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MyPDA Data Map Structural Review

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Abstract: Engineering Accreditation Council (EAC) in Malaysia is the body held responsible to conduct the accreditation processes based on the manual of the Engineering Programme Accreditation. This process necessitates high commitment, also consumes cost and time by the academicians and support staff. This is because they are required to prepare a document that may divert their attention from performing their usual tasks of teaching, researching and publicizing. In obtaining the accreditation, an accreditation report should be produced and submitted for the evaluation by the EAC committee. The difficulty of gathering information is prominent in this stage, especially in a process of collecting the most important evidence of information and materials in the absence of a proper recording and not having the monitoring information system in place. In Perisian Dokumentasi Akreditasi (MyPDA), System Development Life Cycle (SDLC) has been applied to develop the information database. The system and website are best viewed with Mozzilla Firefox, Internet Explorer 7.0, Opera and Safari with the resolution of 1024×768. The system will be developed and tested on the Window XP platform. It will be hosted on the Apache server using the PHP language and MySQL database. The system consist of three extension systems and one new system, i.e., lecturer activity, student activity, PEO and survey. With information technology, it can also increase communication across various parties involved and the administration's productivity. Therefore, the development of the information system which helps boost the process of accreditation is crucial.

Key words: Accreditation document, data mapping, information technologies, Management Information System (MIS), EAC report, Malaysia

INTRODUCTION

The accreditation which is programmed by the Accreditation Board for Engineering and Technology (ABET) requires an outcome-based assessment and evaluation process whereby the program, its supporting courses and objectives are continuously refined based on the constituent assessment (ABET, 2010). In fulfilling this new surge of advancement in the engineering education system, it pushes higher education institutions to document, coordinate and maintain additional information on programme offerings. In Malaysia, the Engineering Accreditation Council (EAC) is the body held responsible to conduct the accreditation processes.

This exercise is very important to ensure that the academic qualifications of the graduates from various university programsare recognized and subsequently, they are eligible to register asgraduate engineers under the Board of Engineers Malaysia (BEM, 2011; EAC, 2011). The process ofaccreditationby the EAC is based on the Engineering Programme Accreditation Manual (EAC, 2007). Most of the accreditation processes involvea large budget, especially when it involves panel visit, printing (Obermier, 2005), data gathering and a series of meetings in towards completing the report successfully.

BACKGROUND RESEARCH

As the Civil and Structural Engineering Department (JKAS), UKM has experienced at least 19 out of 24 active academic staff were heavily involved in the production and submitting of the EAC report for the year 2010. In addition, frequent meetings had been conducted in order for the report to be completed. This was due to the emerging difficulties ingathering information and evidences which serve as the most important thing to be done in the the accreditation process of the EAC, despite the absence of an effective system which can record and

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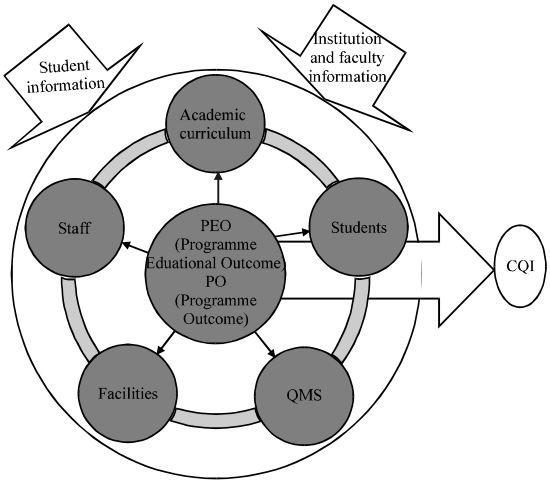

Fig. 1: EAC accreditation data collection framework

monitor information. From the experience, problem starts as early as the information input process when there was an apparent lack of understanding and awareness among some of the department staff. The report consists of five main elements: Academic curriculum, students, staff, Quality Management System (QMS) and facilities. Figure 1 shows the graphic interpretation of those elements with additional supporting factors of the institution, faculty and student information.

MyPDA is proposed to be developed mainly to function as a database system that manages data input, process and output according to the EAC report document. The system is also needed to accommodate user edits of information rather easily. This paragraph would be dedicated to describe the content of the report which stands as a guide in listing the relevant information needed. The Self-Assessment Report (SAR) is the main report that is submitted by each programme to the EAC for accreditation. In the era of globalization and sustainable development, the fraternity has recognized the need to measure quality and in response to this, Malaysia has embarked on adopting the Outcome-Based Education to ensure the highest quality of the programmes and the graduates in particular (Hoare *et al*., 2002). In line with this, the JKAS strives to pursue an ongoing commitment to provide engineering education of good quality. Since June, 2004, the department has been exerting serious efforts towards implementing the OBE. Changes have been made in the curriculum structure, delivery method and assessment that reflect the needs of the stakeholders (students, parents, the alumni, employers and nations) and the industry. Those changes need to be documented in the SAR report, as well as supported by relevant references.

MATERIALS AND METHODS

System development of MyPDA: The methodology employed for the purpose of this research is called the System Development Life Cycle (SDLC). This is a conceptual model used in the project management that describes the stages involved in an information system development project. Documentation is crucial and is usually done in parallel with the development process. In general, the SDLC methodology follows the steps as:

- Deficiencies are identified from an existing information system. This is accomplished by the critical analysis of function in the existing information system
- The new system requirements are defined and this includes addressing any deficiencies in the existing system with specific proposals for improvement
- The proposed system is then designed. Plans are created in which the new features have been added and elaborated
- The new system is developed and the components and programs must be installed. Users of the system must be trained in its use and all aspects of performance must be tested. If necessary, adjustment must be made at this stage
- The system is put into use. This can be done in various ways. Lecturers and students will be enlightened with the new integrated system. Subsequently, they will expectedly identify the deficiency of the system
- Once the new system is up and running, it will be evaluated. Maintenance must be sustained and updated rigorously at all times. Users of the system should be kept up-to-date concerning the latest modifications and procedures

In order to fulfill the research needs, the main objective will be conducted as an experiment as can be seen in Fig. 2.

The system developed will be available online so that students, lecturers and other staffs can have more convenient access. All the information will be kept in the database and reports will generate automatically. The entire system will be linked with the JKAS website so that lecturers, students and administrators can have easy access.

Hardware and software requirement: The system will be developed using the following software:

- Macromedia Dreamweaver 8
- Adobe Photoshop CS

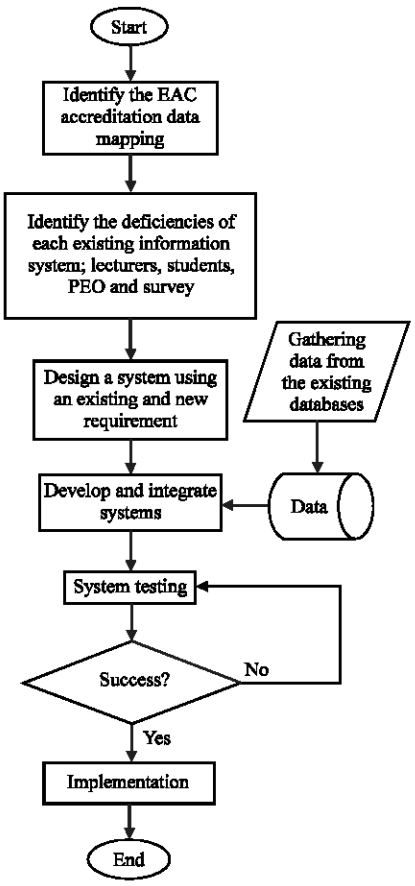

Fig. 2: Experimental methodology of MyPDA information system

- Microsoft Office XP (MS Word, MS PowerPoint, MS Excel)
- Adobe Acrobat 9
- XAMPP (Apache server, PHP, MySQL database)
- Crystal Button
- Joomla 2.5

The system and website are best viewed with Mozzilla Firefox, Internet Explorer 7.0, Opera and Safari with the resolution of 1024×768. The survey form and minutes-of-meetings require the Acrobat Reader, MS Word and MS PowerPoint to be installed for the preview. The system will be developed and tested on the Windows XP platform. It will be hosted on the Apache server using the PHP language and MySQL database.

RESULTS

Product development: The EAC report contains six chapters which reflect the assessment criteria established by the EAC in its accreditation manual. The details of the report are provided as follows:

- Chapter 1 describes the university's vision, mission, programme objectives and programme outcome. The process flow as well as the assessment process and the results of the programme assessment are deliberated in this chapter
- Chapter 2 addresses the issues related to the curriculum design and relationships with the programme outcome, delivery methods and assessment methods
- Chapter 3 elaborates the issues related to students' monitoring and advising procedures, their credit transfer policies and workload balance throughout the programme
- Chapter 4 deals with the issues related to the strength and competencies of the academicians and support staff to provide stability and continuity as to cover the curriculum more adequately and effectively
- Chapter 5 focuses on the adequacy of the institutional staff and facilities such as laboratories, libraries, computing facilities, classrooms and offices to advocate the objectives of the programme
- Chapter 6 contains detailed descriptions of the quality management systems processes by which major activities of the faculty and department are delivered and how they are controlled

Holistically, the important and relevant information from all chapters is identified and presented in a form of data mapping as a first step for a wide variety of data integration (Fig. 3). At this initial stage, data map functions as a document or map that tells you where data can be obtained and how the information is made available (Berkeley University, 2006). The three main parties involved in providing the data are the universities, the faculty and the department. Data provided from the university are extracted from the housing unit, Tun Sri Lanang Library (PTSL), the sports centre and the health centre. At this level, the general information of each unit or department, policies, standards services and facilities are to be collected is the next step is to gather ample data at the faculty level such as academic requirements, number of computer labs, number of books in the faculty library and the infrastructure's future plan. Finally, the biggest data information comes from the department itself.

The detailed information about students, lecturers, courses, facilities and the unit under the department are essential. Most of the items in Fig. 3 are kept manually,

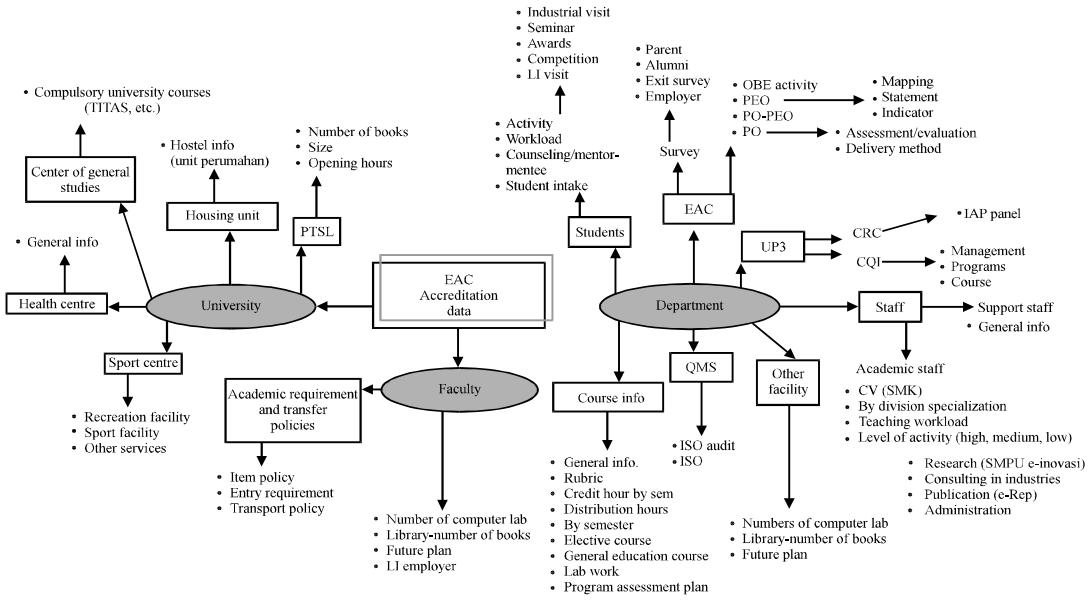

Fig. 3: EAC accreditation holistic data mapping

except for the item with the brackets. There are about 8% of the systems which have been identified to have been available online as developed by the university from the entire data entity, i.e:

- The University Information System (Sistem Maklumat University (SMU))
- The University Research Information system (Sistem Maklumat Penyelidikan Universiti (SMPU))
- The e-Repository Publication System (Sistem e-Repositori Penerbitan (eReP))
- Housing Information (Unit Perumahan)

System data collection: Two main portals in the UKM are eWarga and ePelajar. They serve as information hubs to students as well as the staff. eWarga is more interactive whereby staff are able to update, change, monitor and view reports of all university activities including traffic information, complaints and facility reservation. This portal is linked with many other systems. Under the SMU system for example, staff are able to update personal information under Sistem Maklumat Kakitangan (SMK) and also research activities under Sistem Maklumat Penyelidikan Universiti (SMPU). However, not all information in the systems is suitable for accreditation requirements and some of the information need to be extracted manually by the EAC task force members for example in terms of the number of the ISI index journal published by the department. Therefore, three extension systems and one new system are proposed to be developed at the department level, all of which include:

- System 1: Lecturer activity
- System 2: Student activity
- System 3: PEO
- System 4: Survey

DISCUSSION

Lecturer system: The first system is the details of lecturer's level of activity. The main information needed in the SAR is the level of research, consultation, publication and administration of each lecturer, besides other general information. In a previous study, Woodroof and Searcy (2004) develops a web-enabled faculty database comprising of both management tools and data to support an accreditation process called the SEDONA Project. It is capable of producing reports that are extremely useful for the purpose of accreditation such as the curriculum vitae, research information, department development, internal and external services and etc. As this project has been getting good reviews, about 20 business colleges have adopted SEDONA, including the University of Illinois and several other universities are in the process of evaluating SEDONA for adoption (Woodroof and Searcy, 2004). In UKM, a similar system has been generated called the SMU. Most data are

available in this system. However, the system output may not be suitable with the accreditation format of writing. MyPDA proposes an extension system that is able to produce and supply a complete report on academic workload towards teaching, research, publication and administration.

Data will be collected from several systems in UKM and will be integrated into a unified system. The systems are:

- Staff Information system (Sistem Maklumat Kakitangan (SMK))
- University Research Information system (Sistem Maklumat Penyelidikan Universiti (SMPU))
- The e-Repository Publication System (Sistem e-Repositori Penerbitan (eReP))
- Industry and Community Involvement Information Systems (Sistem Maklumat Keterlibatan Industri and Masyarakat-ICEsys)

Instead of logging into a different system to key in data or access lecturer's information such as their respective research, publications and teaching information, user only needs to log into one system and can therefore, access all the data needed. Furthermore, they will be able to generate report automatically. The sample of the report is shown in Table 1.

For the time being, report is generated manually by staff at the department level. To write a report, all they need to do is to compile all the information about each lecturer. The information is gathered from the hard cover document and also from the online system already available in the UKM database. Also, they need to email every lecturer in order to obtain new information or updated achievement. This will require a lecturer's effort and time where sometimes this requirement tends to be a hassle. A great deal of time has been spent to finish a report. Furthermore, every time a report is to be written, they need to do repeat the same procedure because sometimes the old report is missing or there is simply no new information to add.

Student system: The second system is related with student activity. The recent problem that emerges is that there is yet to be any official data recorded about students' activities at the department level. The student information system is administered by the university and to date, there is no student activity recorded in the system. Therefore, the new system needs to be developed whereby the data upload module will be used (Chan and Chen, 2000). For this system the person in charge for the particular activity, most likely the lecturer, must make an effort to register the event in this system. Before the activity, they must fill the required details in the online form and upload a report after the event has finished.

Table 1: Report which shows lecturers' involvement

Names	Date of 1st appointment at the Fac./Sch./Dept.	Part or full time or from other programme	Academic qualification/field of specialization/institution and year of award	Prefessional qualification	Membership in prefessional bodies
Lecturer A	1987	Full time	PhD/Environment/Engineering /Leeds/1994	PEng	MIEM, BEM
Lecturer B	1985	Full time	PhD/Geotechnical and Geoenviroment /Engineering/Louisiana State Univ./1996	Registered subject specialist DOC/JAS	Graduate MIEM, BEM
Lecturer C	1985	Full time	PhD/Hydraulics and Maritime Civil Engineering/Liverpool/1997	Peng	MIEM, BEM member Malaysian Association
Lecturer D	2005	Full time	PhD/Structural Engineering/ Wales-Cardiff/1978	C.Eng	Fistructe FRINA, FASCE, FIE (S), FIE (I) FSSSS
Lecturer E	1995	Full time	PhD/Transportation/Management and Modelling/UKM/2003	Peng	MIEM, BEM REAAA, REAM
Lecturer F	1984	Full time	PhD/Structural Engineering/ Wales-Cardiff/1995	Peng	MIEM, BEM
Lecturer G	1997	Full time	/Bride and Structural Engineering/ Birmingham/2004	Peng	MIEM, BEM

Years of experience		Level of acitivity (high/medium/low/none)				
Govt./industry practice	This Fac. /Sch./Dept.	Professional society (indicate society)	Research	Consulting work in industry	Publications	Administration
5	22	High	High	Medium	High	Medium
1	24	Medium	High	Medium	High	High
1	24	Medium	Medium	Medium	High	High
47	7	High	High	Medium	High	High
15	14	Medium	High	Medium	High	High
2	24	High	High	High	High	High
18	12	Medium	Medium	High	Medium	High

Data will be collected from several systems available in UKM and will be integrated into one student-centric system. The systems are:

- The Student Information System (Sistem Maklumat Pelajar-SMPWeb)
- The Internship and Industrial Systems (Sistem Latihan Amali and Industri (SLAI))

For the department level, data for student activity will be recorded and saved into the system database and can be accessed by the department's administrator, lecturers and students themselves. Reports on student's activity can also be generated automatically through this system. All the actions such as requests made for the activity's venue, time and date, including transport booking can be done online through this system.

PEO: The third system is the data system that contains course information which supports the accreditation. The ABET Engineering Criteria requires that each accredited program measures and applies the outcomes which are regarded to be important to its mission. Many of these outcomes are equivalent to other courses, across engineering disciplines. Each course will be linked to the indicators and course outcomes. A similar system has been developed by Owen *et al.* (1999) and Kumaran and Lindquist (2007). Owen *et al.* (1999) who have created the database using Microsoft Access and Kumaran and Lindquist (2007) developed a web-based database-driven software system called the CISA (Course Information System supporting Accreditation). The CISA is more interactive where it maintains the course, outcome and objective data and clearly demonstrates relationships among these information when following an outcome-based assessment process for accreditation and curricular evolution.

Programme outcomes or PO are statements that describe what students are expected to know and are be able to perform or attain by the time they graduate. The outcomes are related to the skills, knowledge and behaviors that students are supposed to acquire through the programme. In the Department of Civil and Structural Engineering there are ten Pos, all of which are shown in Table 2. These PO statements will be the guideline for all Course Outcomes (CO) under the department. The examples of the department Course Outcome (CO) are as shown in Table 3. CO is use to describe what students are expected to know and able to perform or attain by the time the course ends. The PO and

Table 2: Programme outcomes statement

PO	Jkas Programme Outcomes (PO) statements
PO 1	Has adequate fundamental and civil and structural/environmental engineering knowledge and able to apply it to the solution of complex engineering problems
PO 2	Able to undertake complex Civil and structural/environmental engineering problem identification and provide solutions
PO 3	Able to design complex civil and structural/environmental engineering projects, systems or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal and environmental aspects including sustainable development
PO 4	Able to behave professionally and practise moral ethics
PO 5	Able to design and conduct investigation using research-based knowledge (experiment/modelling/ survey/etc.) as well as to analyse and interpret data of complex civil and structural/environmental engineering problems
PO 6	Able to recognize and/or use the techniques, skills and modern engineering and IT tools, necessary for complex civil and structural/environmental engineering practice
PO 7	Able to convey spoken or written complex engineering activities not only with engineers but also with the community
PO 8	Able to function effectively as an individual and in groups with the capacity to be a leader or manager as well as effective team member
PO 9	Able to recognize the needs and practice of life-long learning
PO 10	Able to adopt elements of design/construction project management, asset management, public policy, administration, business and entrepreneurship and finance

Table 3: Course outcomes

	Assessed program outcomes												
Statements	1	2	3	4	5	6	7	8	9	10	Indicator	Delivery methods	Assessment methods	Assessment tools
Able to understand the basic methods of graphic engineering	/										1C2	Lectures	Exam	Final exam
Able to apply knowledge and concepts learned to draw pon several basic civil engineering elements				/							3C3	Lectures	Exam	Final exam
Able to differentiate knowledge and concepts between different methods in graphic engineering drawing				/							3C4	Lectures	Exam	Final exam
Able to use modern engineering software and IT tools in producing graphic engineering drawing under some supervision							/				6P2	Project based	Rubric	Assignment
Able to use modern engineering software and IT tools in producing civil engineering drawing under minimum supervision						/					6P3	Project based learning	Rubric	Project

CO data gathering processes across 62 courses are very complicated because each course has different COs and currently there is no available system to compile the entire COs prescribed in the department. To measure and analyse the CO and PO, a system that is currently under development by other research grants will be attached in the system. The system will be evaluated and user can assess POs from all courses and Courses' Outcomes (CO) for each course. Evaluated and user can assess POs from all courses and Courses Outcome (CO) for each course.

Survey: Finally, the fourth system is the survey. Online survey is the best practice to be applied because it is fast and feasible. There are several types of surveys required in the SAR; the alumni, exit survey, employer, industrial training employer and the parent. An assessment tool that is developed and being used by seven universities is known as The University of Pittsburgh's On-line Student Survey System (OS^3) by McGourty *et al*. (2001).

These surveys are available via the web under the management of the local administrator that can download the data for research purposes. Now-a-days, it is easy for people to send and answer a survey online instead of sending a form via the snail mail or manually. Furthermore, all the data of the survey will be accessible automatically from online database and report or calculation can be generated more quickly than usual. There is no need to key in the data manually into the database for one to start an analysis. The development of the survey system will be useful for alumni students, lecturers and administrators. They can access the survey form anywhere they are. Users can also upload and download the survey form through this system.

All those systems will then be gathered to become a database system called MyPDA in order to simplify the data retrieval in the accreditation process.

CONCLUSION

The educational goal is to produce graduates who are imbued with confidence, ethics, leadership and national integrity and who are able to engage themselves internationally. Therefore, any effort that involves students' achievement and involvement that guarantees to raise their level of success is very important. The most affected persons by the accreditation are students because their focus is solely placed on the educational process and the value of accreditation can be said as a point of satisfaction to the institution, faculty and students (Petrova *et al*., 2006). However, the processes of getting the accreditation prove to be very difficult. Manual data achievement is time-consuming and requires great manpower as discussed earlier. Information technology makes data achievement faster and easier.

With information technology, it can also increase communication across various parties involved and the administration's productivity. Therefore, the development of the information system which helps boost the process of accreditation is crucial. The system will generate reports and summaries automatically in all circumstances. The time and effort to generate the written documents manually will be spared. Thus, the researchers hope that MyPDA will be developed successfully in near future. Admittedly, a lot of work still needs to be done and in tandem with this, this research will continue until MyPDA verifies itself as a well-functioning tool. Researchers have the growing anticipation that this database system will make the accreditation process operate in a smoother condition and that it will be more feasible, quick and user-friendly.

ACKNOWLEDGEMENT

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