced FYP process model followed by a full description of the suggested process. Afterwards, the improvements will be

matched to the organisational context in order to identify the suitability of the proposed improvement to BU context.

9.4.1 Final Year Process Supervisors Allocation

The proposed improvements are annotated in Figure 60 to show equivalent changes.

1. The process starts at the end of the second year instead of the beginning of the final year. The Project tutor starts informing students about the FYP and introducing the webpage that would serve as an informative guide through their process. This would give students more time to think about their project topics.
2. Supervisors access the system to add suggested process topics.
3. Students start accessing the system to check proposed project topics. Some students may start contacting supervisors before the beginning of final year in order to discuss their topics. The access the system to check supervisors' field of interest and start exchanging e-mails about their topics.
4. Supervisors send their feedback to students in order to refine the topic idea.
5. At the beginning of the final year, students access the webpage in order to choose a supervisor. A list of supervisors would be available highlighting their field of interest and showing their availability. If a supervisor was assigned his maximum load and asterisk will be displayed beside to his name. Unlike the AS-IS model which shows that some supervisors bare more load than others, this would provide an almost equal load for each supervisor. The system confirms supervisor's selection by sending a confirmation to the student.
6. The project tutor follows up the allocation process online and helps in matching supervisors for students have not completed this step.
7. After a student is allocated to a supervisor they meet in order to discuss the project.
8. Students then start preparing their proposals and fill in the ethical form online. The proposal and ethical form are submitted online

9. The system subsequently sends a notification to the supervisor who accesses the system to read the proposal.
10. After supervisors read proposal they send their feedback to students and sign the ethical form off.
11. Students start working on their projects and may optionally attend 5 lectures through the final year concerning the projects and how to conduct them.
12. Students attend weekly meetings with their supervisors to discuss their projects.
13. After each meeting, supervisors amend the meeting log on the system to verify that students attended the weekly meeting.
14. Almost half way through their project, students need to complete an online progress report.
15. The system notifies the supervisor to approve and sign off form and then notifies project tutor that sheets are complete.
16. The project tutor checks the progress form. In case of concerns he follows up to resolve any issue.
17. When submission is due, students submit 2 copies of their project to the project tutor.
18. The project tutor ticks off on the system the receipt of each project and stores the projects in storage room.

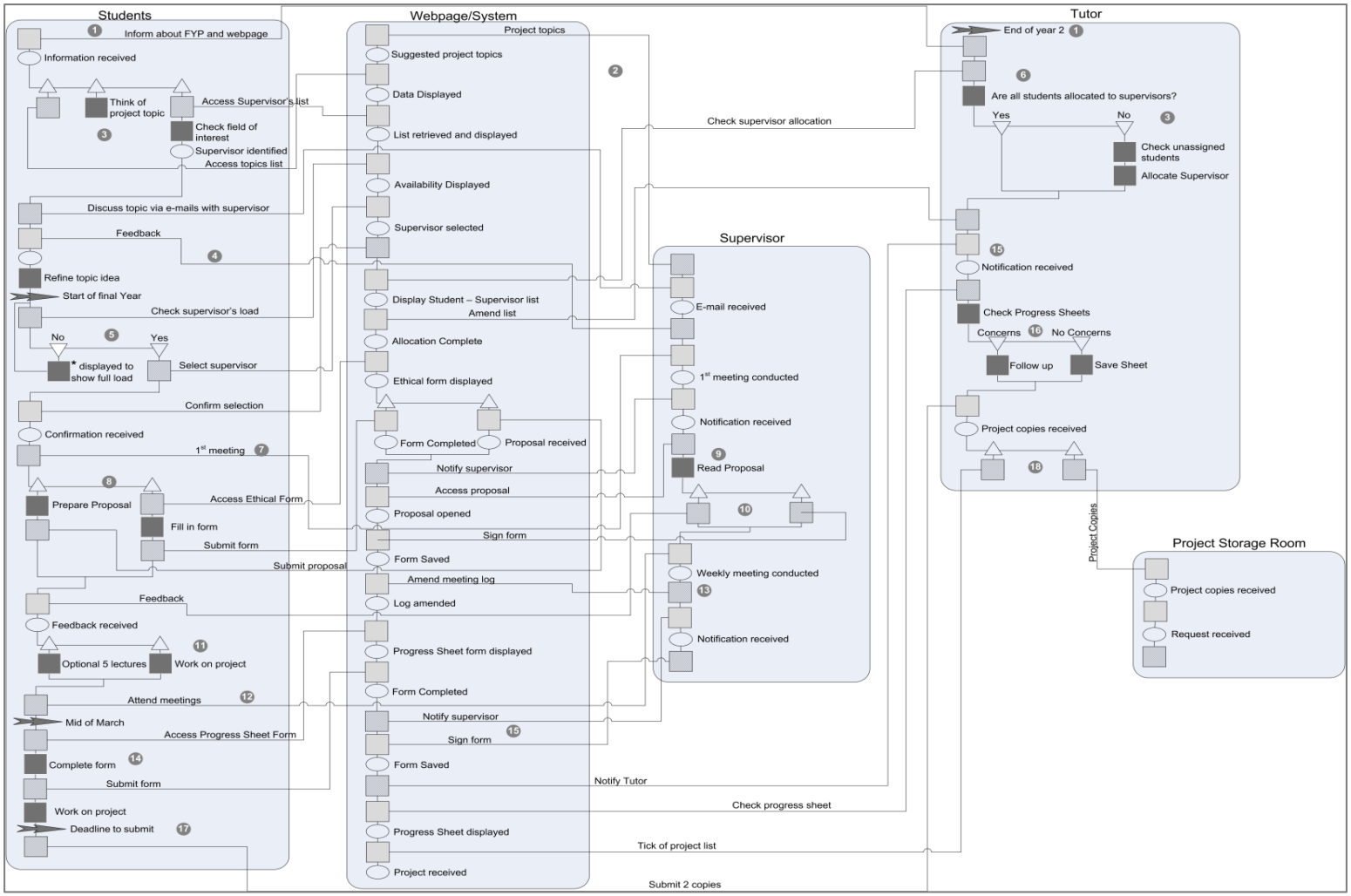


Figure 60: Final Year Project Supervisors Allocation TO-BE Process

9.4.2 Double Blind

The proposed improvements are annotated in Figure 61 show equivalent changes.

19. In order to assign the second reader, the project tutor access the supervisors' list and starts contacting them via email.
20. The project tutor expects a response from the second reader. Usually second reader are available and accept the assignment, however in case they are not the project tutor iterates the process until a second reader is assigned.
21. Then project copies are sent to both readers for assessment.
22. Each supervisor reads the project and comment on them.
23. Supervisors enter their availability dates and times on the system.
24. The system notifies the project tutor that data is available.
25. Then the project tutor uses this information to generate a timetable including list of supervisors, students, examiners, rooms, and time slots.
26. The timetable is sent to supervisors as well as students.

9.4.3 Presentation and Marking

The proposed improvements are annotated in Figure 62 show equivalent changes.

27. Students should present their projects. The defence does not carry any marks, but can affect marks by providing additional information to markers, over and above that provided by the report.
28. Examiners discuss the project mark.
29. Afterwards each supervisor enters the mark on the system and sends the project copies back to the project tutor.
30. The system then notifies the project tutor that marks are entered.
31. If there is a disagreement on the mark, the project tutor assigns a third reader.
32. Again the project tutor sends an e-mail to one of the supervisors who responds back to the project tutor confirming their availability.
33. The project tutor then sends the project copy to the third reader.

34. The third marker reads and marks the project and enters the mark on the system.
35. The project tutor is again notified by the system that project mark is entered.
36. Project copy is sent back to the project tutor in order to store them for the exam board.
37. The project tutor extracts a list of students and marks from the system to issue the results.
38. Finally, marks are sent to students via e-mails.

After mapping the selected improvement alternative, the next step is to assess the organisational context in order to match the suitability of the suggested improvements to BU context.

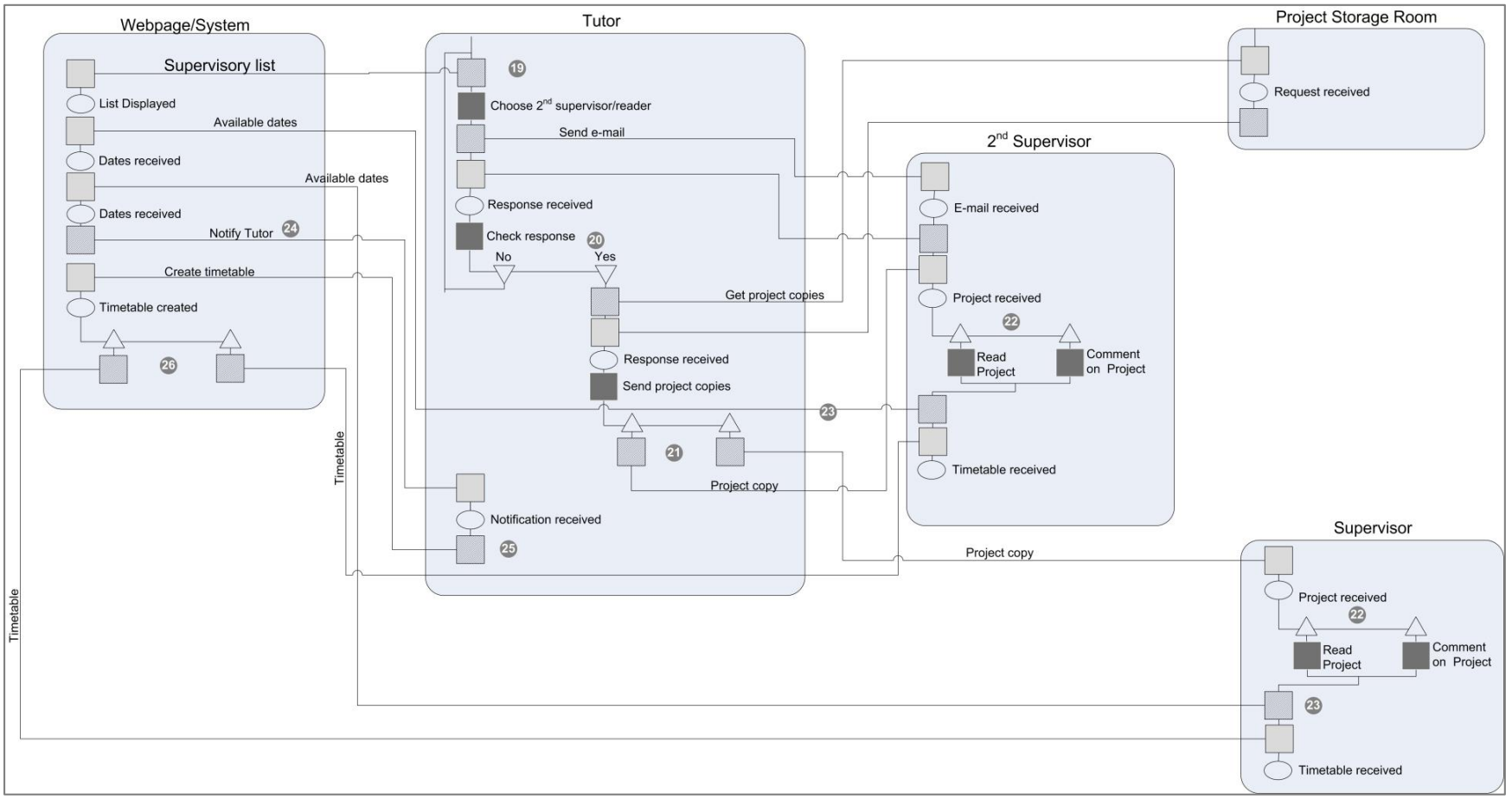


Figure 61: Final Year Project Double Blind TO-BE Process (cont.)

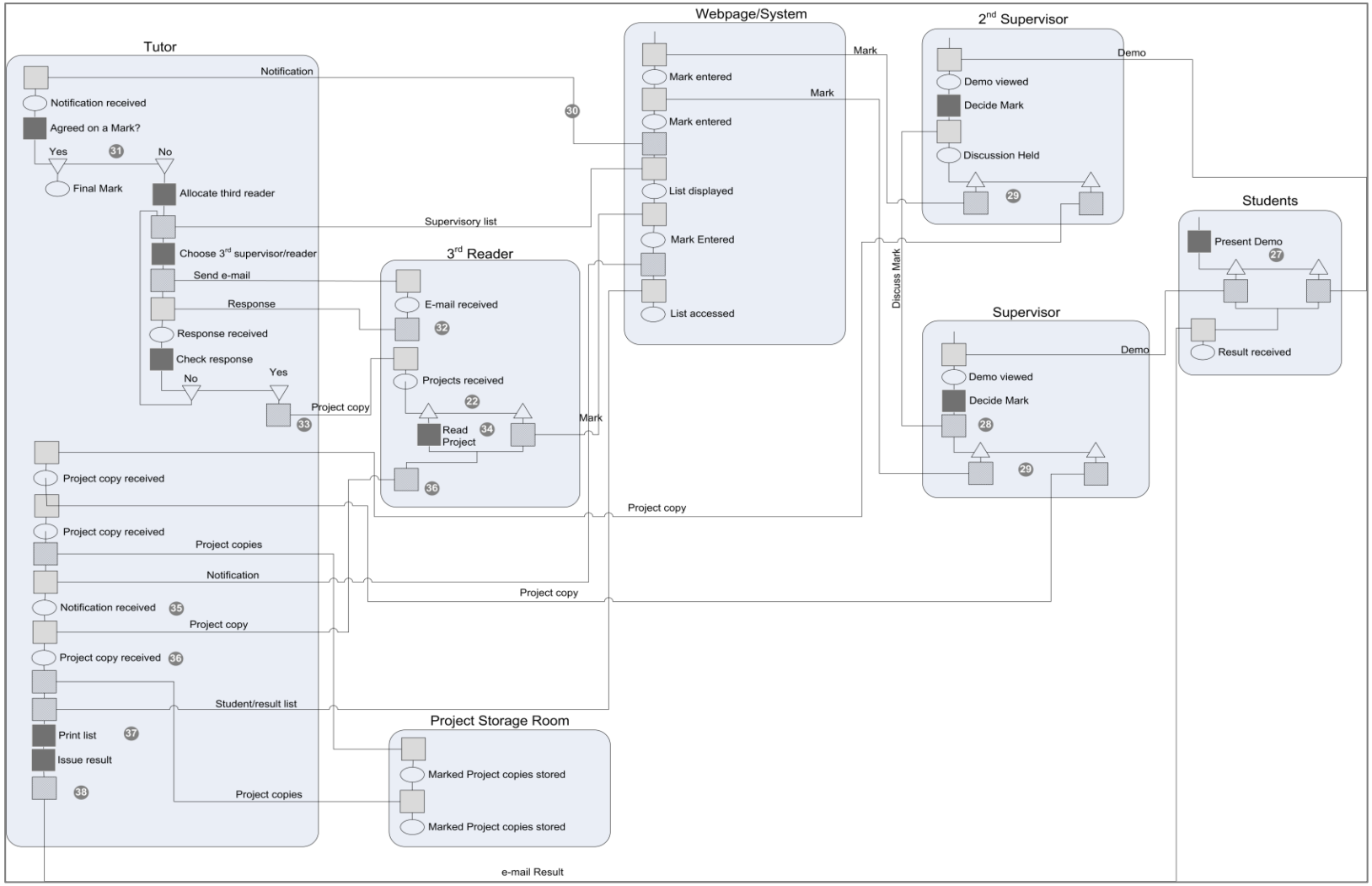


Figure 62: Final Year Project Presentation and Marking TO-BE Process (cont.)

9.5 Further Verification of the Method

This section shows how the method is further verified by conducting a discussion with the new FYP project tutor in order to validate the outcome of implementing the method. The new project tutor, who was assigned the task a year after the AS-IS model has been created, was contacted to discuss the proposed improvements of the FYP.

The researcher discussed the proposed RADs models with the project tutor in order to highlight the issues that need to be changed and show how they could be improved. The project tutor acknowledged that the FYP needs to be improved and thus approved the suggested improvements highlighted in section 9.2 as he thought that automating the process would make it more efficient.

However, although he acknowledged all improvements, from his point of view some of the suggestions may not be suitable. The following Table 24 shows a summary of the proposed improvements and highlights the ones accepted for implementation as well as the ones that could not be regarded.

Table 25: Proposed and considered Improvements

No	Problems/Issues	List of Solutions	Derived From	Consid
1	Students become aware of the project process only shortly (6 months in advance) before the start of the final year.	At the end of the second year, make useful information/ guidelines of the FYP available online. Encourage students to access that information.	IT solution based on best practice	√
		Create an online list of topics to show some project ideas	IT solution based on best practice	√
2	Students are responsible for choosing their supervisors on their own.	Create a supervisors' **database**, which includes list of available supervisors.	IT solution based on best practice	√
3	The model shows some supervisors are overloaded and some have few students and others are free	Apply a maximum load restriction rule **online**.	IT solution based on best practice + Handbook	√

4	The tutor manually prepares supervisors, students and project title list.	Retrieve **online** lists of supervisors, students and project titles.	IT solution	√
5	The Project tutor also makes sure that each student is allocated a supervisor.	Project tutor monitors the allocation process **online**.	IT solution	√
6	No follow up on weekly meetings	Whenever students attend their meetings their supervisors should tick off an **online** registry	IT solution	x
7	Progress Sheets	Students need to fill in the progress sheet form online and send it to their supervisor, who revises it and signs it off electronically. The system alerts the project tutor of progress sheet submissions.	IT solution	√
8	Admin staff help project tutor	The project tutor ticks off online in order to confirm receipt of project copies. Project copies are kept in alphabetical order in the storage room.	IT solution	√
9	Demo Scheduling	Automate the time table process. Project tutor retrieves a list including first and second supervisors as well as students' name and project title of the system. Afterwards allocate a set of rooms and prepare a timetable to assign students to rooms and time slots.	IT solution based on best practice	√
10	Marking System	After assessing the projects, marks are entered on the system for each student by markers. The project tutor does not have to enter the marks manually for the whole students' group. It can be recalled easily from the system.	IT solution	x
		After validating the marks by exam boards, e-mails are sent to students to inform them of their marks.	IT solution	x

The researcher noticed that the acknowledged improvements are the ones that affect the project tutor's tasks only. The project tutor expected that improvements that imply change to supervisors' tasks or students' tasks may face some resistant as this would mean more work load especially for the supervisors. The reason for that is that the supervisor would be responsible for ticking off an online registry. Also, automating the marking system may face resistance by supervisors who are not willing to change their work style or get used to a new system which will involve IT. Therefore, imposing new tasks to supervisors may make them feel burdened with extra tasks. Finally, sending the marks to the students via e-mail is against university policy which implies that students need to attend in person to collect their marks.

9.6 Discussion

This chapter aimed to show the implementation of the proposed improvement method in order to verify its applicability. The FYP process at BU was chosen as the project tutor complained of undertaking lots of activities and that the process needs to be improved.

To apply the method, the AS-IS state of the FYP process was mapped in order to analyse its activities and identify project tutor's perception of the undertaken work. Deriving the changes based on the integrated RADs-Rich Picture model enables both the identification of problems and the consideration of tutors' perception while suggesting improvements. This in turn is aiming at reducing resistance to change at least on the side of process owners.

After mapping the process, the models were analysed to identify problem areas as well as possibilities for improvement. The outcomes of the models revealed various areas that could be improved. However, although the models helped in highlighting the problems, it did not provide any improvement suggestions. As a result, different alternatives for improvement were suggested, which is the second step of the improvement method. The IT system alternative was considered initially for improving the FYP process. The motive for that is that the project tutor carries almost all activities manually; therefore, automating the

process would help in carrying out process activities quicker and in a more efficient way. It was also anticipated that introducing an automated process fit BU's context as they rely mostly on IT system at the university. However, the next step is to make sure whether the suggested improvements are really fit for the university's context.

Accordingly, the maturity was assessed as well as the resistance to change. Afterwards, the selected improvement alternative was mapped in an initial TO-BE RADs model. The reason for that is to highlight the difference between the AS-IS and the TO-BE models and to be able to match the changes and its suitability to the organisational context.

The initially suggested model is expected to improve the process by automating it. Moreover, it will serve as a guide for tutors in undertaking their activities, i.e. unlike the FYP handbook, which defines the process form students' perspective, the model will assist tutors as it will provide a defined process. In other words, the process is defined and therefore, it would not matter in case the project tutor changes.

Finally, in order to verify the proposed changes and the effectiveness of the improvement method, the new project tutor was contacted in order to discuss the suitability of implementing the suggested improvements.

9.7 Conclusion

It can be concluded that process owners can improve the way they are carrying out their tasks. When it comes to changing regulations or enforcing new system that involves other parties, resistance can appear and there may be difficulties in complying with organisational context. Therefore, it is important not to neglect organisational context when deriving improvements. The next rational step is to discuss the implementation of wider scope system that would suit all involved parties undertaking a process.

In this case, the highlighted columns may be considered a further step to improve the process. Thus, moving gradually towards enhancing the process. The derived TO-BE model will become the AS-IS state once implemented. If the proposed method is iteratively implemented it would guide organisations to constantly improve their processes, hence achieving continuous improvement.

Chapter 10
Conclusions and Further Work

10.0 Introduction

This chapter starts by revisiting the research objectives then introducing the findings. It provides a discussion on how the objectives have been achieved. The contribution to knowledge is also highlighted and further work is suggested.

10.1 Research Objectives

The purpose of this research was to examine Higher Education Institution (HEI) processes with the following two aims:

1. Explore how and if Business Process Modelling (BPM) techniques are suitable for transfer to educational processes this will be achieved by the following objectives:
   1.1. conduct a literature review about quality in higher education;
   1.2. investigate the application of BPM to HEIs processes;
   1.3. analyse and select appropriate modelling techniques and
   1.4. apply the selected techniques and evaluate the results

2. Enhancing the results from Aim 1 in order to explore additional improvement to HEI processes. This will be achieved by the following objectives:
   2.1. adopt improvements that are suitable for the HEI context;
   2.2. design a method that will be suitable to improve processes within Higher Education;
   2.3. determine other aspects that may affect improvement initiatives and
   2.4. apply method and validate any findings

10.2 Research Summary and Findings

This section will illustrate how the research objectives were achieved and highlight the research summary and findings.

1. **Explore how and if Business Process Modelling (BPM) techniques are suitable for transfer to educational processes. This will be achieved by the following objectives:**

1.1. Conduct a literature review about quality in higher education

The literature review in Chapter 2 and 3 revealed that HEIs are now facing severe competition and are under increasing pressure to enhance the efficiency and effectiveness of their processes. However, although there were various attempts and approaches that have been implemented in the educational environment, there was no agreement on how to achieve quality in HEIs. Moreover, the literature shows that there was no widespread understanding concerning the benefits that Business Process Modelling (BPM) can bring to education. BPM was introduced in some HEIs but the widespread use in business has not transferred to education.

1.2. Investigate the application of BPM to HEIs processes.

To further explore this issue and evaluate the use of BPM approaches in HEI, various modelling perspectives (section 3.3.1) and modelling techniques (section 3.4) were investigated in order to identify which technique/s can be used to model higher education processes.

1.3. Analyse and select appropriate modelling techniques

In order to explore how BPM can lead to improvements, a pilot case study was conducted in an Egyptian HEI (Chapter 5) based on evidence gathered mainly from three sources: Interviews, observations, and documentation. The study focused on investigating the course design and delivery processes of an Egyptian Masters Programme.

Initially Data Flow Diagrams (DFDs) and Role Activity Diagrams (RADs) were derived; however, after analysing the models DFDs were excluded. The reason for that was that the models were hard models and did not emphasize the soft side of the environment. Therefore, there was a need to also apply SSM Rich Pictures in order to illustrate social aspects. Using RADs and Rich Picture concurrently (Section 5.2.6) allowed the highlighting of more process problems than either one alone and helped in uncovering more issues for improvement.

Having compared several techniques helped in identifying the best techniques to integrate different process aspects. As a result, RADs and Rich Picture in conjunction were more suitable for mapping the course design and delivery processes as it helped in identifying process problems, which were considered for improvement. Finally, a modelling approach in section 5.2.7 was proposed to model similar processes using the hybrid RADs-RichPicture model.

An improvement proposal for course design and delivery processes was introduced in section 5.4 based on the findings and outcomes of the models. Also the current state in section 5.5 showed the undertaken improvements initiatives at PQI.

1.4. Apply the selected techniques and evaluate results

In Chapter 6 a second study was conducted to validate the hybrid RADs-RichPicture. The hybrid model was applied to a larger set of processes, the students' journey processes, in order to verify the modelling approach suggested in section 5.2.7. The entire student journey processes were modelled from application and admission, through all of the phases of the student journey. The hybrid RADs-RichPicture model helped in revealing issues which would not have been uncovered using either of the existing notations alone, and proved to be suitable in terms of accessibility, for modelling higher education processes.

Afterwards, an improvement proposal including some minimal IT solutions was proposed by the author. In order to verify the suggested improvements, final year students, in a UK university, were assigned to model the same set of processes. They successfully modelled the processes and introduced process improvement suggestions for automating processes. The most interesting finding from this study was the variation between the proposed improvements suggested by the author and the students. The proposed solutions suggested by the author were based on knowledge of the process environment. However, students gave more technical based solutions which were considered more ambitions but were not suitable for the Institute's context. As a result of this variation of improvement proposals, further work was needed to identify the suitability of proposed improvements to the organisational context.

2. **Enhancing the results from Aim 1 in order to explore additional improvement in HEI processes. This will be achieved by the following objectives:**

2.1. Adopt improvements that are suitable for the HEI context.

The differences between the author's and students' improvement proposal identified a number of important issues, such as which improvements should be considered for a given situation and how may they be identified. The models revealed the current processes and provided a guide to the management of the educational institution, thus helping them to understand the problem areas.

However, the models were limited in identifying suitable improvement proposals. Various alternatives to improvement may be available; however, HEIs would not be able to determine which were more suitable to their context or which of them fits their need to improve.

2.2. Design a method that will be suitable to improve processes within HE

Chapter 7 investigated the practicality of creating a method for adopting improvements initiatives that were suitable for an educational organisation.

A Fusion Method integrating benchmarking, maturity models and modelling was proposed to facilitate process improvement. The suggested method was applied to the admission and complaint processes in order to investigate the method and further develop it.

While trying to identify best practice for both admissions and complaint processes the QAA indicators were introduced as best practice. However, the UK QAA quality code included indicators or principles to ensure HEI's show good intentions but did not state what HEIs should do in order to have improved processes. Those indicators/principles were considered as guidelines that institutions use to design processes in their own way in order to achieve better outcomes. Therefore, there were no agreed practices that higher education can undertake to improve their processes and there was also a lack of literature that describes agreed best practice.

Another interesting finding as stated in section 8.2 the most common Capability Maturity Model (CMM) was created for software development organisations. Motivated by the original CMM, many researchers derived maturity models to address other business fields. In the educational field various models were suggested for e-learning, improving people practices, improving curriculum design and online course design. However, most of the suggested models did not identify process areas and their related goals. Moreover, there was a lack in the literature of a complete maturity model which supports management and teaching practices that are present in academic institutions.

The result of this study led to the need of further investigating other aspects that may affect improvement initiatives. It was thought that more aspects could be considered not only best practice and maturity.

2.3. Determine other aspects that may affect improvement initiatives.

In chapter 8, a further study was undertaken in order to suggest other aspects that may affect process improvement. The mind map technique was useful to brainstorm more aspects. Accordingly, the Fusion Method was

further developed in order to provide a better context. The three pillars of the initial Fusion Method were modelling, maturity and benchmarking. The modelling pillar remained the same because as highlighted earlier it was the start of the improvement process.

However, the mind map revealed that the context of any organisation may be affected by many aspects such as resources, culture, maturity and change management. Therefore, the maturity pillar was found to be one of a number amongst other aspects under organisational context. In order to consider all aspects, the maturity pillar was changed to be Organisation Context.

In addition, best practice may not be always suitable for improving processes as applying change depended on the organisational context (i.e. maturity, resources, culture ... etc.). Therefore, the best practice pillar was changed to become alternative improvements, which includes best practice, direct fixing or IT systems, as any institution may investigate various improvement alternatives and decide on the most suitable one according to their context.

2.4. Apply method and validate any findings

Finally, Chapter 9 aimed to apply the proposed Fusion Method in order to validate it. The method was applied on the Final Year Project process at the Department of Engineering and Computing (DEC), Bournemouth University (BU). The application steps of the improvement method were highlighted in detail and resulted in the identification of the most suitable improvement alternative based on the universities context. In order to verify the proposed changes and the effectiveness of the improvement method, the new project tutor was contacted in order to discuss the suitability of implementing the suggested improvements.

The proposed To-BE RADs models were introduced to the project tutor in order to emphasize the issues that need to be changed and show how they could be improved.

The verification was successful as the project tutor approved the suggested improvements in section 9.2 as he thought that automating the process would make it more efficient. Therefore, the method was found to be promising in guiding improvement initiatives for HEIs.

10.3 Summary of Findings

In conclusion, the main findings of this research are as follows:

1. The models facilitated the identification of problems for the students' journey processes.
2. Application of a real problem found that using more than one technique (the combination of RADs and RichPicture) was fruitful.
3. A modelling approach which combines RADs and RichPicture was identified that is useful for mapping educational processes.
4. The RADs-RichPicture modelling approach whilst facilitating the identification of issues did not provide improvement solutions.
5. UK QAA quality code indicators/principles did not provide details of the way in which HEIs should design improved processes. Those indicators/principles were only guidelines that institutions use in order to design processes in their own way.
6. The proposed Fusion Method can be useful for improving HEIs' processes.
7. There was no complete maturity model for HEIs.

10.4 Contribution

This research makes several noteworthy contributions. Firstly, investigating various modelling techniques lead to the identification of the suitable techniques for mapping HEI processes. The RADs-RichPicture models were very useful in highlighting and revealing process issues thus showing that modelling techniques can be successfully transferred to the educational processes.

Although the integrated models uncovered both hard and soft issues about processes; it did not give any indication of how those problems can be

improved. Thus it was limited in providing improvement solutions. Various improvement solutions can be proposed however, there was a need to identify which would be more suitable for the different institutional contexts.

In order to complement this limitation a Fusion Method was introduced. The modelling was considered as one of the fusion pillars. In fact, the first pillar, as it represents the main base for starting the improvement process.

After modelling processes, HEI need to identify how to choose the most suitable improvements. Therefore, the second pillar investigates a range of possible improvements. Finally, in order to choose amongst the proposed alternatives, the third pillar suggests that the improvements were matched to institutional context. Taking the maturity, culture, and resources into consideration enabled the selection of the most suitable solution in terms of needs and capabilities of HEI.

Therefore, the Fusion Method was successful in complementing process modelling limitations as well as guiding process improvement initiatives. Institutions will achieve continuous improvement by choosing the most suitable proposal and planning to move forward gradually.

10.5 Research Strategy

The case study strategy was used in this research in order to explore how to improve HEIs processes. The reason for choosing case study as a research strategy was that it provides rich understanding of a phenomenon within its context. This was very important as the present study aimed to investigate how BPM can be transferred to higher education processes as well as exploring the possibility of creating a method for improving higher education processes.

The case study enabled the researcher to use multiple sources of data to explore the research problem. The data was collected based on three different sources namely, documents, semi structured interviews and observation.

10.6 Further work

Further research should explore other aspects that may affect process improvement decisions such as different elements of culture other than resistance to change. Another possible area of future research would be to derive a set of maturity models for the educational field. A comprehensive higher education maturity model that focuses on both administrative and learning processes and models of individual educational processes. The comprehensive maturity model would help in identifying maturity on an organisational level while the individual maturity models on the process level. Moreover, there is a need to introduce an agreed best practice that higher education can undertake in order to improve their processes.

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Appendix A

Interviews Questions

Name:	**Date**:
Job Title:	**Duration**: min

Section 1: Course design and delivery

1. Tell me about the teaching process especially material preparation and course delivery

2. How are you assigned to teach a course?
3. Who prepares course material?
4. Is the course material understandable?
5. Does the course material cover all knowledge area? Are texts /course material well chosen to attain course objectives?
6. Do you interact with teaching assistants to discuss course material design?
7. Are you allowed to make amendments on course material?

8. Who prepares assignments and exams?

9. Are assignments and exams representative of the course content?

10. What problems do you face in teaching material which you have not prepared?

Section 2: Students' performance and feedback

1. How do you assess student performance?

2. Do you monitor students' understanding of the lecture?

3. How do students perceive the material?

4. Is there any feedback from students concerning course material?

   How?

Section 3: Improvement

1. What do you suggest for improving the course design process? How could the course content be improved?

2. What do you suggest for improving the delivery process?

Name:	**Date**:
Job Title:	**Duration**: min

Section 1: Course Material

1. Do you have any problems with course material?

2. Are the aims and objectives of the course clearly explained?
3. Is the course material handed out adequately to your satisfaction?
4. Is the material clear and easy to understand?
5. Does the course encourage the development of academic interests and skills or does it only depend on memorizing?
6. Are assignments and exams representative of the course content?
7. How did you benefit of the written assignment?
8. Are teaching aids effective?

Section 2: Teaching and Staff
1. Do you think lecturers prepare their own material?
2. Is the lecturer well prepared for classes?
3. How satisfactory is the lecturer's knowledge of the subject-matter?
4. Is the lecturer clear and understandable in his explanations?
5. Does the lecturer encourage interaction? 6. How useful did you find the class discussion?
7. How do you interact with staff or Teaching Assistants? 8. Do they show interest to understand difficulties you may be having?

Section 3: Feedback
1. Does your progress depend on grades only? 2. Are you given regular feedback on your progress?
3. Is there any feedback questionnaire to show you opinion? 4. How did you complain? 5. What was done do resolve the complaints?
Section 4: Improvement
1. What do you suggest for improving the teaching process (design and delivery of course)?

2. What did you benefit from the master degree?

Name:	**Date**:
Job Title: Teaching Assistant	**Duration**: min

Section 1: Course Design Process

1. How do you design master courses?

2. How are you assigned course design?
3. Are the courses distributed according to your background?
4. How much time is available to design a course?
5. How do you gather references? 6. Are they always up-to-date?
7. Are there any rules according to an accreditation body for course design?
8. How are courses reviewed?

9. Do you face any problems in designing a course?

10. Are you assigned other jobs than course design?

11. Do you consider yourself overloaded? Why?

12. Are there extra incentives for course design?

13. How often are the courses updated? Why?

14. Who prepares assignments and exams?

15. Are they relevant to course material?

16. How do you measure student satisfaction of course material?

17. Do you receive complaints from students and lecturers concerning course material?

18. What is done to resolve complaints?

Section 2: Course Delivery

1. Are you involved in the teaching process?

2. Do you interact with lecturers concerning the delivery of the course?

3. Are lecturers able to deliver course material which they did not prepare?

Section 3: Improvement Recommendations

1. What do you suggest for improving the master course design process?

Name:	Student (…..)	**Date**:	...../……/2012
Job Title:	Student	**Duration**:	min

Section 1: General
1. Tell me about your journey as a student
2. How was the interaction with staff?

3. Did they show interest to understand difficulties you may be having?

Section 2: Admission and Registration

1. How did you apply to the programme?

2. Did you face any problems during the admission process?

3. How did you register?

4. What obstacles have you faced during registration?

Section 3: Time Tabling and Loading

1. Did you receive time tables on time?

2. Are there any problems with timetables?

Section 4: Complaint

1. Did you need to complain at any point during your student's journey?

2. How did you complain?

3. Did you get any response?

4. Was the response satisfactory to you?

Section 5: Student Appeal

1. Are you allowed to appeal?

2. What is the appeal process?

Section 6: Research Supervision

1. Were supervisors sensitive to your needs and concerns?

2. Did the supervision provide you personal support, professional development and case direction?

3. Did you face any problems during the supervision process?

Section 7: Viva Process

1. What are the arrangements for the viva?

2. What happens after the viva?

3. Did you face any problems?

Section 8: Postponing and Withdrawal Processes

1. What happens if you need to postpone your study if needed?

2. How?

3. What happens if you need to withdraw a course if needed?

4. How?

Section 9: Feedback Process

1. Were you asked about your opinion about the programme? (Questionnaire)

2. How?

3. Did you feel that your comments were taken into consideration?

Section 10: Problems and Improvement Recommendations

1. What are the problems that you faced during your journey?

2. What do you suggest for improving the student journey process?

3. What do you suggest for improving the student journey process?

Job Title:	**Date**:
	Duration: min

Section 1:
1. Who is involved in the project assignment process (roles)?
2. When do you inform students about projects?
3. How are supervisors assigned/allocated to Students?
4. What is the duration of the final year project?

5. Do student get any introductory courses about the project?

6. What are the steps of the final year project process?

7. How regular do students meet with supervisors?

8. What are the problems incurred during the process?

Section 2: Improvement
1. What do you suggest for improving the final year project process? How could the course content be improved?

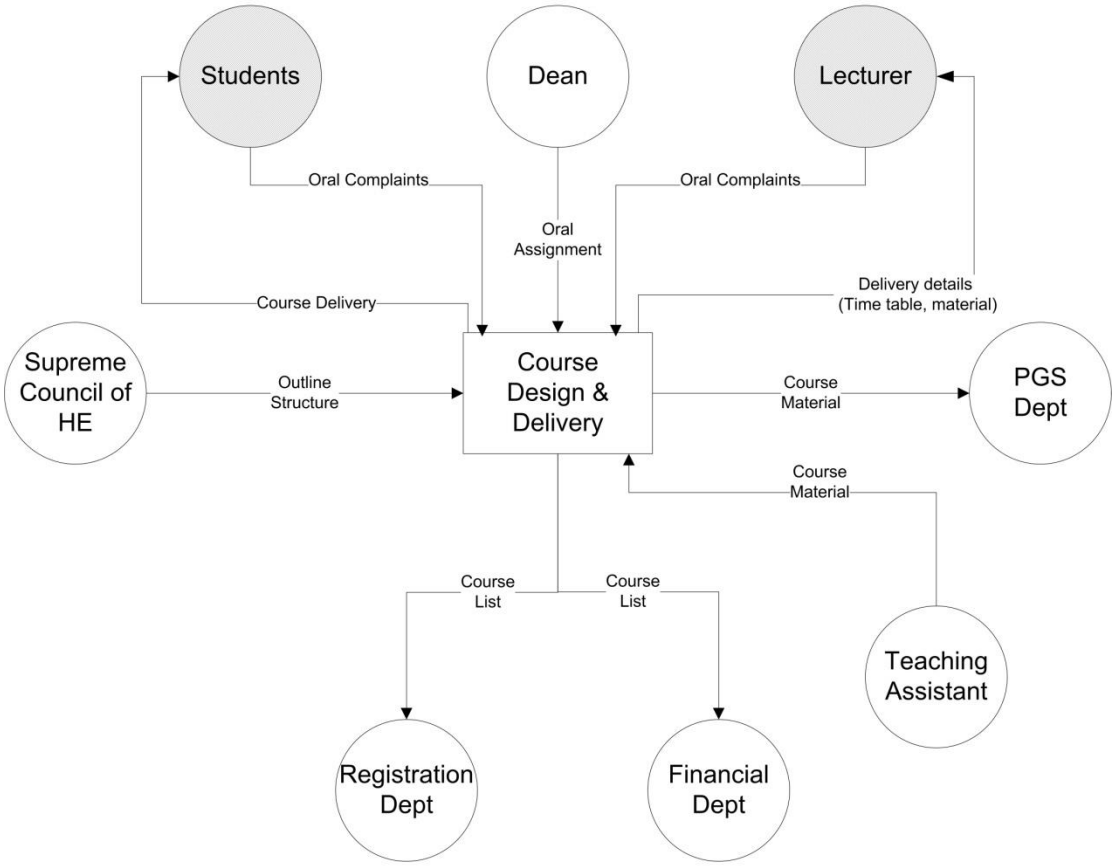
Appendix B

Data Flow Diagram (DFDs)

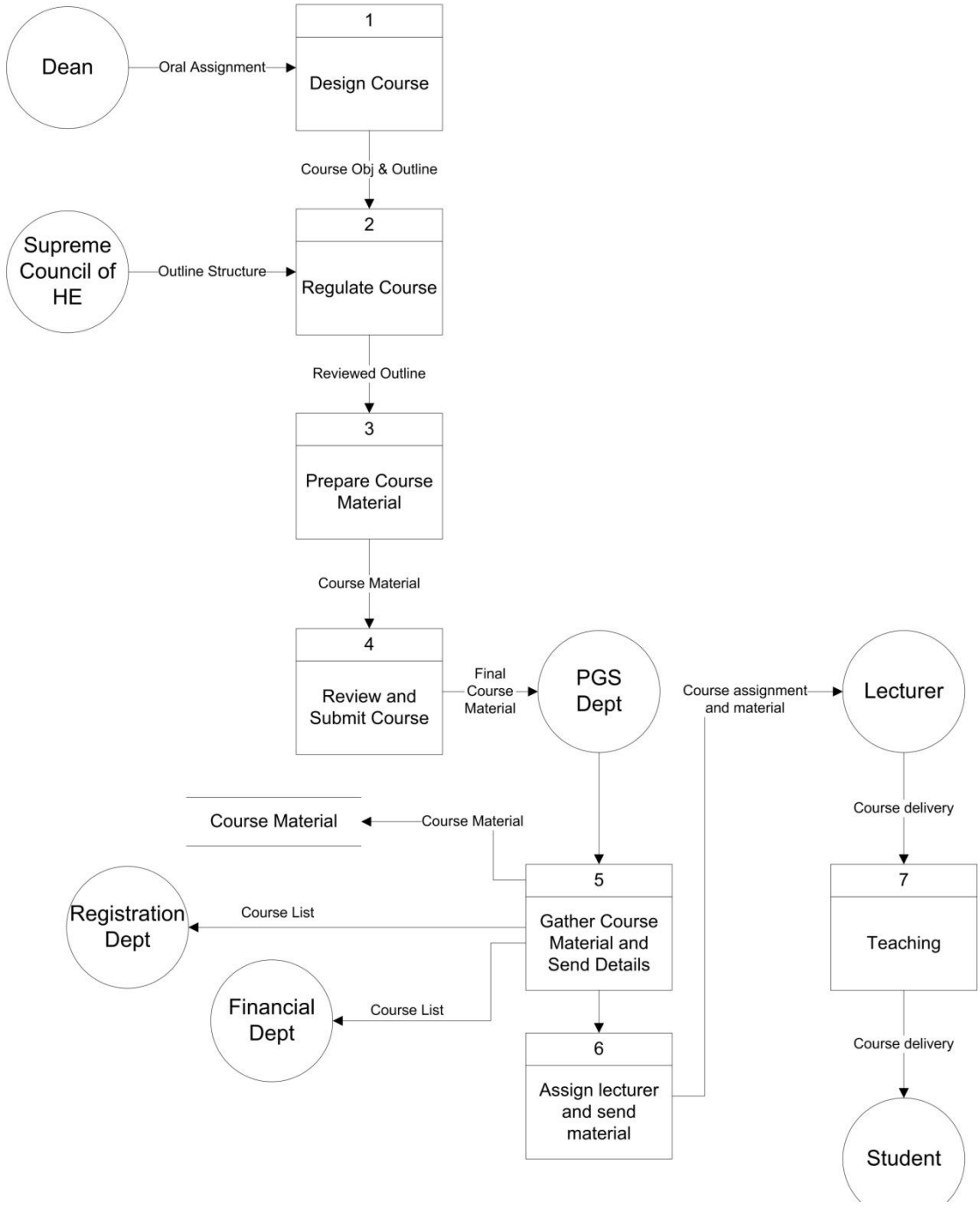
Course Design and Delivery Processes

Data Flow Diagram for Course Design Process

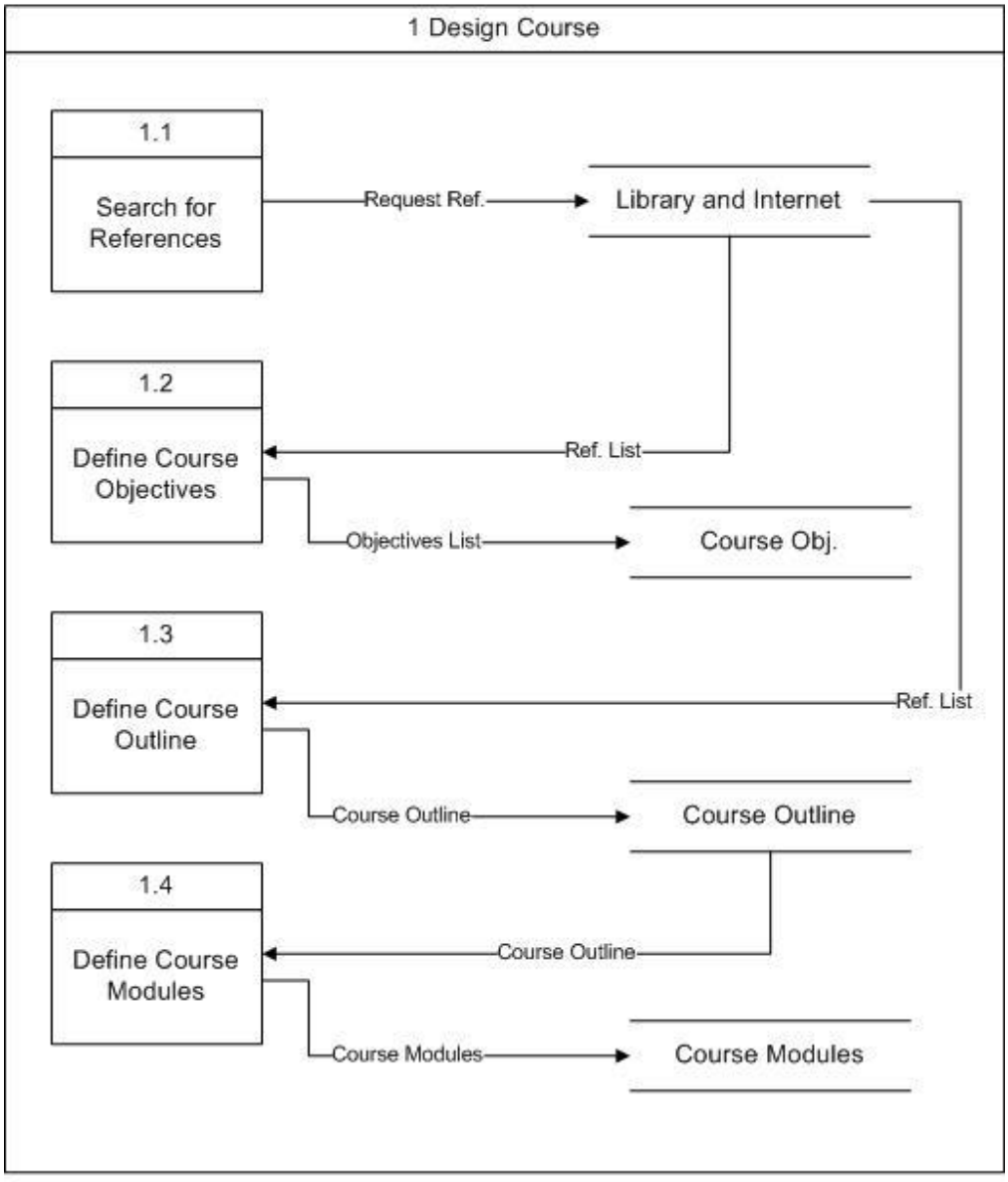
Context Level



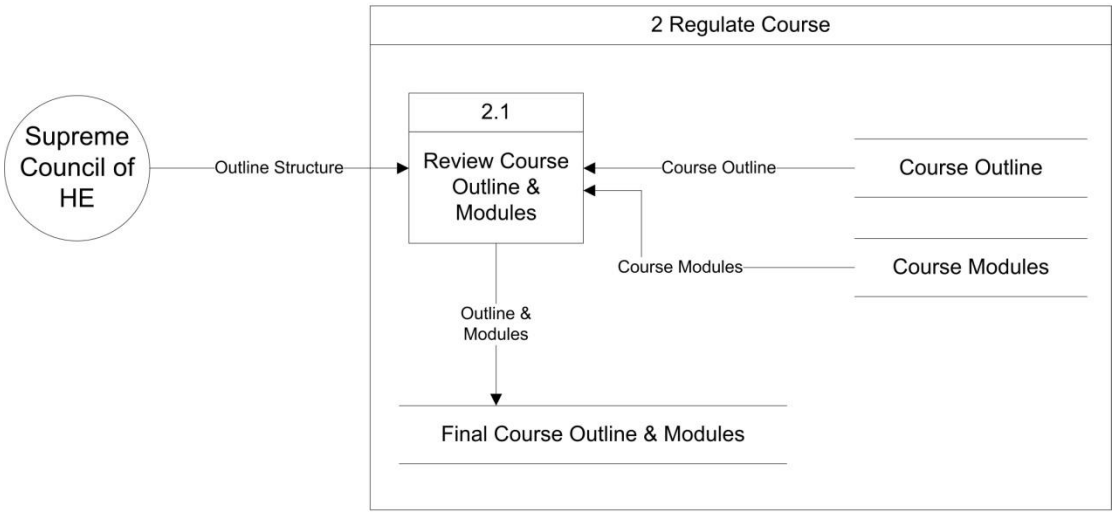
Level 1


Dean
Oral Assignment
1
Design Course
Course Obj & Outline
Supreme Council of HE
Outline Structure
2
Regulate Course
Reviewed Outline
3
Prepare Course Material
Course Material
4
Review and Submit Course
Final Course Material
PGS Dept
Course assignment and material
Lecturer
Course Material
Course Material
Course delivery
5
Gather Course Material and Send Details
7
Teaching
Registration Dept
Course List
Financial Dept
Course List
6
Assign lecturer and send material
Course delivery
Student

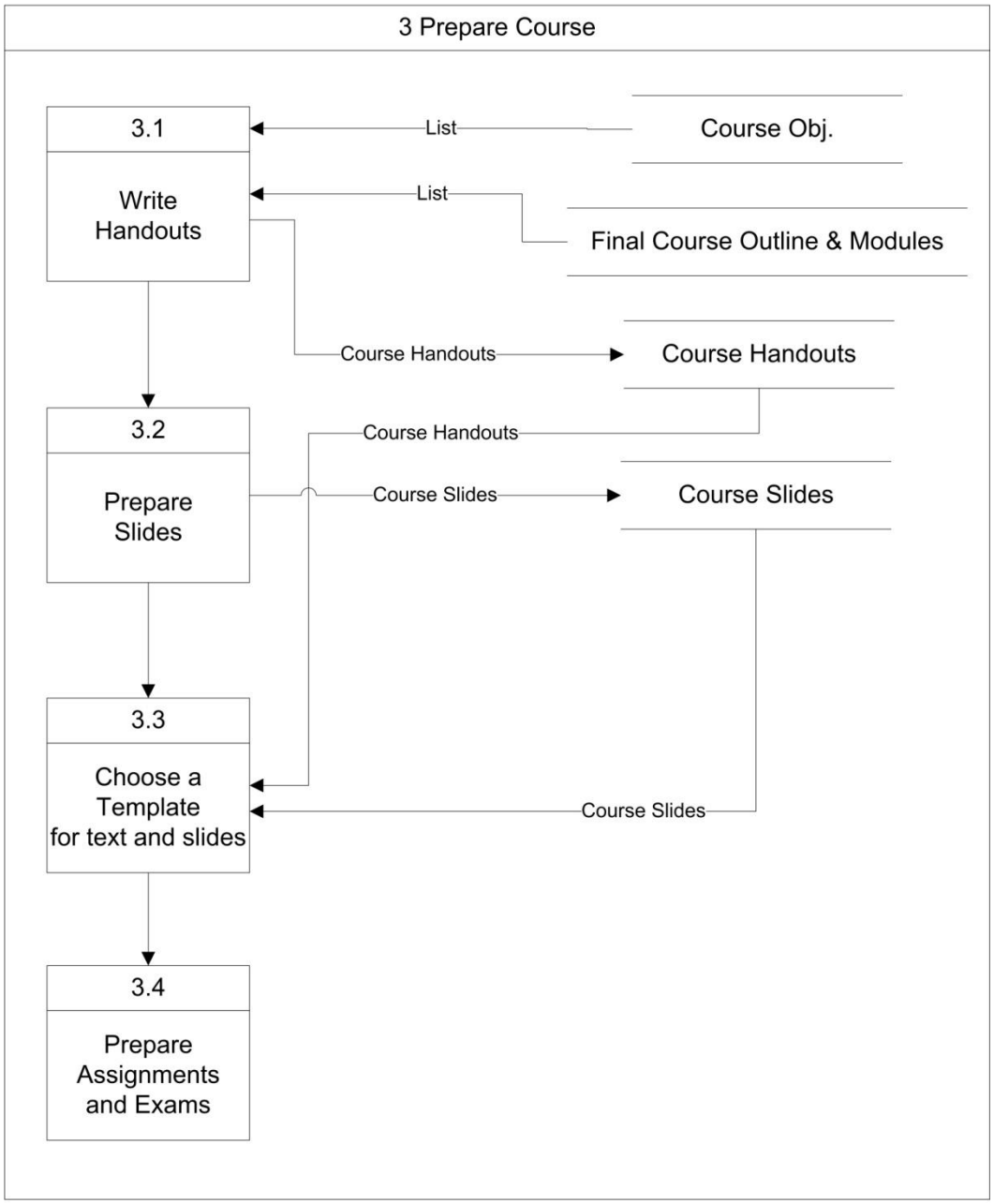
Level 2


1 Design Course
1.1
Search for References
Request Ref.
Library and Internet
1.2
Define Course Objectives
Ref. List
Objectives List
Course Obj.
1.3
Define Course Outline
Ref. List
Course Outline
Course Outline
1.4
Define Course Modules
Course Outline
Course Modules
Course Modules

Level 2

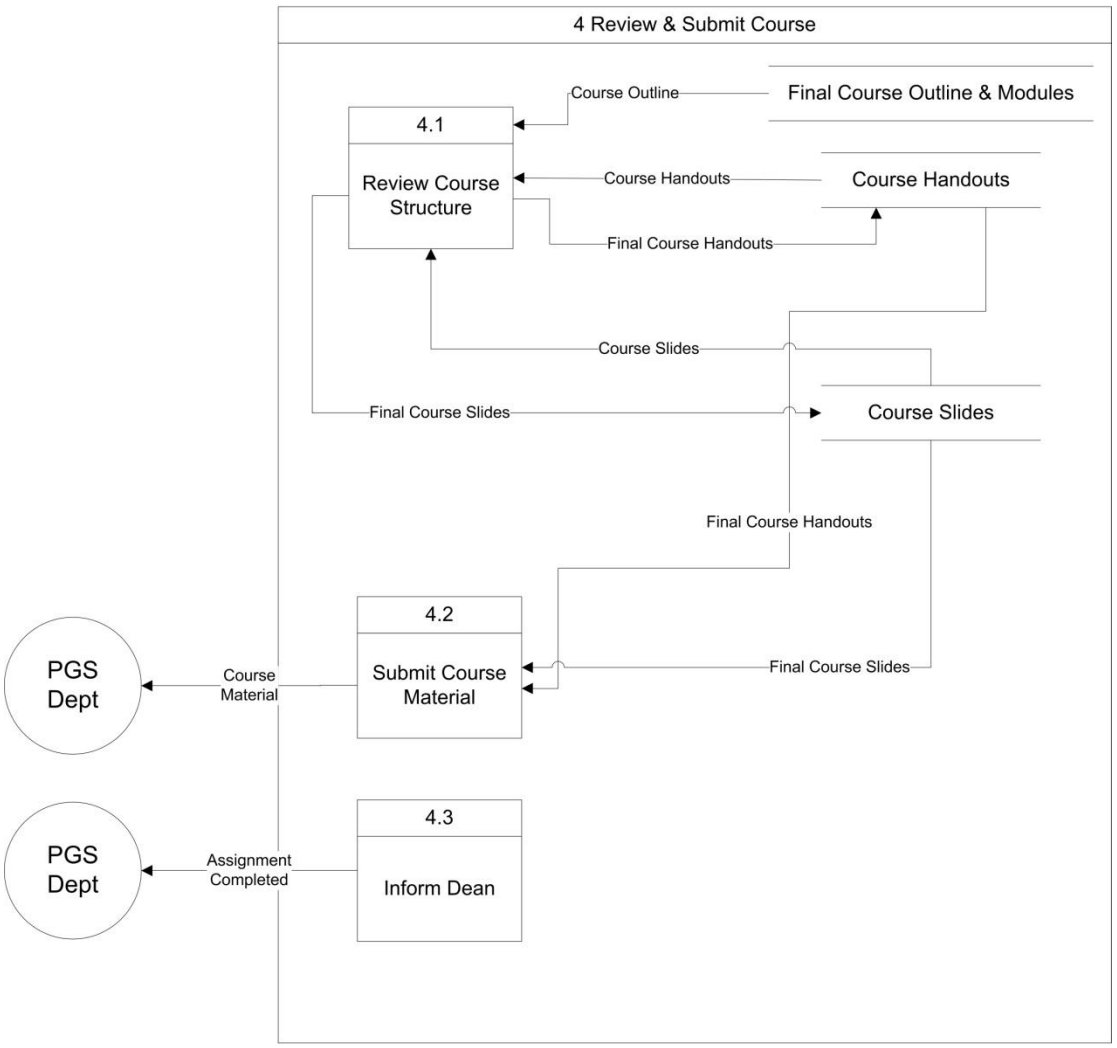

2 Regulate Course
Supreme Council of HE
Outline Structure
2.1
Review Course Outline & Modules
Course Outline
Course Outline
Course Modules
Course Modules
Outline & Modules
Final Course Outline & Modules

Level 2

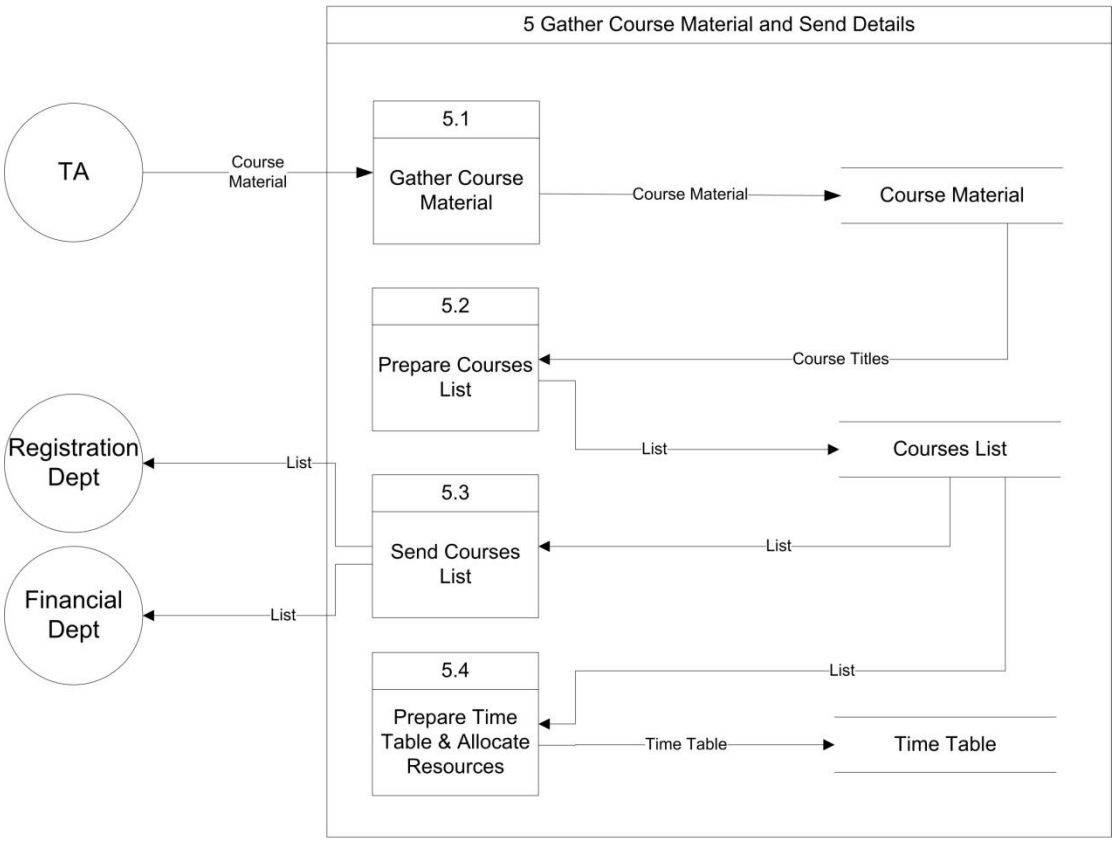

3 Prepare Course
3.1
Write Handouts
3.2
Prepare Slides
3.3
Choose a Template for text and slides
3.4
Prepare Assignments and Exams
List
Course Obj.
List
Final Course Outline & Modules
Course Handouts
Course Handouts
Course Handouts
Course Slides
Course Slides
Course Slides

Sometimes even no structure review because of lack of time

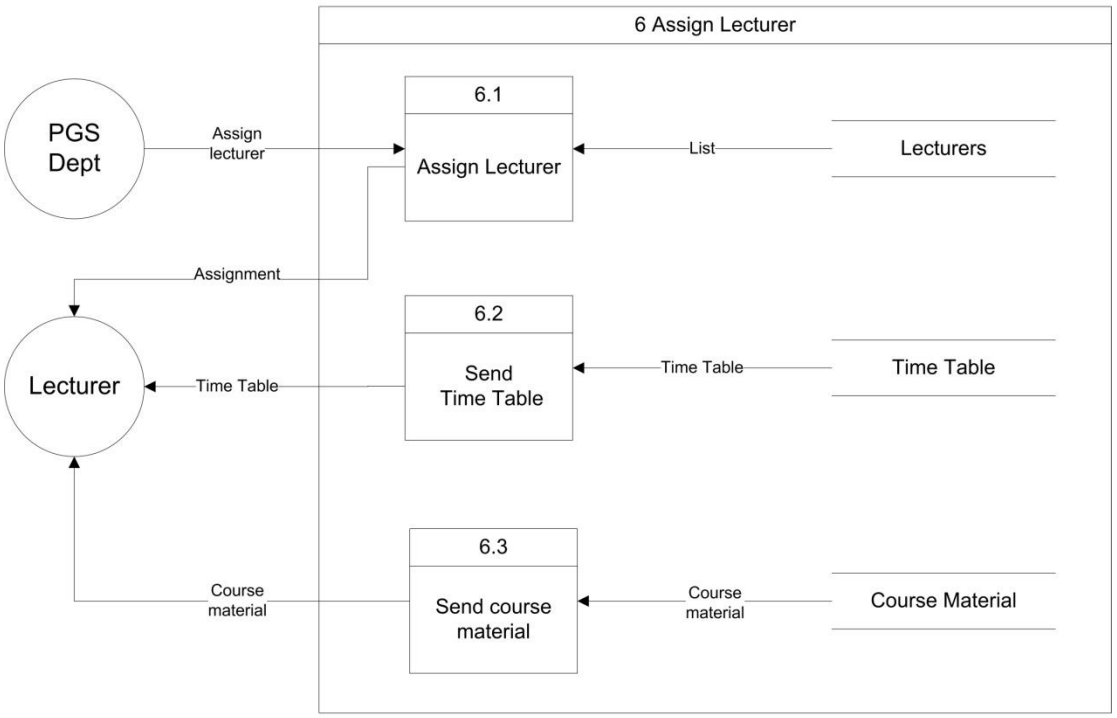
Level 2



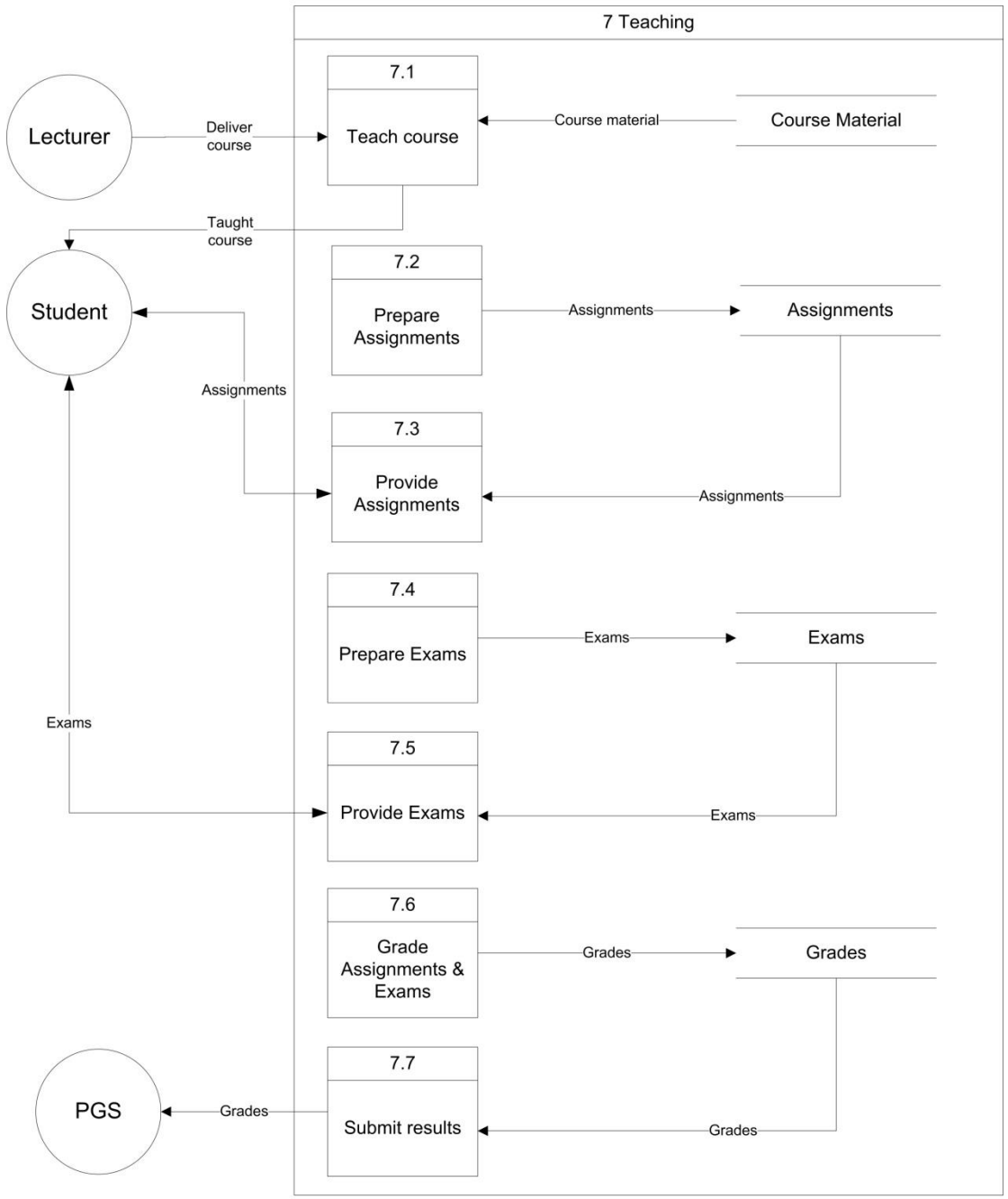
Level 2


5 Gather Course Material and Send Details
TA
Course Material
5.1
Gather Course Material
Course Material
Course Material
5.2
Prepare Courses List
Course Titles
List
Courses List
Registration Dept
List
5.3
Send Courses List
List
Financial Dept
List
5.4
List
Prepare Time Table & Allocate Resources
Time Table
Time Table

Level 2


6 Assign Lecturer
PGS Dept
Assign lecturer
6.1
Assign Lecturer
List
Lecturers
Assignment
Lecturer
Time Table
6.2
Send Time Table
Time Table
Time Table
6.3
Send course material
Course material
Course material
Course Material

Level 2


7 Teaching
7.1
Teach course
Course material
Course Material
Lecturer
Deliver course
Taught course
Student
7.2
Prepare Assignments
Assignments
Assignments
Assignments
7.3
Provide Assignments
Assignments
7.4
Prepare Exams
Exams
Exams
Exams
7.5
Provide Exams
Exams
7.6
Grade Assignments & Exams
Grades
Grades
PGS
Grades
7.7
Submit results
Grades

Appendix C
Role Activity Diagram (RADs):
Course Design and Delivery Processes

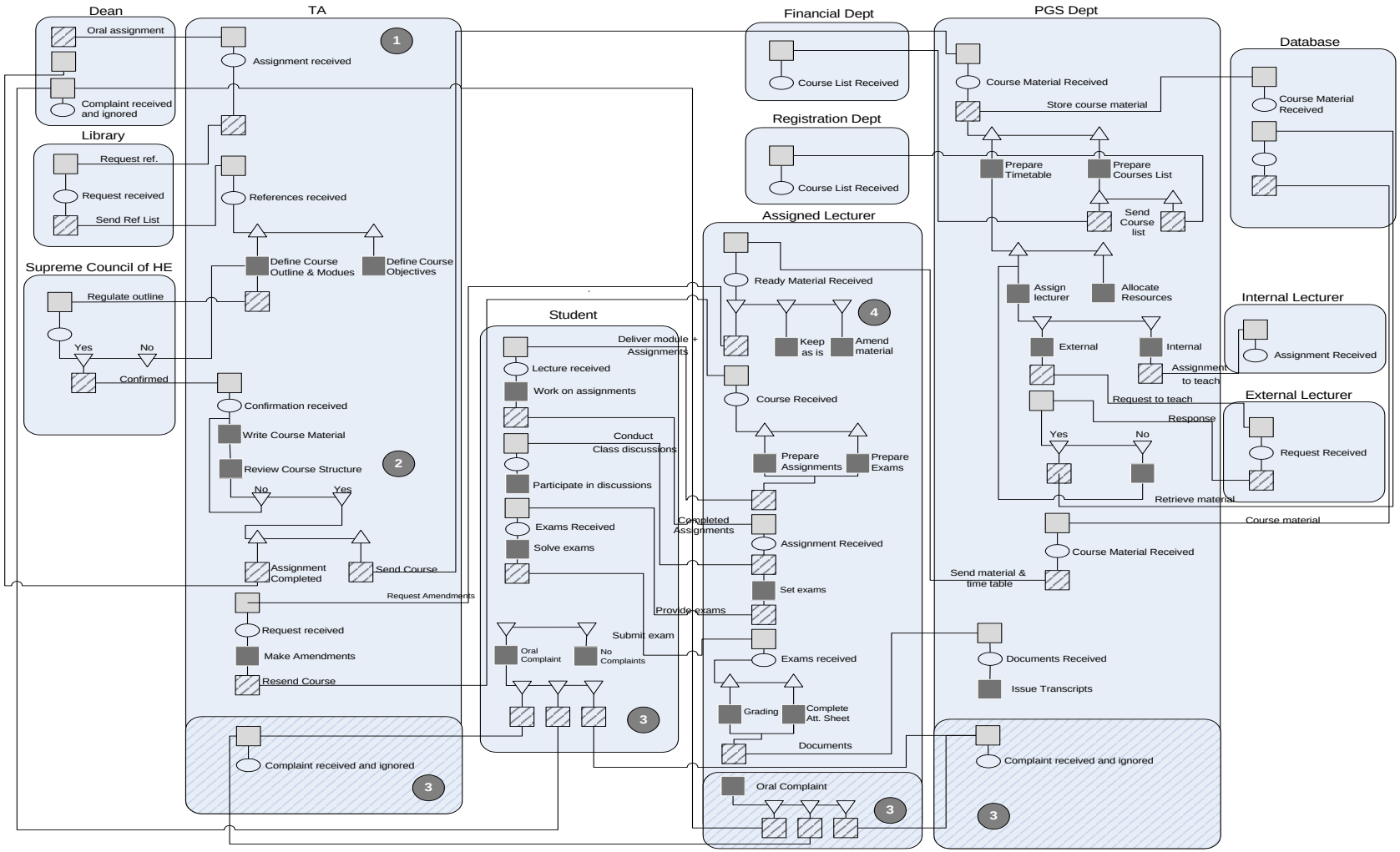


Figure C1: Course Design and Delivery Processes

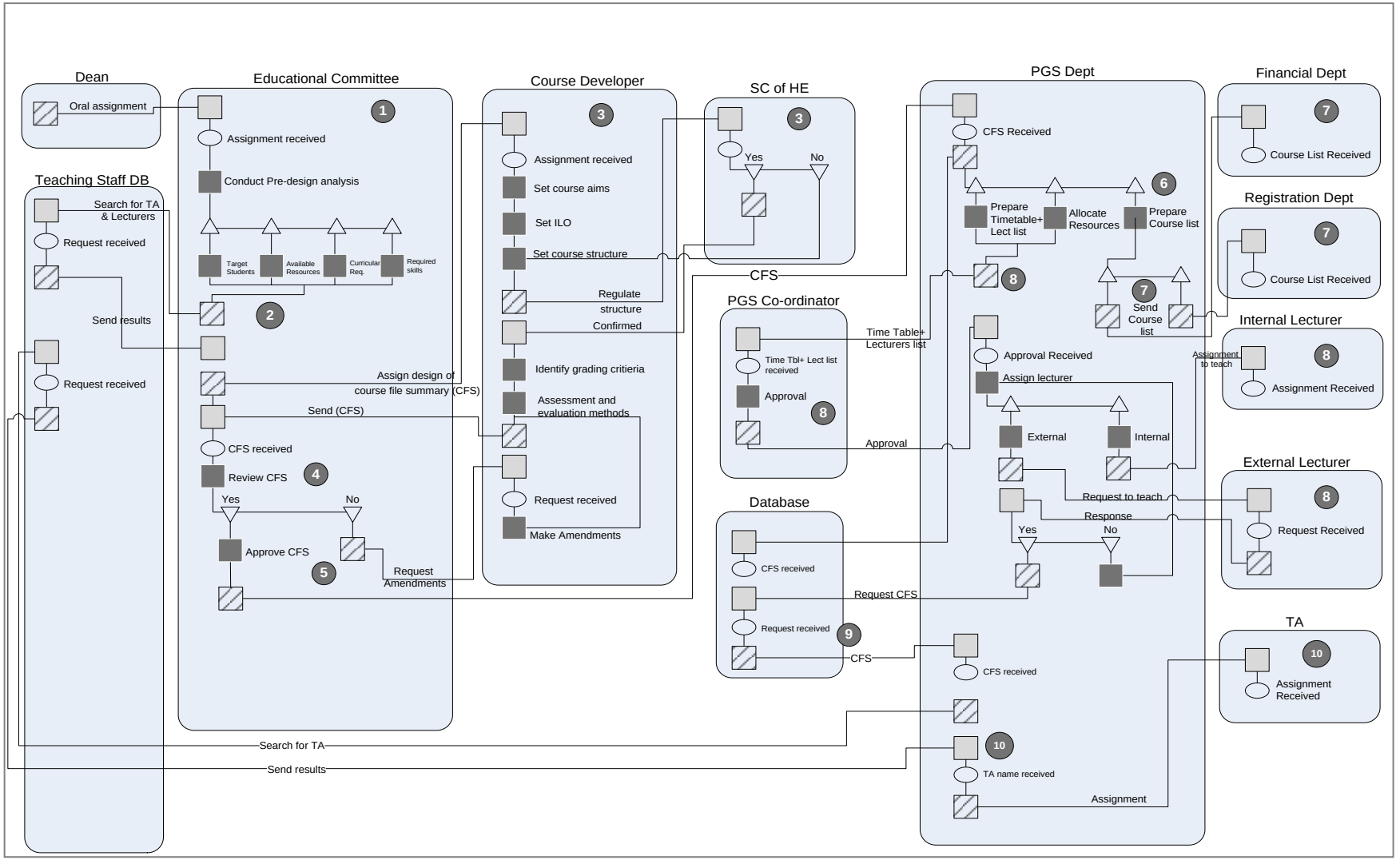


Figure C2: Proposed Improved Course Design Process

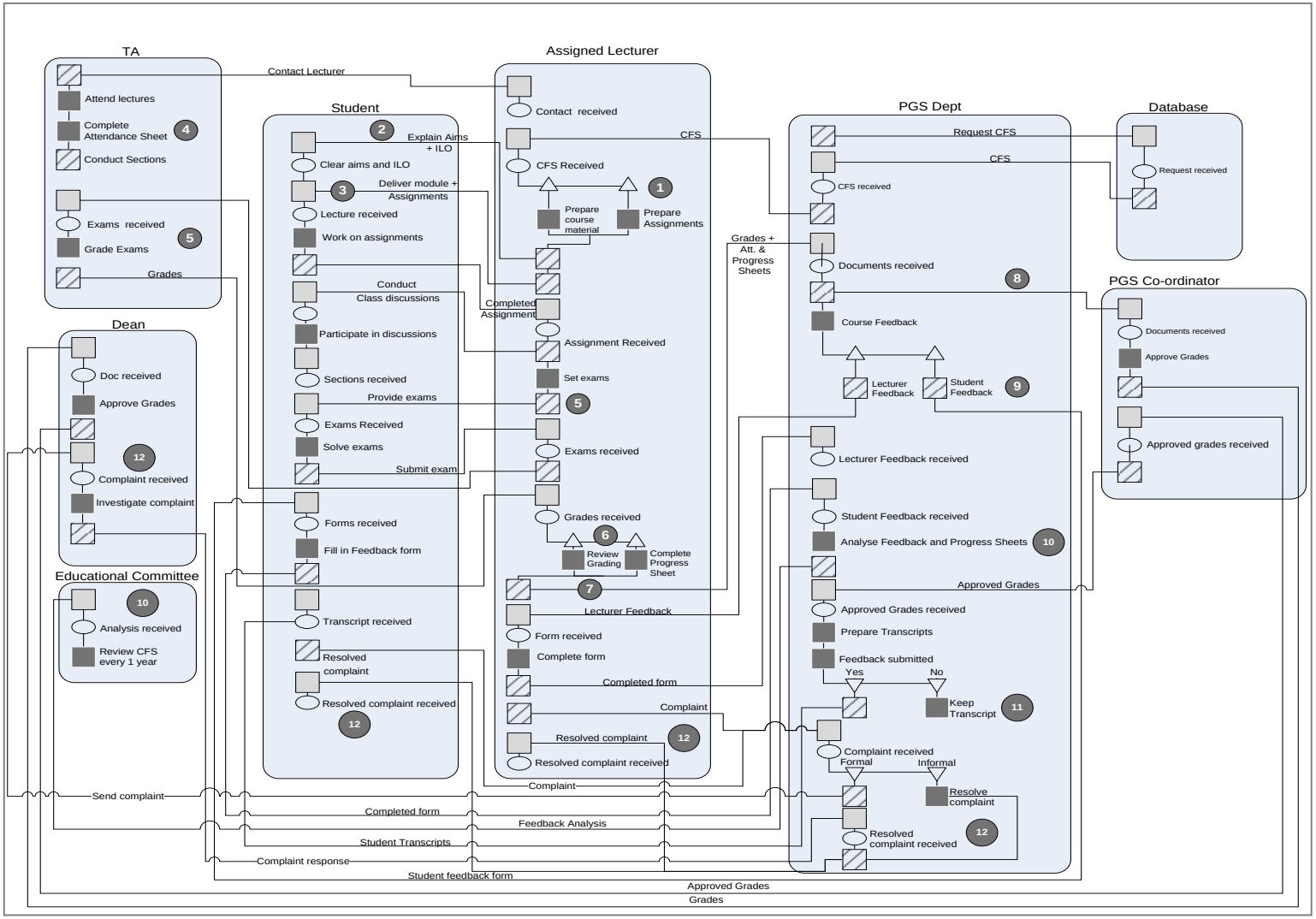


Figure C3: Proposed Improved Course Delivery Process

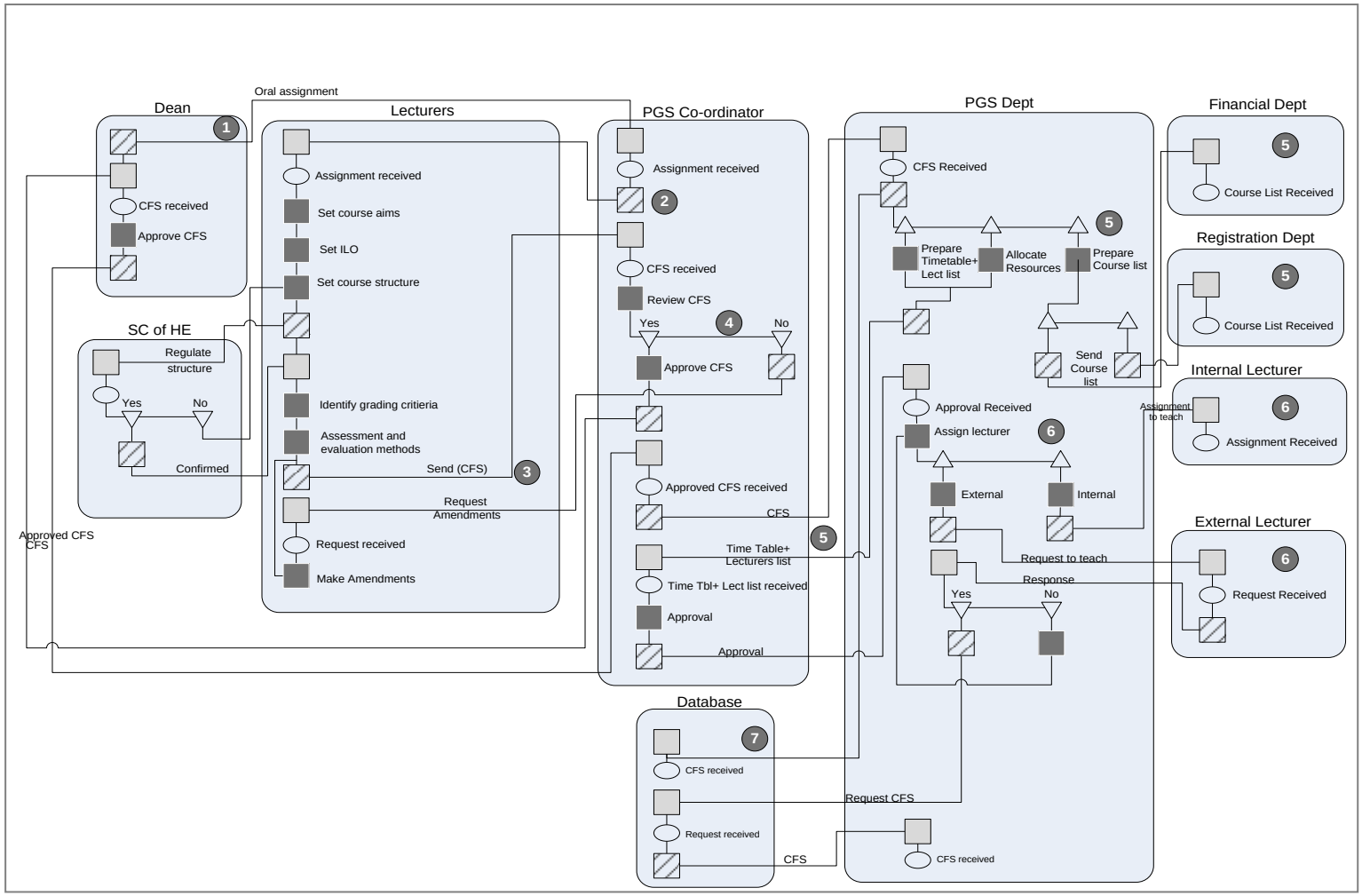


Figure C4: Current State for Course Design Process

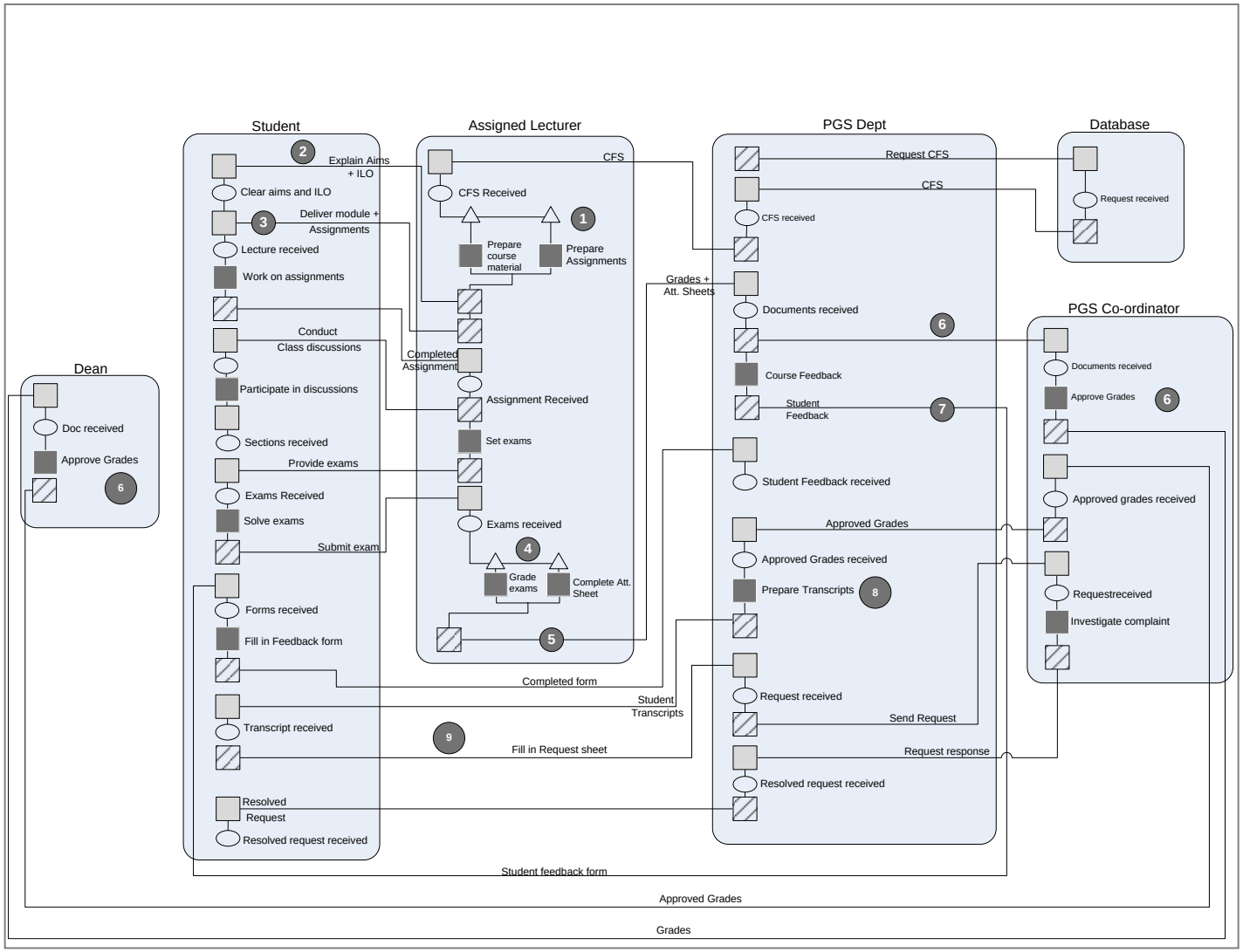


Figure C5: Current State for Course Delivery Process

Appendix D
Role Activity Diagram (RADs):
Students' Journey Processes based on Procedures

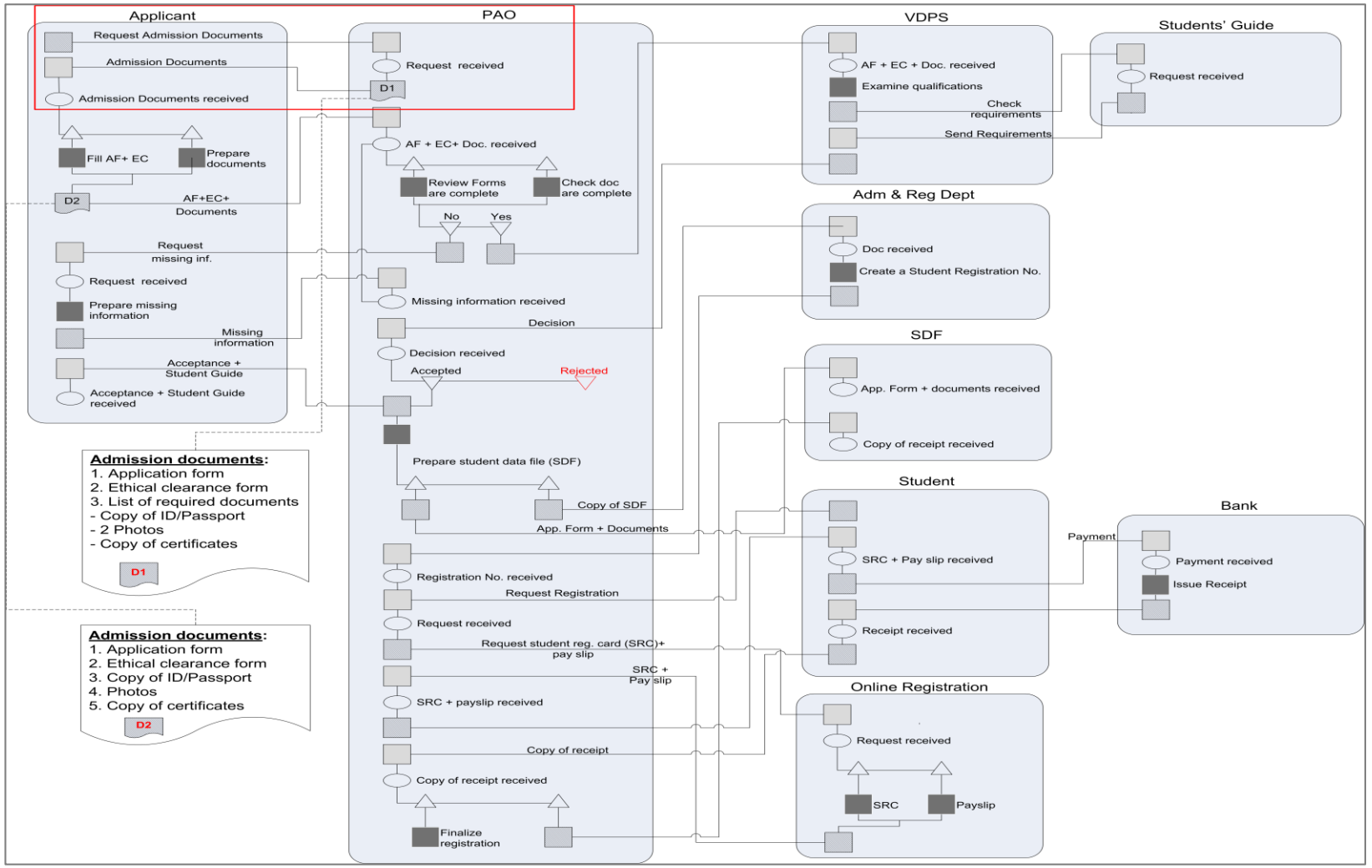


Figure D1: Admission and Registration Processes

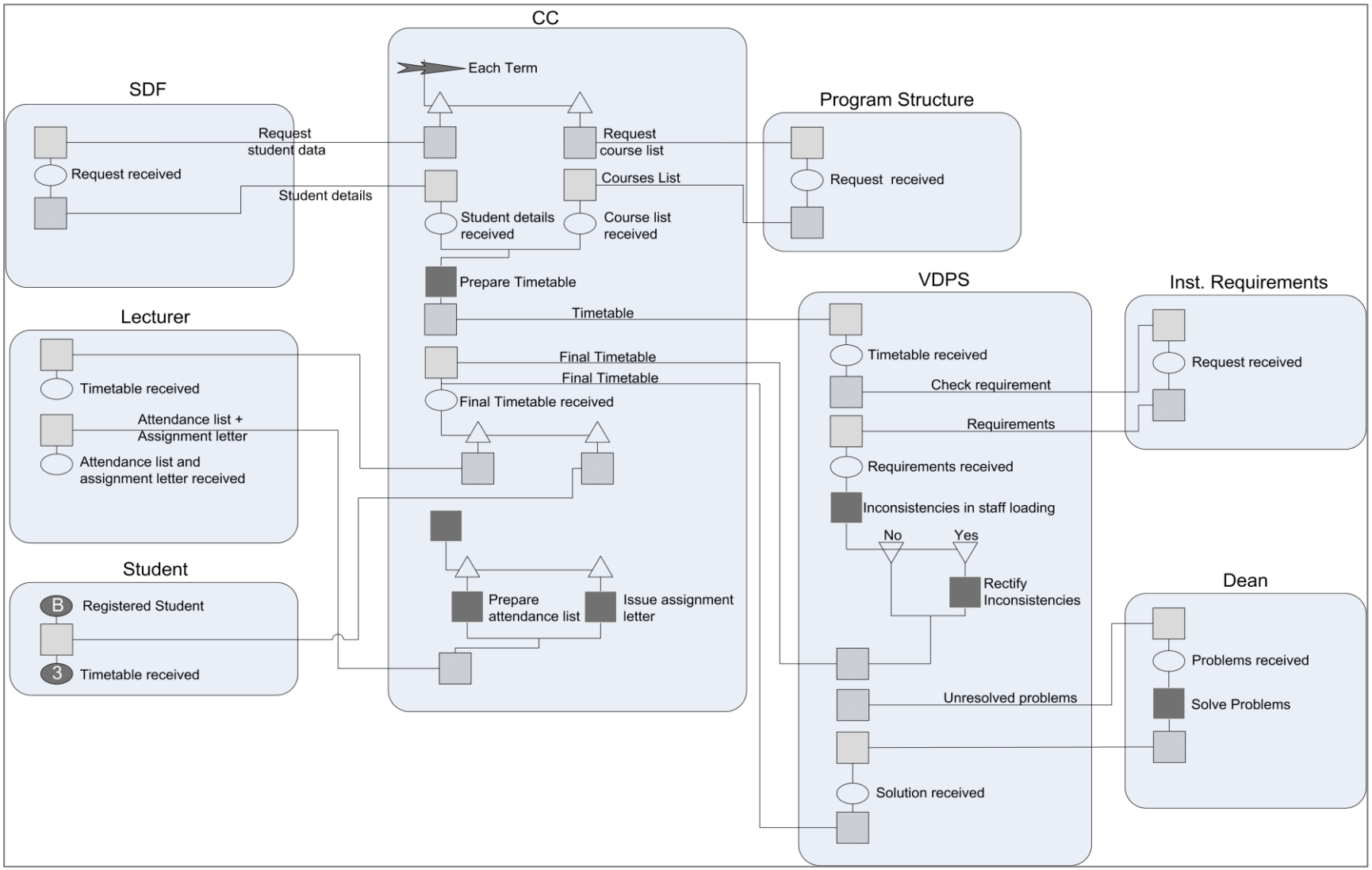


Figure D2: Timetabling and Loading Process

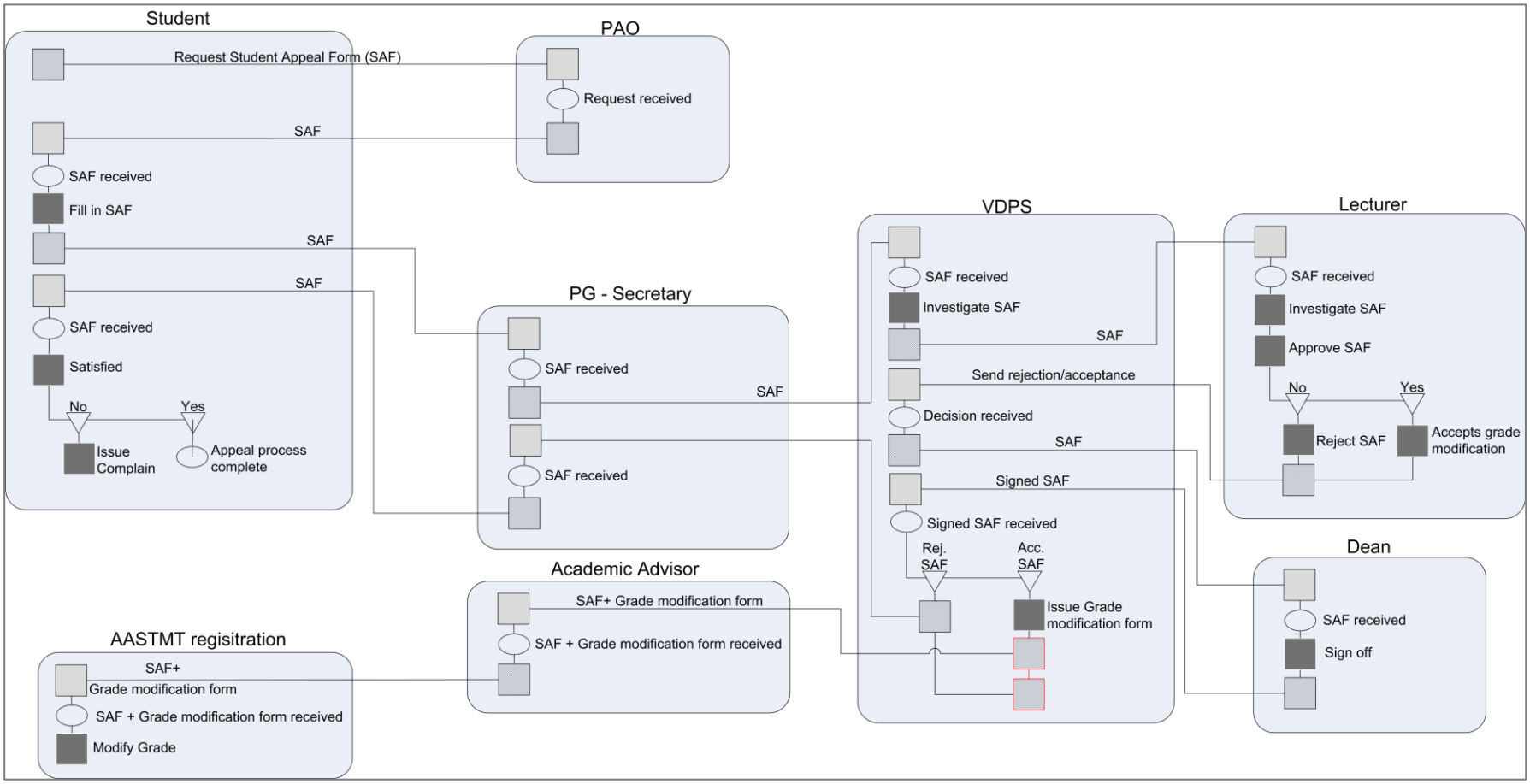


Figure D3: Student Appeal Processes

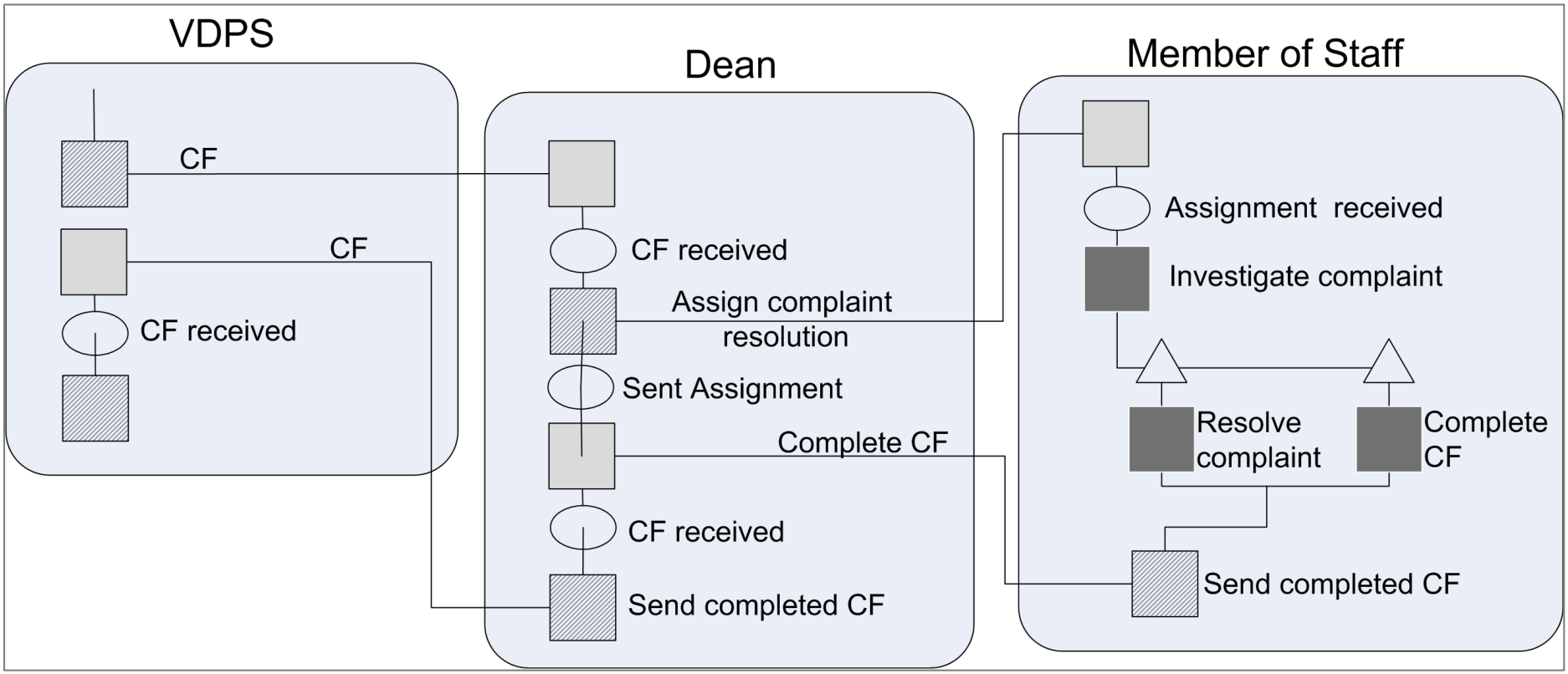


Figure D4: Complaint Process

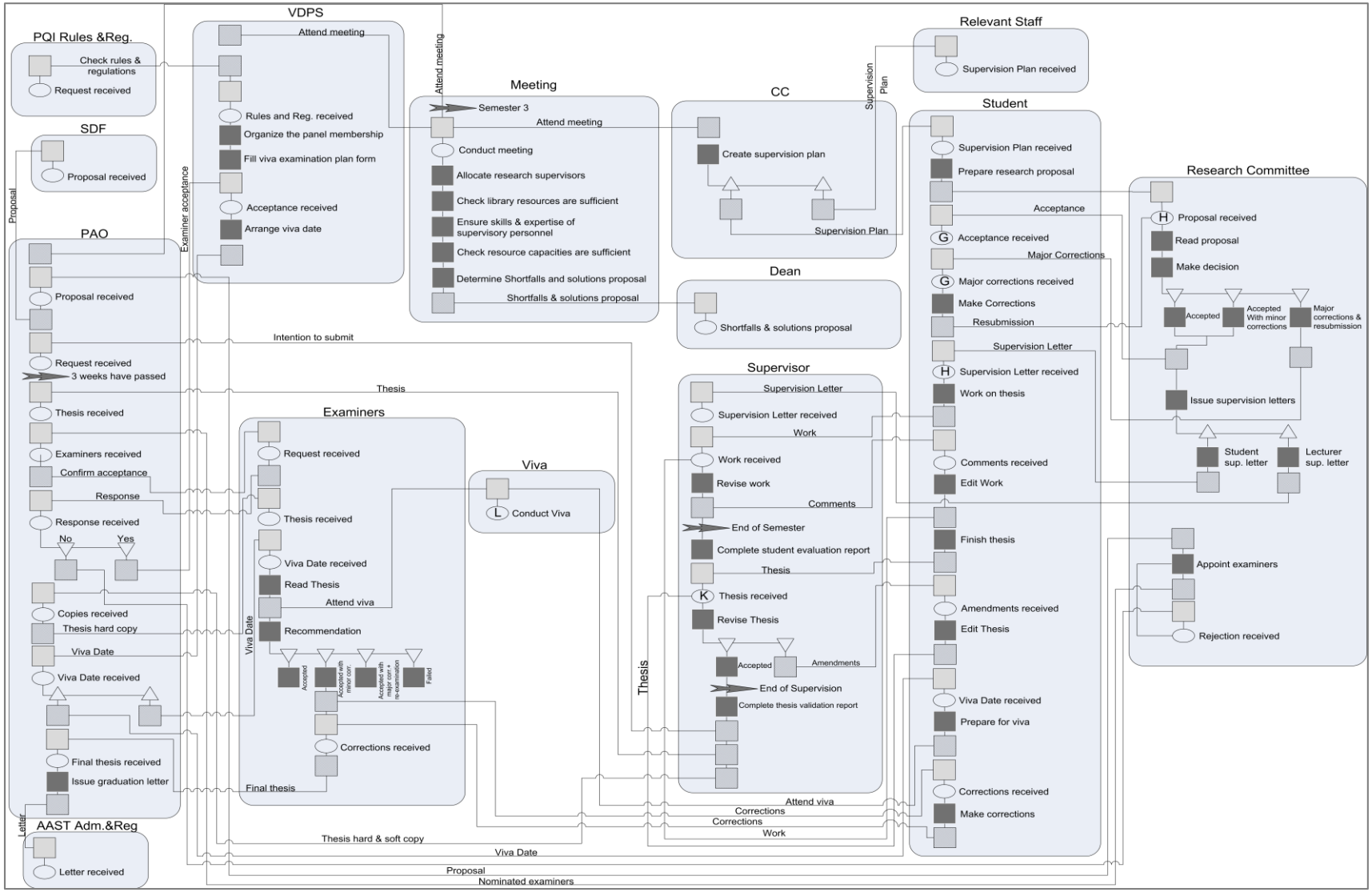


Figure D5: Research Supervision Processes

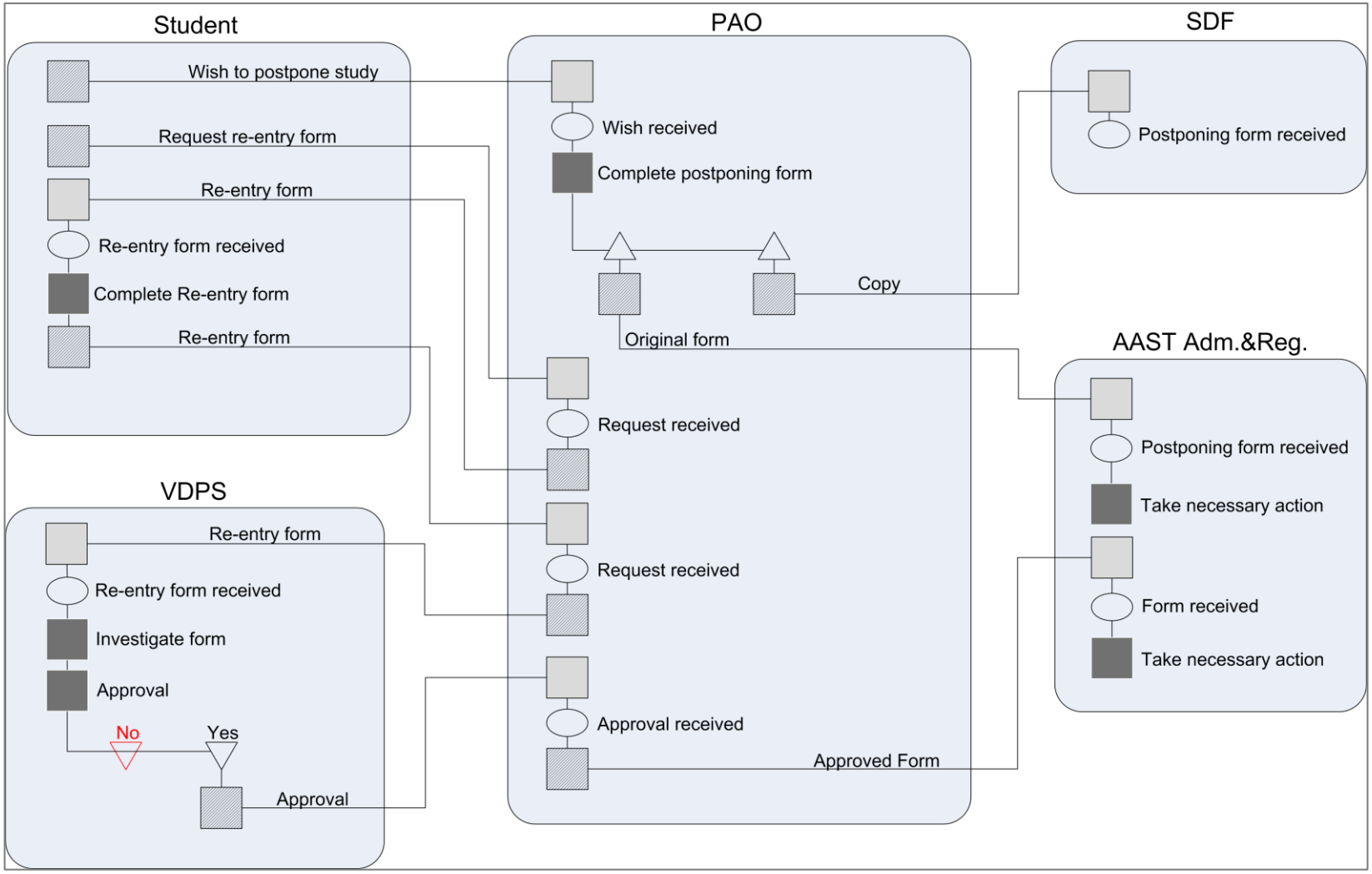


Figure D6: Postponing Study Processes

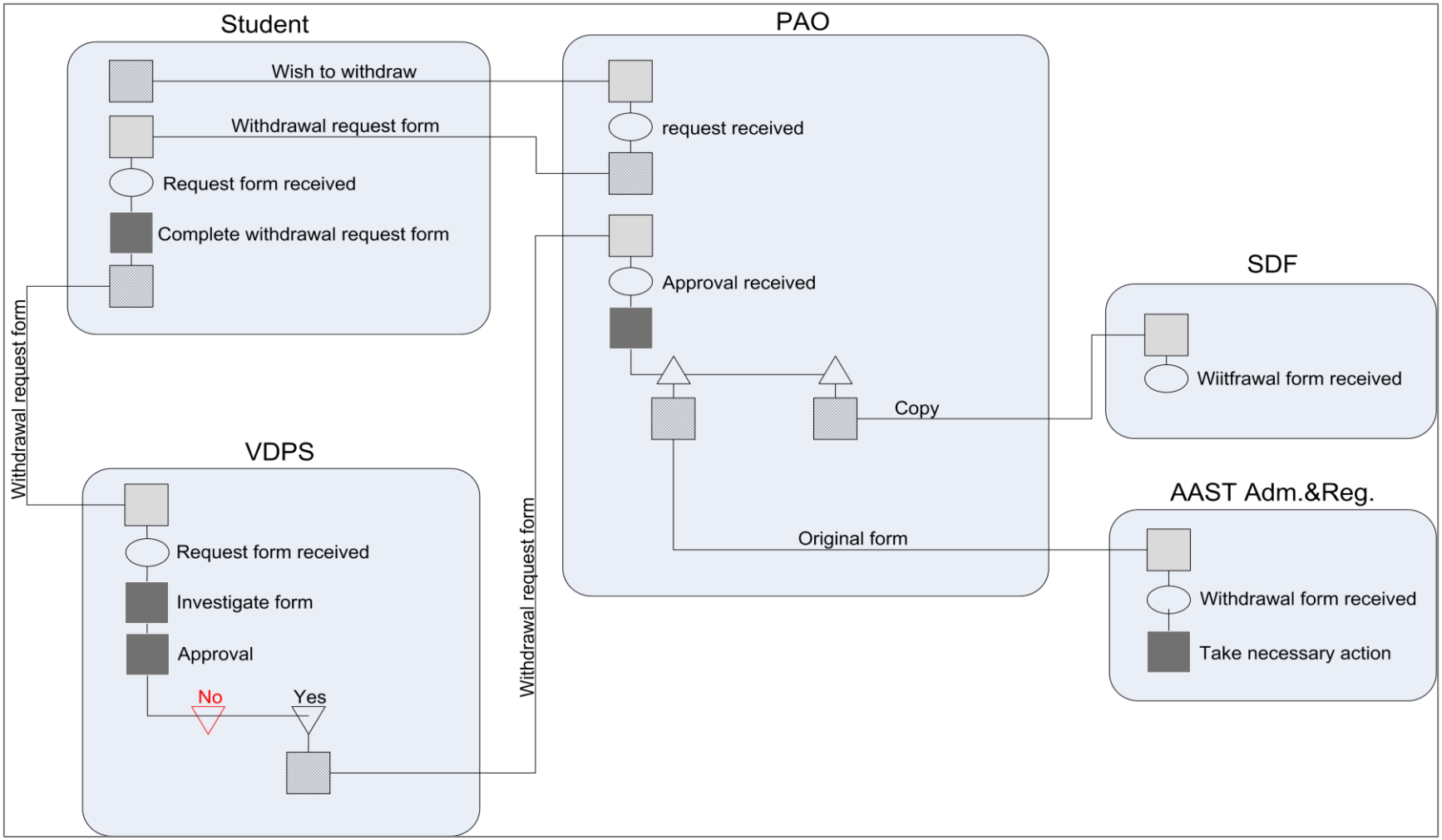


Figure D7: Withdrawal Processes

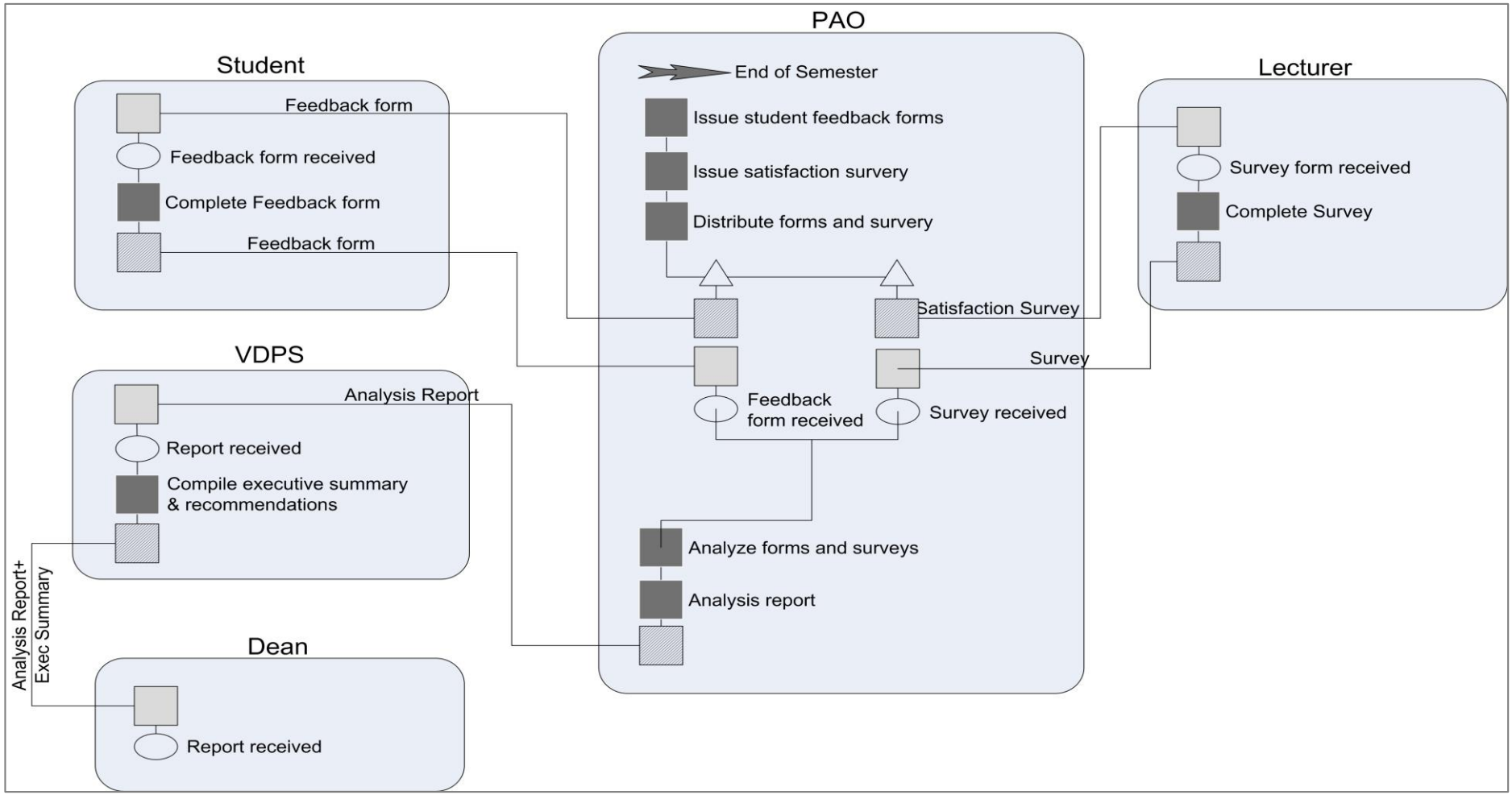


Figure D8: Feedback Processes

Appendix E

RADs-SSM models for Students' Journey Processes after conducting interviews

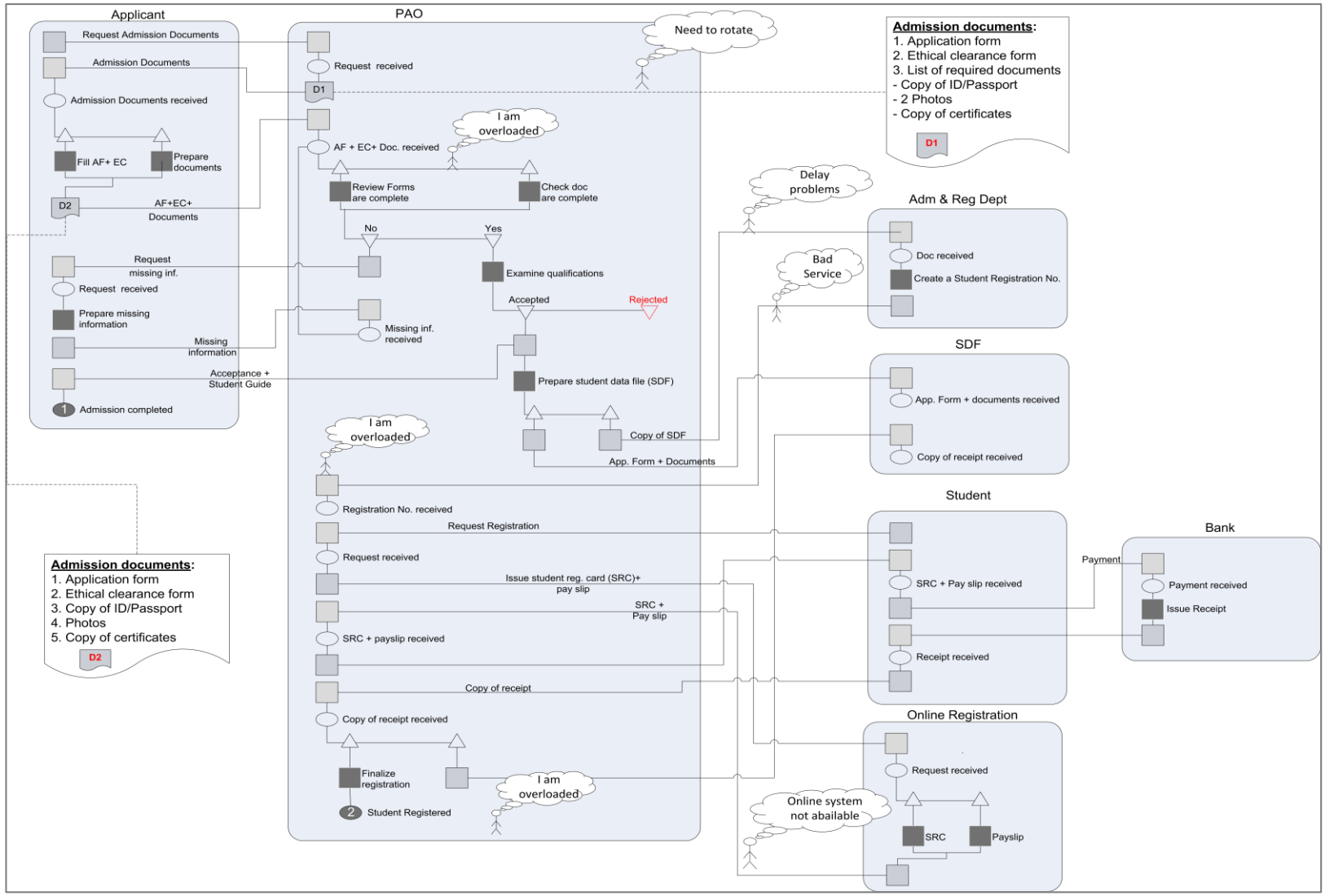


Figure E1: Admission and Registration Processes

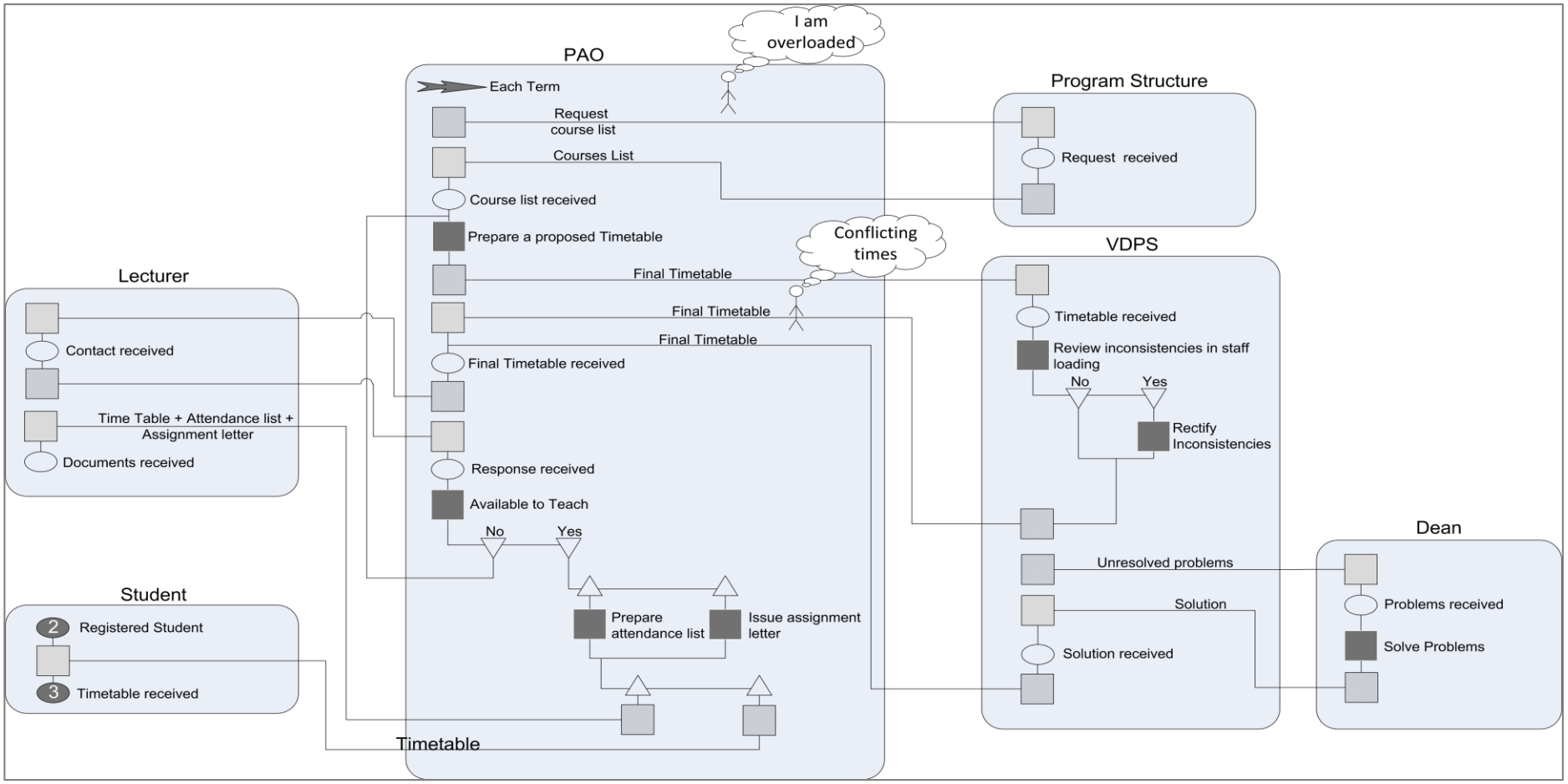


Figure E2: Timetabling and Loading Processes

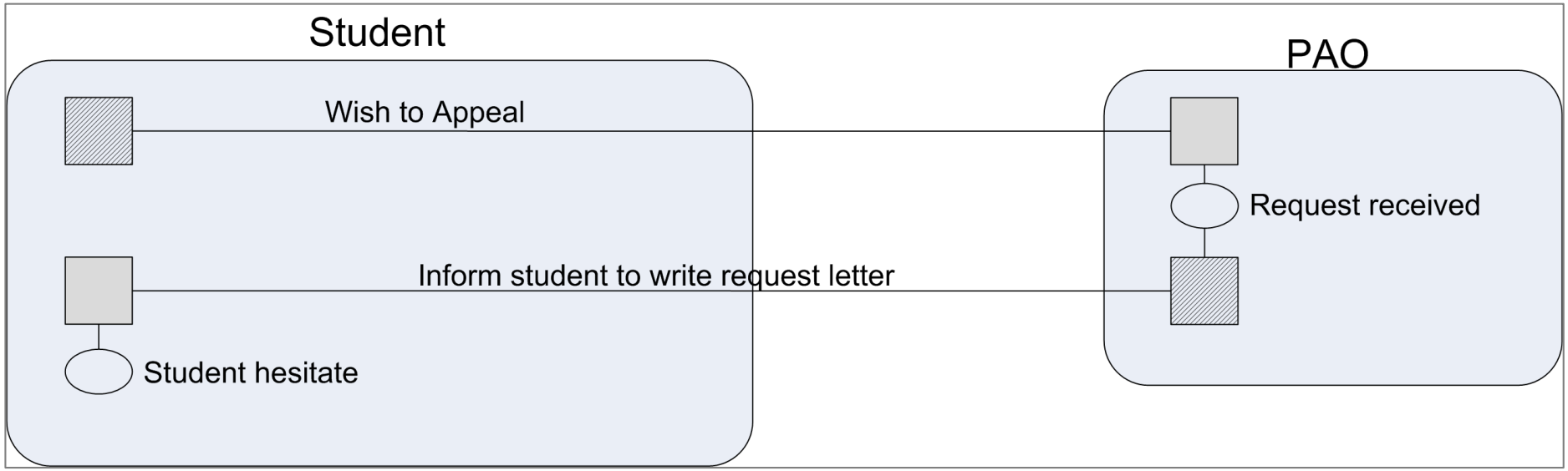


Figure E3: Student Appeal Process

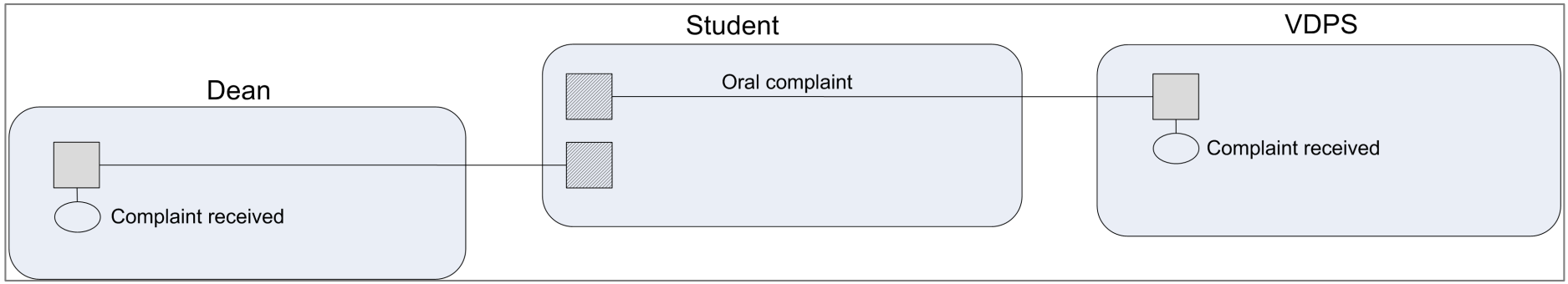


Figure E4: Complaint Process

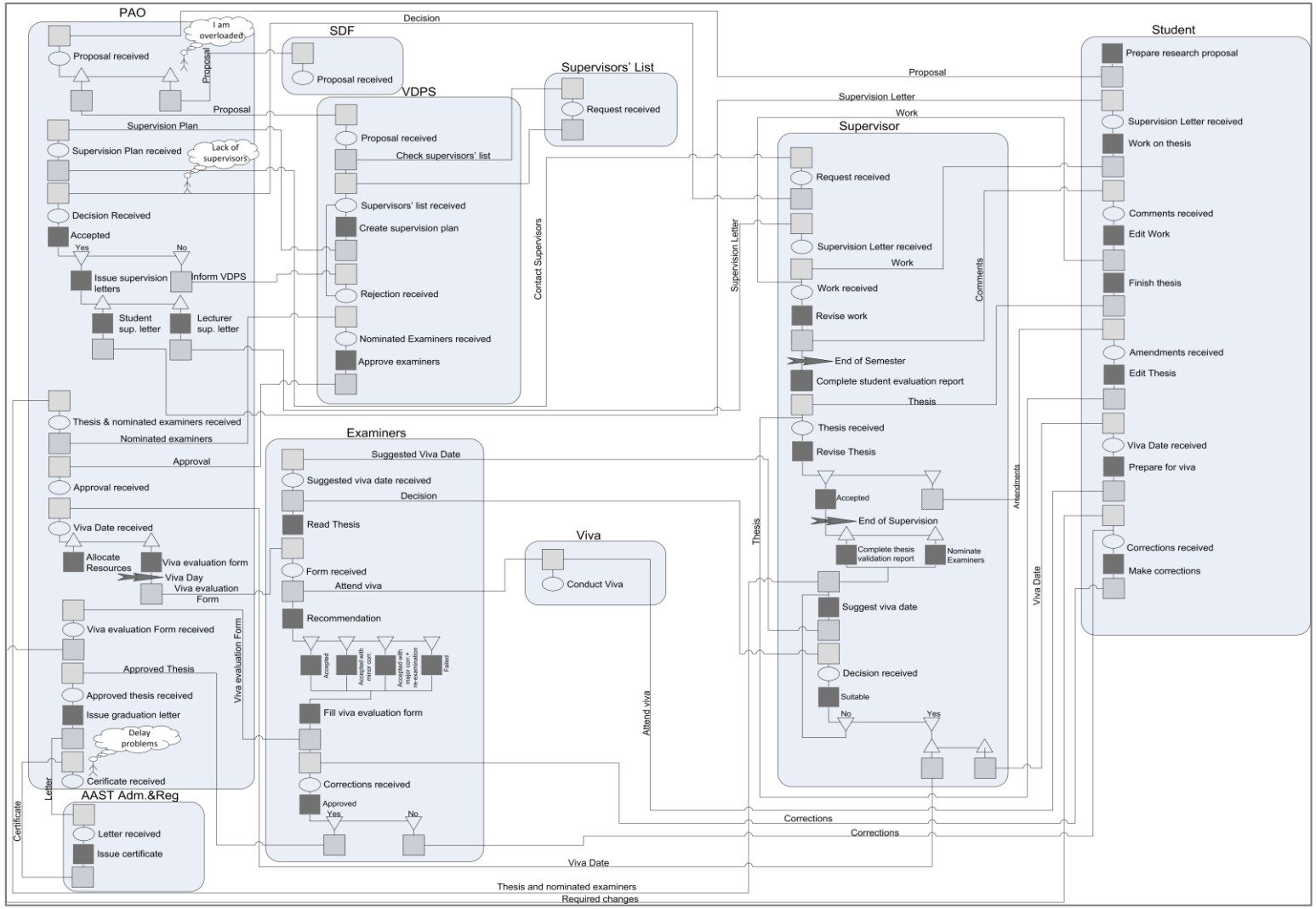


Figure E5: Research Supervision Process

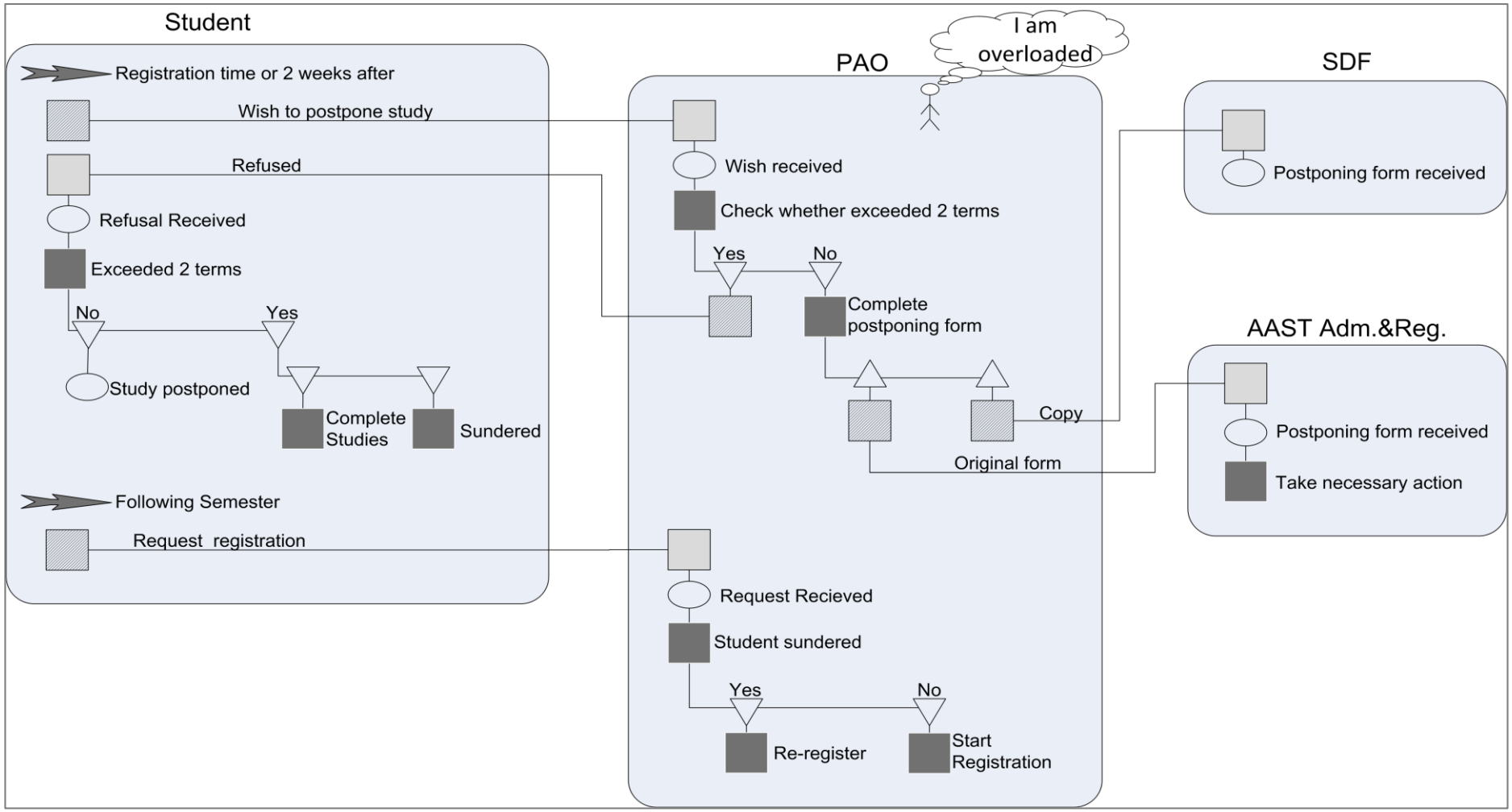


Figure E6: Postponing of Study Process

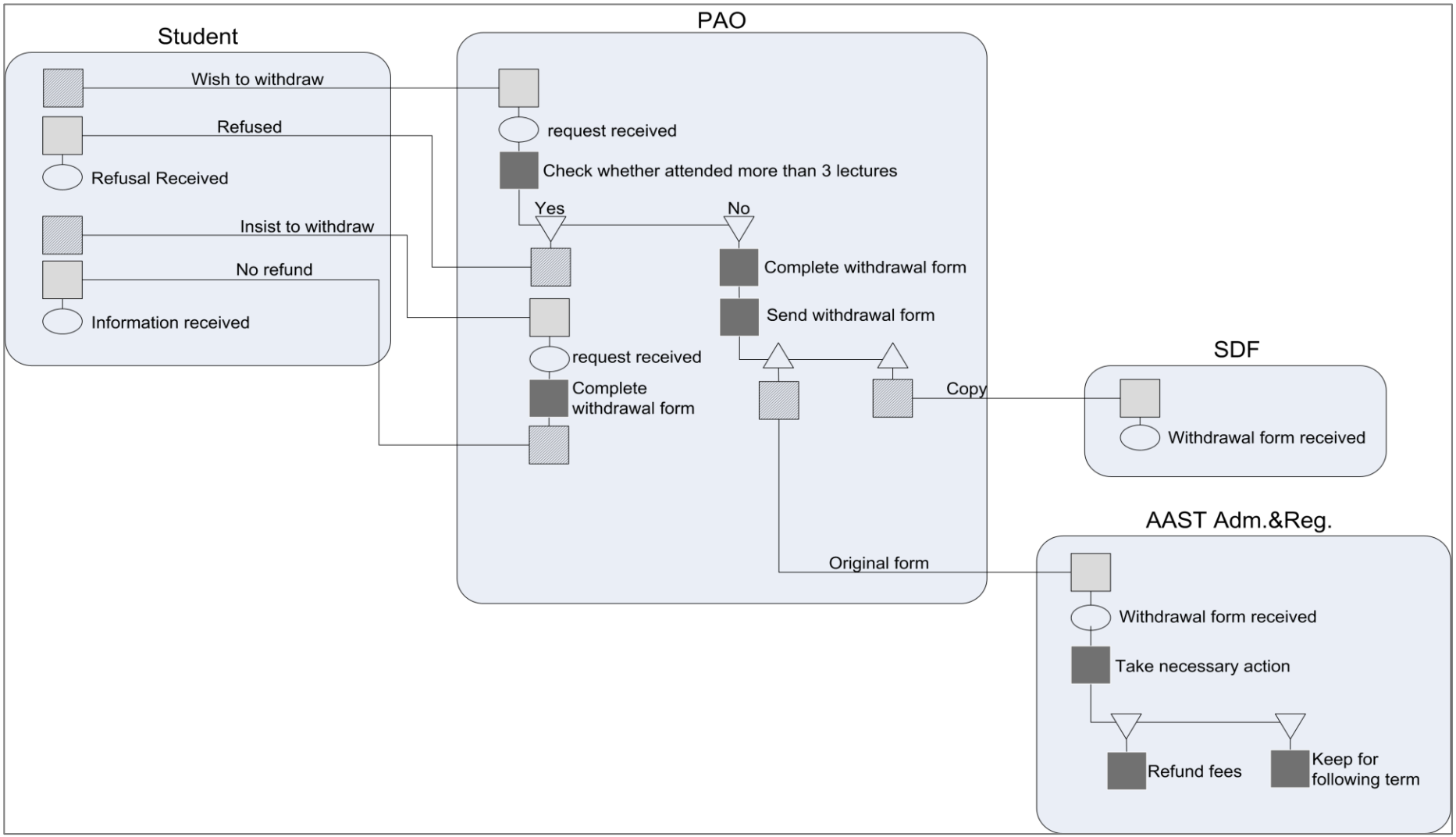


Figure E7: Withdrawal Process

Appendix F
Mind Map

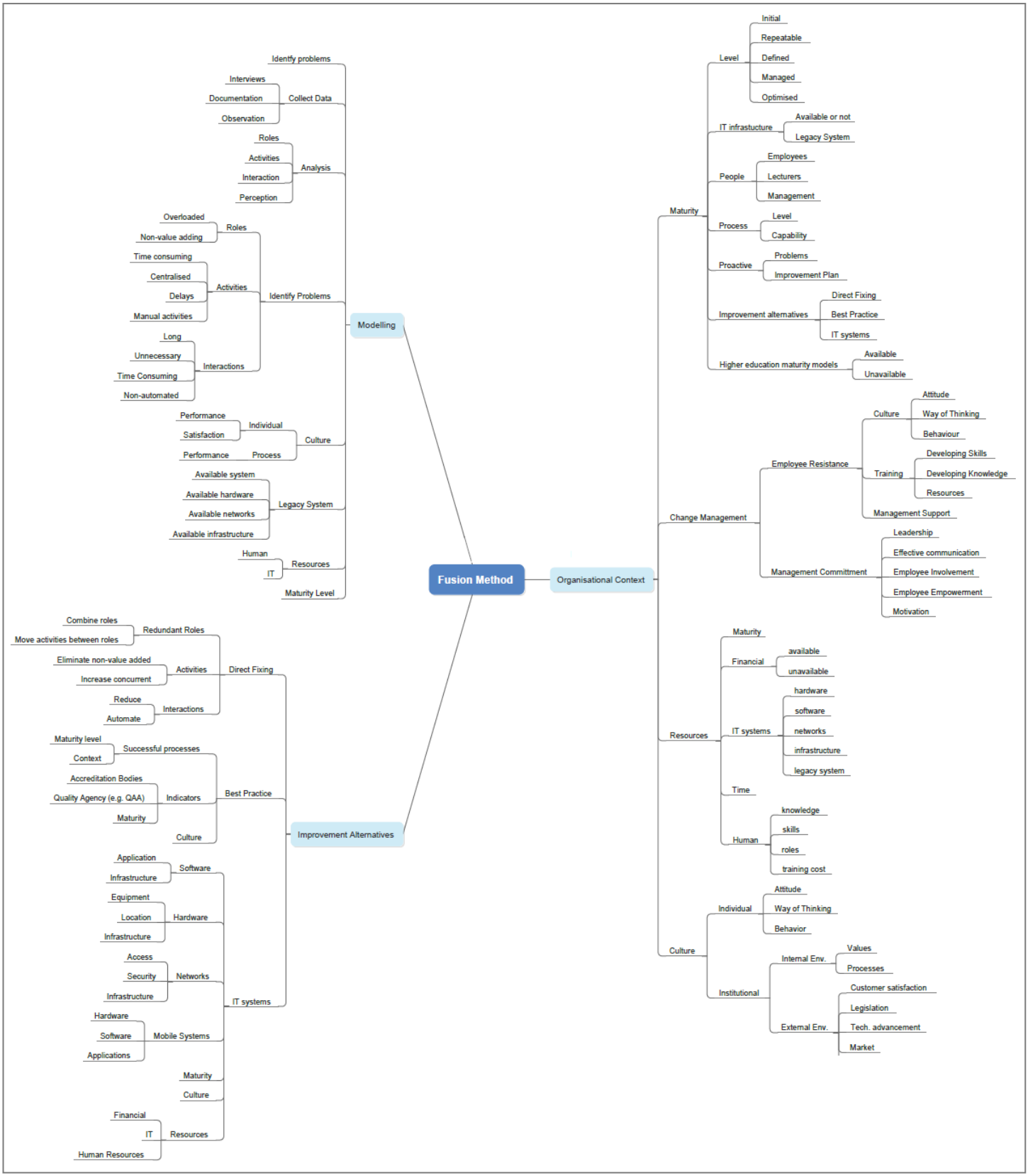


Figure F1: Mind Map

Appendix G
Final Year Project Process

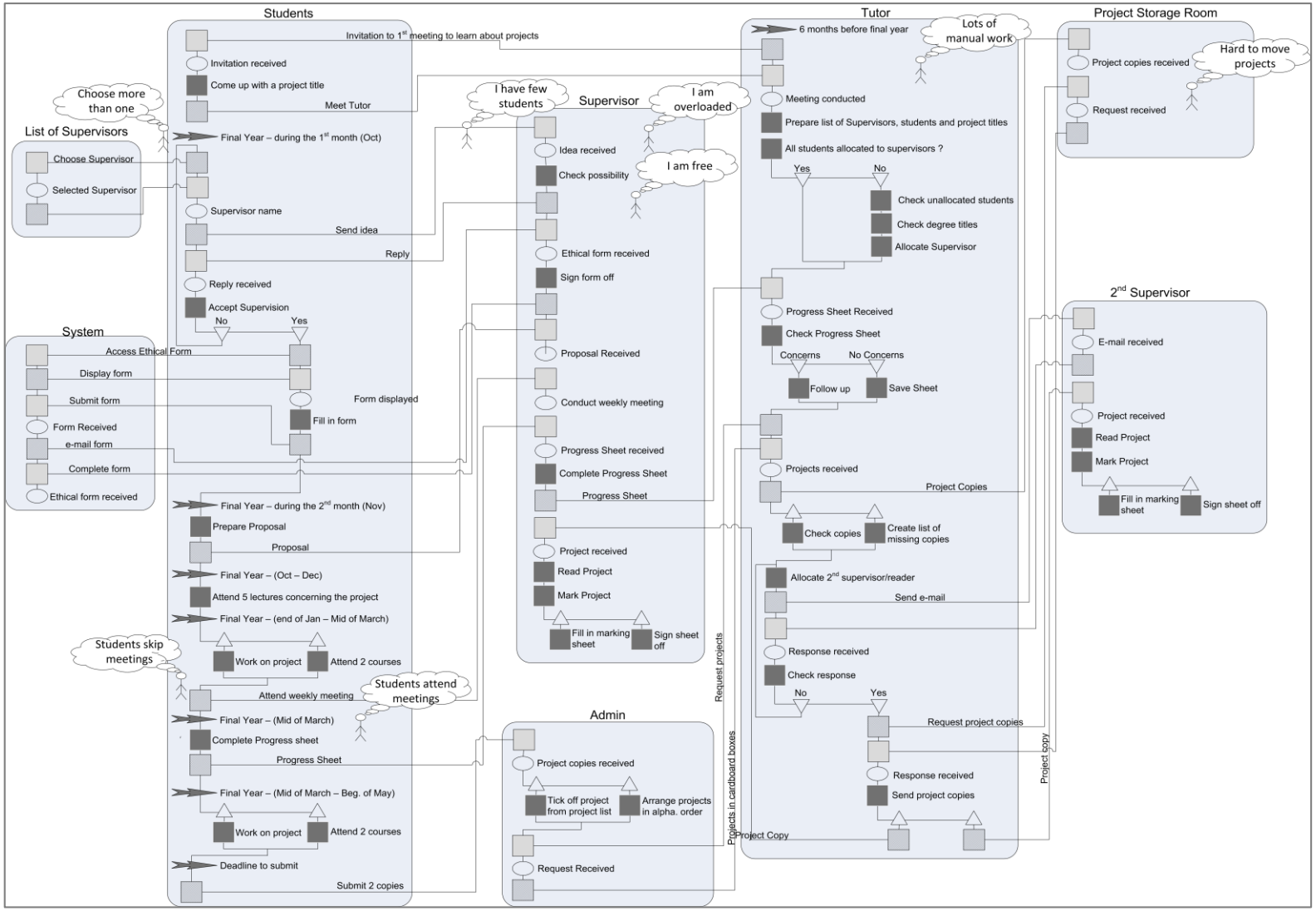


Figure G1: Final Year Project AS-IS Process

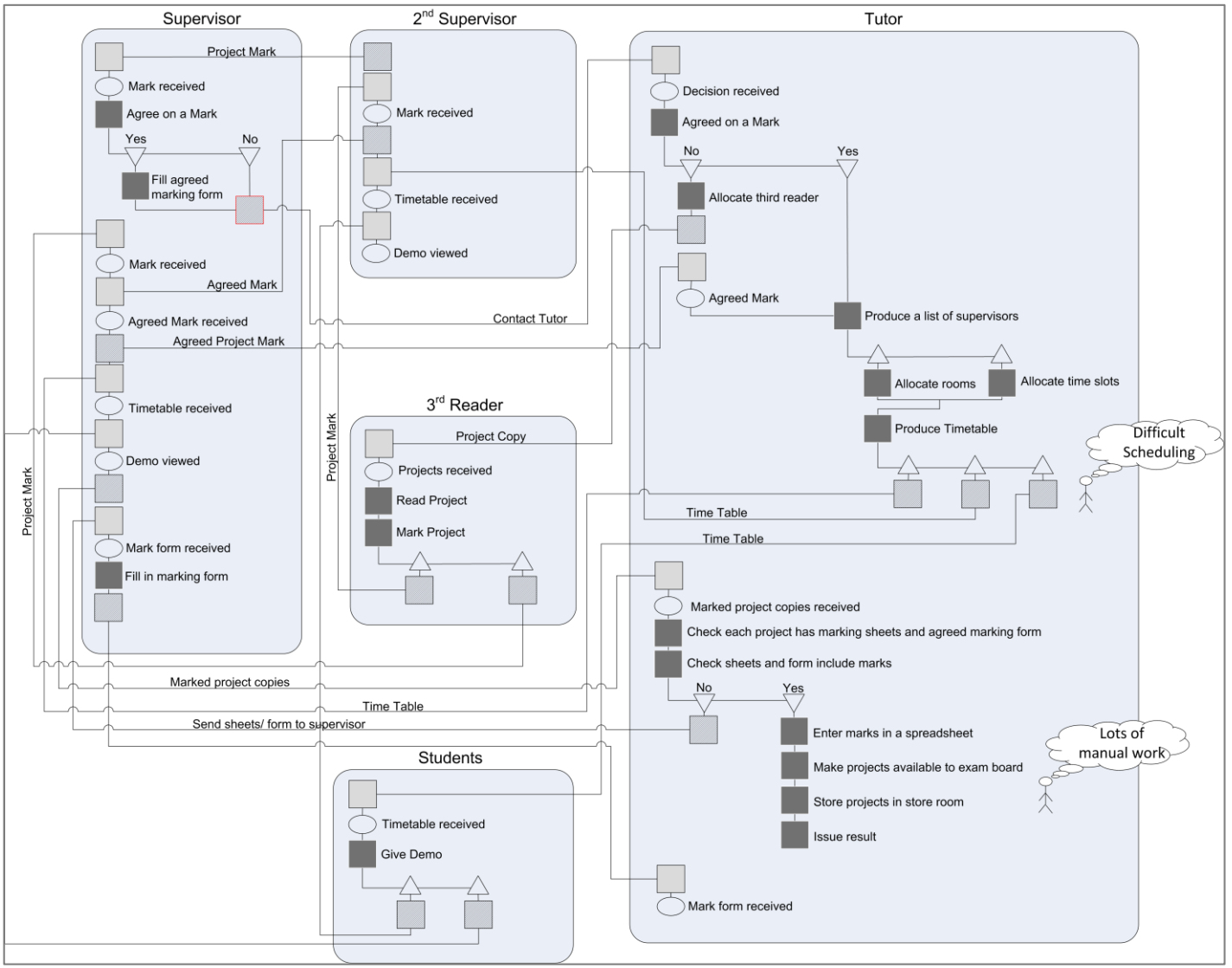


Figure G2: Final Year Project AS-IS Process (cont.)

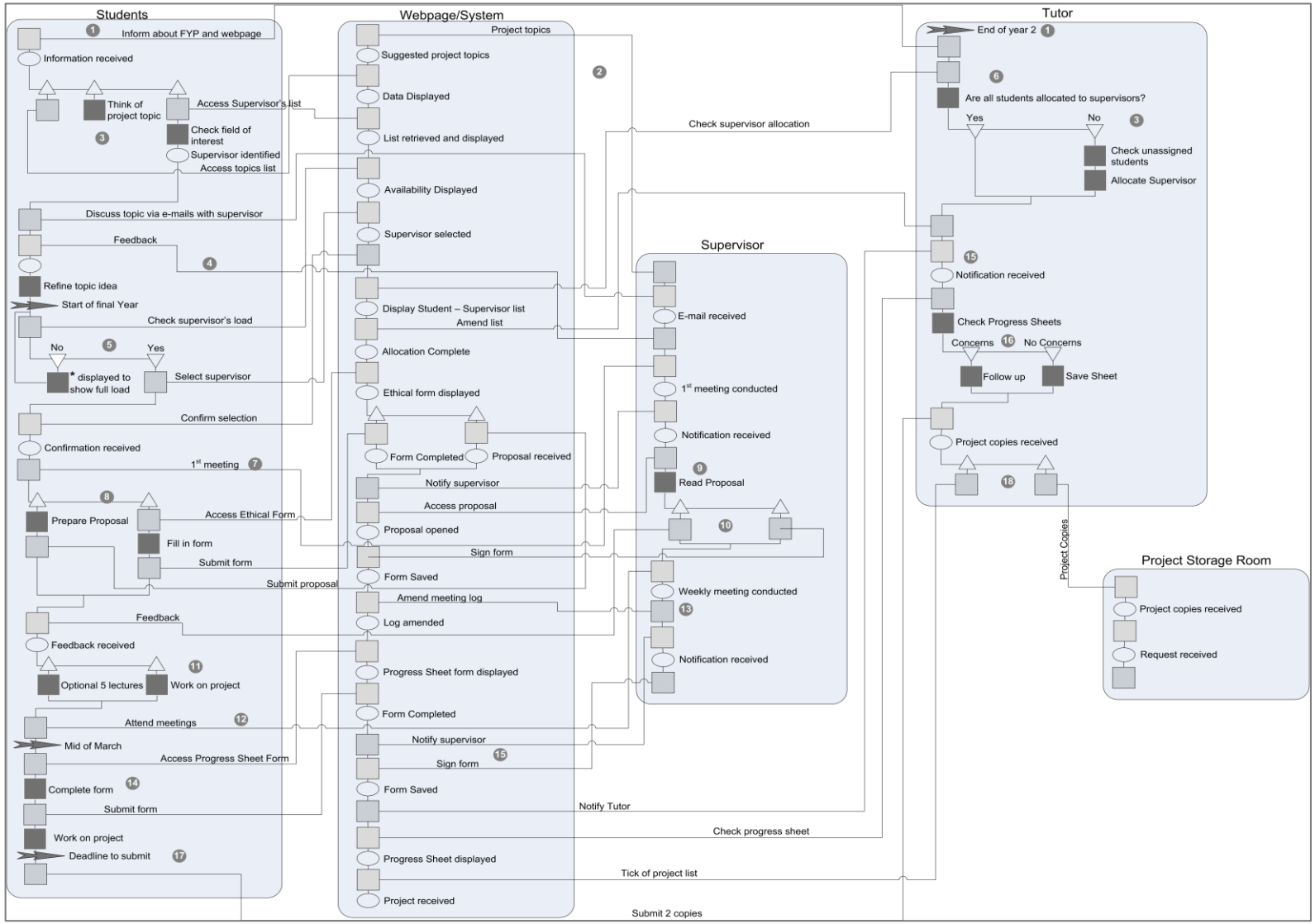


Figure G3: Final Year Project TO-BE Process

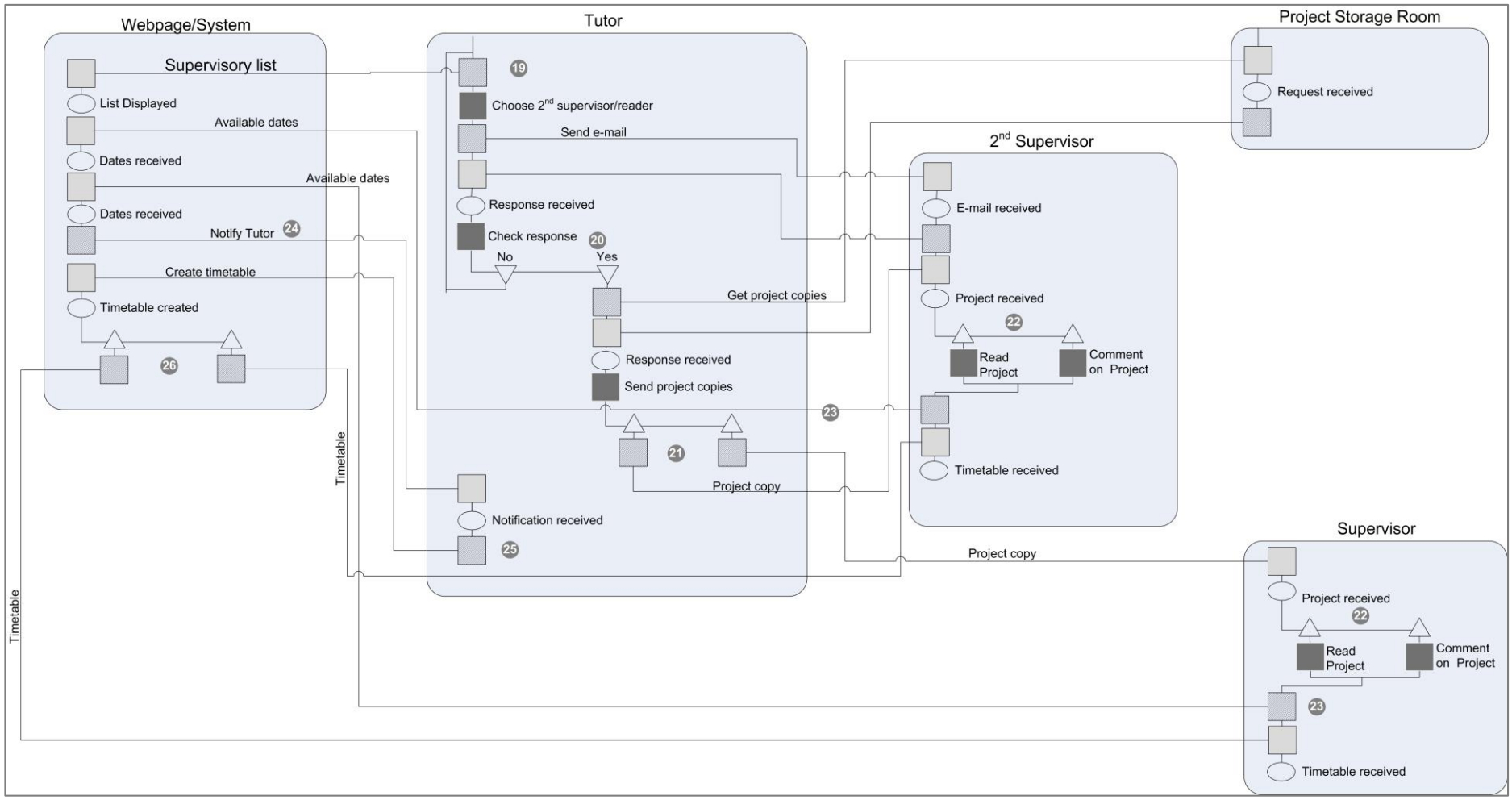


Figure G4: Final Year Project TO-BE Process (cont.)

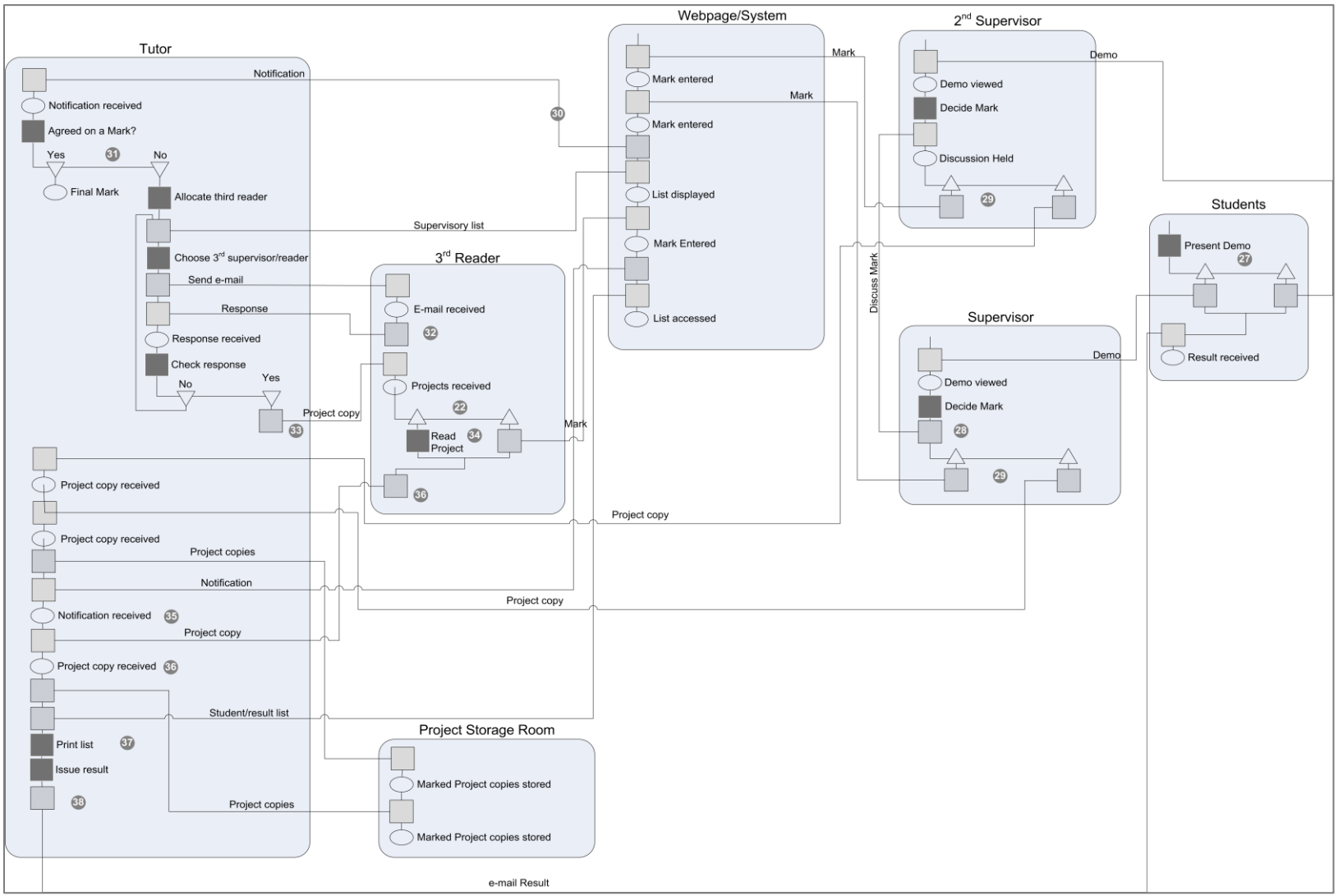


Figure G5: Final Year Project TO-BE Process (cont.)