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Using ICT to Improve the Egyptian Higher Education Business Processes: A Case Study

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Abstract: Applying business process modelling on higher education (HE) system enhances the understanding of the flow of work and the flow of information within and between its processes. In this research, Riva method is used to extract the essential processes of the higher education system and the relationships between them. The Arab Academy for Science and Technology and Maritime Transport (AASTMT) has been chosen as a major learning institution in Egypt. The structure of the learning process in the College of Management and Technology is analysed and modelled. This method simplifies understanding the nature of the learning system and disclosing unseen processes and activities that are performed in order to assess/examine the extent to which Information and Communication Technology (ICT) could be applied in this field. The essential business identified in the architectural model opens the door to compare the AASTMT system with other educational systems. The use of ICT in order to improve the HE business processes can also be generalisable.

Keywords: Business process modelling, ICT, Riva, Role Activity Diagram, Architectural model, higher education system.

Introduction

In higher education institutions business process modelling was used to enhance the quality of education by focusing on the graduates' satisfaction. Graduates' needs, requirements and expectations were outlined in order to fulfil the needs of the labour market (Dragan, Ivana and Arba, 2014). O'Neill and Palmer (2004) argued that service quality evaluation in higher education is more shifted towards psychometric performance rather than the practical value. Therefore, this results in poor improvement in the quality of education.

The ways services are delivered to customers have changed and automated applications were noticeable due to the penetration of technology and computers in many different sectors including education (Abd El Aziz, 2012). The number of university networks worldwide has been growing rapidly and students have started to use computers and the Internet as a vehicle

for self-directed learning, educational broadcasting and video-conferencing (El Gamal and Abd El Aziz, 2012).

The environment of Higher Education (HE) is developing due to a number of factors such as rising costs, shrinking budgets, and an increasing need for distance education encouraged the realisation of e-learning in HE creating new and exciting opportunities for both educational institutions and students (Wagner, et al., 2008).

In the Egyptian industry learning is a major fragment. Learning institutions in Egypt have recognised the significance of investing in technology in order to address factors such as controlling costs, attracting students, and fulfilling customers' needs like most service providers worldwide (El Gamal and Abd El Aziz, 2012). Therefore, in order to assessment/examine the extent to which automation and innovation could be applied in this field, the essential business needs to be analysed and modelled. Areas of improvements and redesign of business processes can also be assessed/examined for generalisation.

The Educational System

The Egyptian Higher Education (HE) sector includes 17 public and 19 private universities, respectively, located within major cities engaging 21,13,482 students in 2012 14,31,469 and 71,715 students (Information and Decision Support Center, 2013). One major problem facing the higher education in Egypt is the poor quality of education making graduates unable to meet the employment market requirements (El Gamal and Abd El Aziz, 2012), where the HE quality has been declining due to the rapidly growing enrolment rate that started in the 1970s and 1980s (El Gamal and Abd El Aziz, 2012), which lead to a large number of students per class.

There are a number of challenges that affect students' performance and their educational level; among which is the quality assurance and resource utilisation (Thandapani, et al, 2012). This in turn highlights the need for instructors to fully utilise the use of technology in the best way in order to add value to the class.

ICT in education makes it possible to track the student's performance by gathering information about the student from the time of his/her admission until graduation and employment. In order to improve and automate the learning system in higher education comprehensive and integrated systems are needed (Dawson, et al. 2010).

Standardising HE processes in Egypt

Education reform has been the main concern of many nations, driven by the setting of academic standards for what students should know and be able to do. Standardisation can be used to guide all business processes (Roffe, 1998). The SBE (standards-based education) reform movement calls for clear, measurable standards for all school students. Rather than norm-referenced rankings, a standards-based system measures each student against the concrete standard. Curriculum, assessments, and professional development are aligned to the standards (Dawson, 2010).

Standardisation has officially started in 1957, when presidential decree number 29/1957 established the Egyptian Organisation for Standardisation (EOS). Presidential Decree 83/2005 changed EOS name to the Egyptian Organisation for Standards and Quality. EOS has synchronised mandatory standards with international standards, 80 percent of which are mandatory standards based on standards issued by international institutions such as the Geneva-based International Organisation for Standardisation. In the absence of a mandatory Egyptian standard, Ministerial Decree Number 180/1996 allows choosing a relevant standard

from international systems such as the International Organisation for Standardisation (ISO) (Egyptian Ministry of Education, 2004).

The Egyptian government has also realised the importance of standardising education. A number of attempts have been initiated by the Egyptian government. The National Institute for Standards (NIS) is affiliated with the Ministry of Higher Education and Scientific Research, and is Egypt's primary standards laboratory. NIS is mostly concerned with measurements, testing, calibration, accreditation and consultation, and it also provides laboratory accreditation services.

Another main attempt of standardising educational processes is the National Authority for Quality Assurance and Accreditation of Education (NAQAAE) (www.naqaae.org.eg). NAQAAE is the accrediting body for all Egyptian educational institutions (higher education, pre-university, and Al-Azhar education). It was established in 2007 by a Presidential Decree. The main goal is to support Egyptian educational institutes by fostering quality assurance practices.

Thus, standardising educational processes are considered essential; even though the way they are implemented might differ. Standardising educational processes and procedures may help in obtaining and retaining accreditation, guarantees a performance assessment standard (Espinoza and Gonza´lez, 2013). This in turn would help attain quality standards for quality assurance purposes and accreditation standardisation (Sipilä, 2011). ICT implementation leads to process standardisation by repeatedly performing its activities. The utilisation of ICT in education is the focus of this research. This requires detailed analysis of educational processes in HE to assessment/examine processes that could be automated, semi-automated or perhaps totally un-automated.

Higher education has common activities in general that take place from the time students register in the first year until they graduate. The traditional functions of education were to facilitate and simplify the courses' materials by assessment/exam giving explanation, exercises, activities, and assessment/exams to students in class. Although, there are common and standardised activities in education, however, each instructor has his/her own style in education that could hardly be controlled. Therefore, standardising educational activities will minimise discrepancies among instructors.

Standardisation enables students and instructors from diverse cultures to be aware of the applied system in advance, to be confident in what they will achieve by the end of the educational period, which creates a kind of stability during the study.

Students from diverse countries may accordingly work together and exchange knowledge, experience and ideas to find solutions to problems in shorter time. Therefore, outlining essential processes may enable standardising the learning system processes in higher education, which paves the way for future improvements (Pillay and James, 2013).

Arab Academy for Science and Technology and Maritime Transport

The Arab Academy for Science, Technology and Maritime Transport (AASTMT) was first established on the 11th of March, 1970. The AASTMT was able to develop its programs and plans to become one of the largest educational organisations that encompass several colleges, institutes, centers, and campuses. These colleges are: Maritime Transport and technology, Engineering and Technology, Management and Technology, Computing and Information Technology, Graduate School of Business, International Transport and Logistics, Language and Communication, and Fisheries Technology and Aquaculture. The AASTMT has different

branches in Alexandria, Cairo, and Aswan. The AASTMT is also a fully accredited member of both the Association of Arab Universities and the International Association Universities.

In this paper, the focus is on the educational system of the College of Management and Technology (CMT). The CMT has several majors: Business Information System, Marketing & International Business, Finance & Accounting, Hotels & Tourism and Media Management. Each one of these has its own collection of courses and sections that is managed to deliver an adequate educational level for students.

As both authors are located at the CMT, and have been teaching there for over 15 years, we proceeded to apply the Riva method to produce process architectures after conducting several informal interviews to academics and technicians. Data was collected from all the academic documents related to teaching, exams, assessments, and others for further analysis. Information about the flow of work and the flow of information was gathered mainly by observation beside further interviews with key people in the registration department. Additionally, information about the structure of education and the learning system explained what educational processes being used in the AASTMT was also gathered by meeting head of departments in each major in Business College.

Mobile Usage In Egypt

According to the Ministry of Communication and Information Technology (MCIT), the number of Internet users in Egypt is 39.19 million in January 2013. However, the total number of mobile subscribers in Egypt has reached in January 2013, 96.11 million (115.92%), which reveals a growth of 5.24% (Egypt ICT indicators Portal, 2013). Therefore, it is obvious that there is an upward trend in the Egyptian mobile usage. This brings a calling need for investing on this fertile land, where banking is a leading sector and mobiles are highly valued and used.

Furthermore, 90 % of the telecom providers' revenue in Egypt is coming from voice services; however, this revenue will not be significant financially on the short term. Telecom operators is now trying to target, maintain and protect subscribers by offering new services such as m-banking service (Microfinance Africa, 2011).

Business Process Modelling

The various CMT activities and their interconnections can better be understood by modelling the learning processes. These processes can be modelled using a variety of methods. However, it is important to select an appropriate method that links business process design to process implementation; which widens the scope for communication between different parties involved in a process (Abd El Aziz and Fady, 2012). Due to the high uncertainty and dynamism of the environment and the increasing complexity of businesses, process modelling should provide a high-level of abstraction with which to visualise patterns in the business (Green et al., 2009) that reveals basic structure for organisations in the same line of business.

Process modelling identifies business processes in two different ways; an abstract model and a detailed model (Beeson et al., 2009). The purpose of modelling is to link the process design with the implementation. In the abstract model, an overall picture about the organisation's processes would be drawn. However, in the detailed model, every process could be investigated independently.

The generated model could then be used to produce a prototype for the flow of work and the flow of information; consequently, improvements could be easily managed (Fady and Beeson, 2009). Process modelling can be used to break an organisation's activity down into small processes made up of actions and interactions. The modelled processes can then be analysed and perhaps improved. New processes can be designed and old ones altered. With the support

of business process management software, processes in a model can be enacted to become real processes in the organisation.

Riva Method

The Riva method of business process modelling (Fady and Beeson, 2009) is considered a business-oriented rather than software-oriented, in that it focuses on the management of business entities through the actions and interactions of different roles, rather than on a reduction of business to logic.

The method combines two forms of diagramming; namely process architecture and role activity (Ould, 2005). A process architecture diagram shows several or all of the business processes in an organisation, and how they relate to one another. On the other hand, a role activity diagram shows, for a single process, the activities within roles and the interactions between them. In this paper, we will develop an initial process architecture diagram but will not go on to depict the internal structure of individual processes.

In process architecture diagramming, the aim is to find and draw those processes which act on key objects or entities that the organisation must deal with. These objects are called Essential Business Entities (EBEs). An EBE could be a product or service provided by the organisation, an internal or external customer, or it could just be things the organisation has to deal with during its day, or otherwise 'cannot get away from'. Ould suggests that organisations in the same line of business have to deal with the same EBEs. Organisations are also occupied with objects that are not fundamental to the business, but rather arise out of the way an organisation chooses to do its business. These Ould calls Designed Business Entities (DBEs). These may well differ between organisations in the same line of business (Ould, 2005).

Business entities (whether essential or designed) become units of work for an organisation, in the Riva method, when they are tracked and followed from the time they arrive in the organisation till the time they leave. A unit of work (UOW) diagram shows how different units of work are involved with one another, or generate one another (Abd El Aziz and Fady, 2013).

Building from the UOW diagram, each unit of work can then be treated as a case process within which roles, activities and interactions can be delineated in a role activity diagram. At a higher level, information flow and dynamic relationships between processes can be represented in a process architecture diagram. In addition to each unit of work being modelled as a case process, the flow of units of work through the organisation also needs to be modelled, as a case management process. Case processes and case management processes, and the interactions between them, are modelled in the process architecture diagram.

Once a process architecture diagram has been drawn for a business (or part of one) on the basis of the business entities it handles, it becomes possible to consider whether any improvement or streamlining of the business looks possible. Perhaps some processes could be enhanced, or dropped, or re-ordered. Perhaps departments could be restructured or responsibilities reallocated (Fady and Abd El Aziz, 2010). The diagram permits a debate about change to commence. If sufficiently detailed, and given sufficient software support, the diagram could also serve as a basis for the enactment of new or changed processes in the organisation.

AASTMT Process modelling: Essential Business Entities

A listing of EBEs captures the essence of the business of a particular kind of organisation (Ould, 2005). All entities of interest are initially listed, and the list is subsequently reduced to keep just those judged 'essential'. The following list shows suggested EBEs for AASTMT.

Entities that represent things made by the organisation:

Educational rule: rules that guide the educational process like credit hours, prerequisites, grading scheme...etc.
Course curriculum: The content of each course, including grade distribution, dates and number of assessment/exams, activities, quizzes and assignments.
Schedule plan: The schedule of lectures per semester.
Assessment/exam plan: The schedule of assessment/exams per semester.

Things that the organisation sells:

Book: materials written and printed to aid in the educational process as a reference to be used by students for learning, some books are written by instructors and published by the organisation.
Digital book: books published and can be accessed online using digital devices to aid in the educational process.

Services offered by the organisation:

Lecture: a class weekly scheduled every week where the students meet with the instructor to simplify the course materials as planned in the course curriculum. It might include practical as well as theoretical classes.
Admission: accepting or rejecting a prospective student. By applying the terms and conditions
Registration: students can register each semester in a number of courses according to the number of hours allowed to him/her.
Fees collection: payments done by students each semester for registering credit hours.
Assessment/exam: questions given to students to assess/examine their understanding of the curriculum.
Evaluation: grading of students' performance according to their in-class activities, assessment/exams, assignments, quizzes, projects and others.
Office hours: extra time assigned by instructors to meet the students in their office for any further explanation or information about the course studied.
Advising: assisting students in planning which courses to register in the forthcoming semester.

Service lines the organisation has:

Instructors' educational level: the degree obtained by instructors in addition to their academic experience.
Educational level of students: applying latest educational techniques and bringing in the latest technological advancements for education, including latest computer systems and software.

Things the organisation cannot get away from:

Accreditation: certification needed and obtained from a certifying educational body like ministry of higher education.
Quality assurance: following quality assurance techniques and complete documentation, like ISO standards.
PhD holder: instructors who hold a PhD degree.
Maintenance: the process needed to check all equipment, tools, labs and others for the purpose of fixing, repairing or maintaining any damage.

External customers to the organisation:

Students: individuals who enrol for the purpose of education.

Internal customers for the organisation:

Staff member: employees who work for the organisation.

Things the customers want or have that are EBEs for the organisation:

Student appeal: students can write their complaints about any unsatisfactory condition formally in a student appeal.
Library service: students can access physical as well as online libraries using this service.

Things that differentiate the organisations from others:
Teaching quality: undergoing seminars and training courses continuously.
Conference: preparing academic conferences.

Things the organisation deals with day-in, day-out:
Course withdrawal: students might voluntary withdraw a course or they might be dismissed from the course.
Student re-instate: students dismissed from any course might be re-instated again after investigation.
ISO standard: following quality assurance rules and complete documentation.
Grade: transforming the number grade to letter grade and computing the GPA.
Course path: identifies courses' pre-requisites and their corresponding semester.

Things outside the organisation it needs to respond to:
Local regulations: governmental rules that the organisation has to respond to.

The list of entities above may contain some entities that are not truly derived from the essence of the business. Ould suggests some tests for distinguishing EBEs from secondary entities.

- It should be possible to write 'a' or 'the' in front of an EBE.
- Entities designed by the organisation as a way of carrying out its business are not EBEs.
- Entities which are mainly roles or departments in the organisation are not EBEs.

By applying these rules, it is possible to reduce the list of entities. EBEs that are not generated from the essence of the business like educational rules, book, office hours, maintenance, quality assurance and other entities that are designed by the organisation to get the work done. Roles and departments are also removed. The list of fundamental entities or EBEs is then reduced to that shown in Table 1.

Table 1: Essential Business Entities at AASTMT

Course curriculum	Educational level of students
Lecture	Student appeal
Admission	Teaching quality
Registration	Course withdrawal
Fees collection	Student re-instate
Assessment/exam	Grade
Evaluation	Course path
Advising	

Process modelling for AASTMT: Unit of Work diagram
In Riva, units of work are those entities that have a lifetime in which the organisation is interested. The organisation keeps track of such entities from the time they arrive until they

leave. An entity does not become a UOW if the organisation is not interested in tracking it through its lifetime, nor if someone else has the primary responsibility for looking after it.

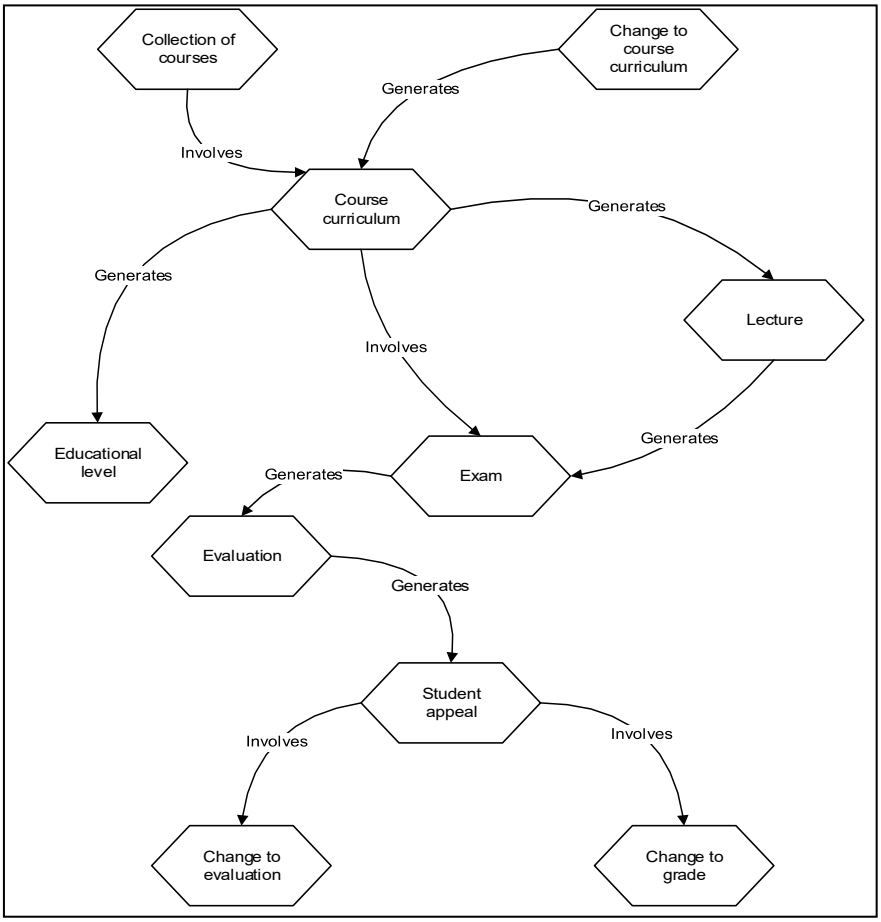
On this basis, some EBEs from the list in Table 1 do not qualify as units of work. Teaching quality, admission, registration, fees collection, course withdrawal, student re-instate, grade, and advising are all important components of the educational system, but the college is concerned primarily with looking after and tracking lectures and evaluations. A list of essential UOWs (EBEs that become UOWs) is shown as Table 2.

Table 2: Essential Units of Work at AASTMT

Course curriculum	Student appeal
Lecture	Collection of courses
Assessment/exam	Change to course curriculum
Evaluation	Change to evaluation
Educational level of students	Change to grade

Ould notes that it is possible for new units of work to emerge around collections of other units or out of changes to existing units. In the present case, the best candidates for 'unseen' UOWs are produced by having to deal with collection of and change to. This produces four additional units of work. A UOW diagram can now be drawn (Figure 1), to show the connections between various units of work, and in particular how they tend to produce or generate one another.

Figure 1: UOW diagram for AASTMT



Process Modelling for AASTMT: Second Process Architecture

In the final phase of modelling in this paper, the UOW diagram is elaborated into a Process Architecture Diagram (PAD). This step, in Riva, involves distinguishing between case processes and case management processes. For each UOW there is one of each of these. The case process (CP) handles each instance of a UOW that arrives at the organisation. 'Handle a. (unit of work)' is commonly used to name a CP. The case management process (CMP) manages the flow of cases for each UOW. A new case arrives first at the CMP, which then requests the CP to start working with the case instance. Managing the flow of processes might mean batching CP instances, putting them in order, prioritising them, solving conflicts that might occur and so on. The CMP activates and starts CP instances and interacts with them if needed. When naming a CMP the phrase 'manage the flow of' is used.

Each process (whether CP or CMP) is represented by a rectangle. The arrows show how processes make a request to, start, or deliver to one another. Two PADs are developed; the first and the second. In the first PAD, each CP is assumed to have a CMP, which can be reduced in the second process architecture, where only needed CMPs are left and the rest are eliminated. Three heuristics are used here to reduce the first-cut process architecture to the second-cut, see Figure 2. The three heuristics are: remove designed UOWs that have no effect on organisational goal achievement; determine whether service or task force relationships are appropriate - service are CMPs that take place outside their CPs and task force are CMPs that are absorbed in their CPs - ; and determine units for outsourcing where there is an advantage to do so (Ould, 2005).

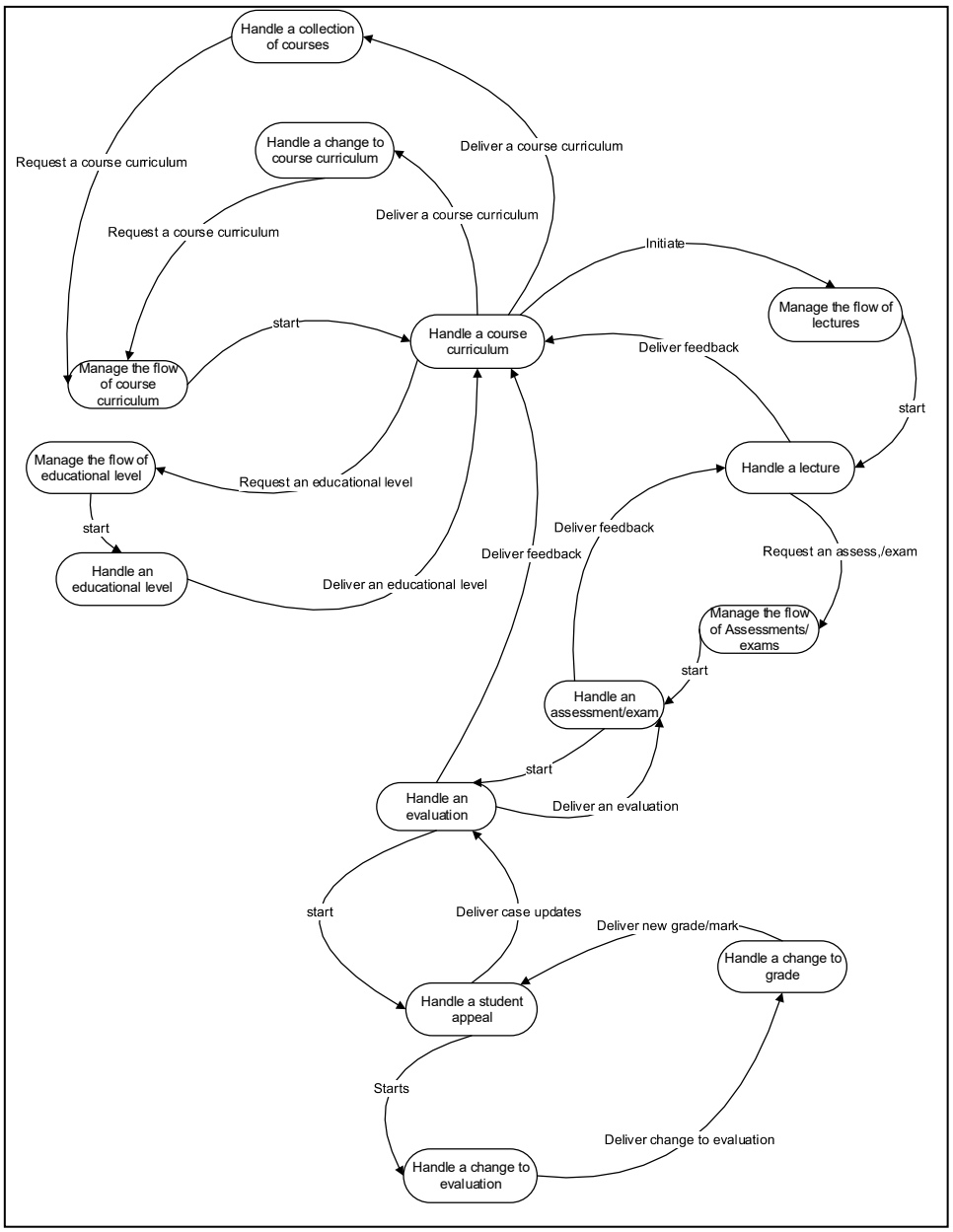
Only the second of the three heuristics mentioned above is used here to reduce the first-cut process architecture to the second-cut. An attempt has already been made to remove designed UOWs, and no consideration is given in this study to outsourcing. But a number of CMPs have been removed in accordance with the second heuristic: 'Manage the flow of evaluations', 'Manage the flow of changes to evaluations', 'Manage the flow of changes to grade', and 'Manage the flow of student appeal', The Initial process Architecture for AASTMT is eliminated in this paper for simplicity, and only the second PAD is used as a representation for the final depiction of the organisation. Based on the UOW diagram in Figure 1, the first and then the second PAD is elaborated to include CPs and CMPs for the UOWs, and the interconnections between them in Figure 2.

Information flow for AASTMT:

After interviewing key people and analysing documents, we were able to identify and analyse information flows between processes. The educational process in AASTMT starts by 'Handle a collection of courses' process and 'Handle a change to course curriculum' process that request preparation of courses' curriculum from 'Manage the flow of course curriculum' process that passes the request to 'Handle a course curriculum'. As a result, new courses are created and existing courses' curriculums are updated.

Accordingly, information about courses are passed back from 'Handle a course curriculum' process to 'Handle a change to a course curriculum' and 'Handle a collection of courses' process to be updated, as well as it initiates 'Manage the flow of lectures' process so that instructors are given the curriculums of their designated courses and the schedule is prepared according to courses' hierarchy. The same information is passed also to 'Manage the flow of educational level' process to start 'Handle an educational level' process based on the needs of the course contents. As a result a feedback about utilised educational tools and techniques is sent back to 'Handle course curriculum' process to see whether they have been applied or changes to course curriculum is still needed.

Figure 2: Process Architecture for AASTMT



Lectures are delivered according to the schedule and the curriculum in 'Handle a lecture' process. Feedback about the course delivery is sent to 'Handle a course curriculum' process after the course is delivered to compare the planned course to the actual course delivered. Based on the information coming from 'Handle a lecture' process about the delivered course and any special requirements or consideration for the assessment/exams, assessment/exams preparation starts requesting 'Manage the flow of assessment/exams' process to prepare an assessment/exam schedule that's delivered to 'Handle an assessment/exam' process to be done as scheduled.

Feedback about the assessment/exam contents is delivered from 'Handle an assessment/exam' process to 'Handle a lecture' process. All documents, assessment/exam papers, and other information received from 'Handle an assessment/exam' process are transferred to 'Handle an evaluation' process in which marking and evaluation take place. The assessment/exam results are then transferred back to 'Handle a course curriculum' process rather than to 'Handle an assessment/exam' process that would also deliver it to 'Handle a course curriculum' process.

Based on the assessment/exams results from 'Handle an evaluation' process, students might place an appeal in 'Handle a student appeal' process that reviews the student information and results before creating an appeal. If the information produced by 'Handle a student appeal' process approves revision of the case, then this initiates 'Handle a change in evaluation' process.

If the result approves changes in the mark or the grade to take place, then the produced information directly initiates 'Handle a change to grade' process rather than sending the information to 'Handle a student appeal' process that would initiate 'Handle a change to grade' process. Results from 'Handle a change to grade' process are sent to 'Handle a student appeal' process to close the case. Table 3 below shows the information transfer between processes.

Table 3: The information transfer between processes

Information	From Process	To process
Request updates/new course curriculum	• Handle a collection of courses process • Handle a change to course curriculum Process	Manage the flow of course curriculum process
Plan for curriculum updates	• Manage the flow of course curriculum process	• Handle a course curriculum process
Updated/New course curriculum	• Handle a course curriculum process	• Handle a collection of courses process • Handle a change to course curriculum Process • Manage the flow of educational level process • Manage the flow of lectures
Updated/New course curriculum	• Manage the flow of educational level process	• Handle an educational level process
Utilised course requirements	• Handle an educational level process	• Handle course curriculum process
Updated/New course curriculum	• Handle a course curriculum process	• Manage the flow of lectures process
Semester schedule and Updated/New course curriculum	• Manage the flow of lectures process	• Handle a lecture process
Course feedback	• Handle a lecture process	• Handle a course curriculum process
Lesson plan/actual contents delivered	• Handle a lecture process	• Manage the flow of assessment/exams process
Conditions and requirements for each assessment/exam	• Manage the flow of assessment/exams process	• Handle an assessment/exam process
Assessment/exam feedback	• Handle an assessment/exam process	• Handle a lecture process
Assessment/exam papers	• Handle an assessment/exam process	• Handle an evaluation process
Assessment/exam results	• Handle an evaluation process	• Handle a course curriculum process
Student information and results	• Handle an evaluation process	• Handle a student appeal

Information	From Process	To process
Approval of student appeal	• Handle a student appeal	• Handle a change in evaluation process
New grade/mark	• Handle a change in evaluation process	• Handle a change to grade process
New grade/mark	• Handle a change to grade process	• Handle a student appeal

Technological Advancements in AASMT:

Information technology has introduced new ways for communication and information transfer that ease the flow of work. AASTMT has also started to realise the importance of ICT in the learning process; especially in the HE. This is clear in the availability of computer laboratories, digital signage screens, data shows, back end information systems, and a web portal that allows direct data entry using electronic forms. However ICT is not fully utilised.

Although some information flows between processes are automated such as 'course feedback', 'assessment exam results', and 'students' information/results', almost all other information flows between processes are semi-automated. In semi-automated information flow computers are used to enter data using Microsoft office, but are not integrated and mostly involve printing paper and archiving documents. On the other hand, a number of crucial information flows between processes are completely un-automated, such as the 'Plan for curriculum updates', 'lesson plan/actual content delivered', 'Assessment/exam papers', and 'approval of student appeal'.

DISCUSSION

ICT plays a great role in the education industry. However, the educational system could not be improved using technology alone. Technology always exists within a social context. In this sense, in order to select the appropriate ICT technology from the technical perspective, it is necessary to clearly understand the business processes and detect inefficiencies in current activities. It is also equivalently important to identify the popular technologies from the users' perspective that best suits their life styles in the given context.

In a country with a mobile subscription rate in Egypt reaching 115.92%, and in a university such as the AASTMT that targets middle to upper class customer segment, almost all students have smart phones (Abd El Aziz and El Bardawy, 2011). This highlights the great potential of mobile applications in this context that is completely and surprisingly absent.

Therefore, this study is analysing the business processes of education at AASTMT in order to determine the areas where automation could be applied. Process analysis is always followed by process improvement and then automation comes later, this helps to ensure the fitness of technology in the process. Additionally, the flow of information is considered highly critical while automating business processes; therefore, business process analysis magnifies the flow of work and information for this purpose. Providing such case analysis can also help in comparing other higher education systems, having similar process models indicates similar business processes and flow of work and, therefore, standardisation of process improvement and automation could be applied.

CONCLUSION

The research reinforces the view that exploring the nature of learning and education in a university like AASTMT enables us to understand how the learning system is applied. By

focusing on the essential learning processes at the CMT, AASTMT, it could be possible to compare different learning processes in different universities and also in different countries. If the same models were derived, then this would indicate the same learning processes. Therefore, the same process and technology improvements may be applicable and equally beneficial.
In this paper, using Riva technique, it was possible to derive the initial process architecture in HE. The diagram provides an overview of the essential business of the college and enables tracing and query connections between different processes. This model allows assessment/examining the work flow methodologically and makes it possible to detect the possible improvements rooted in the essential business of the college.
In future work, a single process could be analysed and technological advancements and automation could be assessed/examined for each activity. According to Ould, organisations in the same line of business have the same business processes. Accordingly, using Riva method, other universities could be assessment/examined and compared to AASTMT. Conformance of the architectural diagrams indicates that same technological advancements could be applied elsewhere and thus be generalisable.

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