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摘要

國內工程及科技教育認證制度實施至今已十年，但未有任何實徵研究探究認證所帶來的影響及實施成效。申請人曾經以全國大學工學院與資電學院教師的觀點，探討其對於工程及科技教育認證的認知與實施現況。以問卷調查與深度訪談為資料蒐集方式，受訪對象含院長、系主任與教師。研究發現：工程及科技教育認證制度實施後教師能留意教學大綱需包含的要素、教學也較為多元；但老師們較少能依據評量結果，分析學生學習情形，這也讓老師們難以評估學生核心能力在認證實施前後有否改變。另外，教師們表示跨領域合作教學有實行上的困難。

目次

目的

IAFOR 為日本跨領域之規模極大且影響力很深的高等教育論壇，旗下有十個專業學術研討會，領域橫跨人文與科技，申請人張佩芬已連續三年參與該論壇舉辦之國際會議，且已受主辦單位肯定，因而兩次受邀擔任 Session Chair，奠定台灣在此論壇之相當地位，**因此申請人決定將原訂赴金澤工業大學參訪之行程，變更為參加 IAFOR 旗下之 ACAH 在大阪舉行之國際研討會，希望能學習如何協助工程相關系所建立評分規準，並且讓台灣在工程教育認證方面的實力與努力被國際社會看見。**

參與本次研討會之過程

申請人希望透過IAFOR組織圓桌論壇，藉由以下四個原則一步步建立推動工程資格認證系統之全球化機制的架構：

1. 跨系統標竿研究之原則與辦法

下列原則可用來控制跨系統標竿研究的複雜度，以及相互承認協定的發展。

1.1. 已達成標準作為互相認可之基礎

在華盛頓協議的認證規範中，畢業生的承認系統是以已達成標準為基礎，由相關認證機構使用明確的學程成果標準來予以認證，而這項原則同樣適用於跨系統認可制度。因此，想要發展跨系統承認制度，便需要針對各項標準進行標竿研究，並確認個別認證系統一定能達成特定成果標準。

1.2 學程成果之通用規則

自 2000 年起，一般慣用的工程學程標準典範已經轉為以學程成果為導向，此方法省去了較困難的比較與相互認可作業，且不會侷限了各國工程師的在地特性 (Lucena et al 2008)。

1.3 實質相當之原則

華盛頓協定 (Washington Accord) 的辦法是承認華盛頓協議各會員國之各司

法轄區(jurisdiction)認證學程畢業生的實質相當性，並進而同意承認彼此的畢業生學位。

心得及建議

參與這次會議充分學習到各國不同的系統與認可機制需要一套適當的整合辦法。成果導向的學程標準策略提供更多相互承認的機會，同時為學程設計與執行帶來更為多元的空間。在判斷實質相當性時，必須觀察該體系的運作方式，以及該體系對其會員體系或學程的評量方法。最後，根據本研討會成果，將彙整提出協助工程相關系所建立評分規準的建議，使教們更能掌握畢業生核心能力標準（graduate attribute）評量規準（rubrics）。

這次研討會除了發表論文'***Harmonization Efforts to Implement the Outcomes-based Approaches of Accreditation in Taiwan: The Difficulties and New Perspectives***'之外，更珍貴的是目睹歐美與亞洲各國之跨國合作研究相當重視政策導向，並強調合作國家特色與專長。歐盟快速崛起，已展現不可忽視的強大科技研發能量與經濟實力。歐盟研發方向強調政策目標及在地特色，雙方進行學術合作可收相輔相成之效。另外，目前科技部旗下之歐盟FP計畫國家聯絡據點移師到中央大學，未來申請人希冀奠基於過去FP 7歐盟科研計畫先期規畫以及耕耘本計畫之國際合作經驗，朝向爭取歐盟科研EU-FP8計畫，以期建立跨國科技研發合作管道與合作規模，建立實質穩固之合作關係。

申請人張佩芬近年來有著多次與日本與歐盟專家合作的經驗：2010年2月12、13日，計畫申請人受邀至比利時參與CLAIU-EU會議(請參閱附件二)，在歐洲工程教育認證聯盟（European Network for Accreditation of Engineering Education，簡稱ENAEE）理事長Dr. Giuliano Augusti見面深談後，進而邀請Dr. Augusti來台，獲得Dr. Augusti首肯，於同年5月份拜訪台灣。同年，計畫申請人在當時國科會國合處之襄助下，前往義大利羅馬與科學、社會和公眾中心

（CSSC）總裁Dr. Emilio Mordini商討「歐盟科研架構計畫(Framework Program，FP)」研究之先期規劃。歐盟FP7中「科技社會」之行動方案，與計畫申請人張佩芬近年來研究領域相近，2010年曾經與義大利合作參與歐盟FP7: SiS-2010-1.1.1-1: The role of Ethics under EU policy and law : the EU as a global actor跨國研究計畫之先期規劃。

另一方面，申請人於2004年與2005年連續兩年受邀至日本名古屋大學與金澤理工大學演講，與金澤工業大學的學者們建立良好互動。其中，Professor Jun Fudano目前受託為聯合國教科文組織負責有關工程教育的國際交流。2006年，計畫申請人曾邀請Professor Jun Fudano來台。本計畫將延續先前和日本大學的合作關係，與日本JABEE學者合作，進行跨國Capstone專題實作課程標竿分析之教學實證研究，進而設計適合台灣之Capstone專題實作課程的教學與評量方法學。重點聚焦於：1)探析學生工程設計與實作之問題解決、團隊合作與溝通的學習歷程，2)實作課程中整合、應用與反思能力。

本次交流更深入發現目前工程及科技教育認證最大的問題，在於大多數系所與教師僅是呈現提供考卷、成績單等資料，並未進一步分析與解釋學生的學習情形與核心能力之間的達成程度；換言之，只是檢視整體受教過程的品質，但缺乏對於課程上的深度檢視、探究、評量及討論等的工作。若能協助工程相關系所建立評分規準（rubrics），將欲評量的項目系統化及指標化，每項核心能力皆具備明確操作型定義、內涵說明，如此方能確保學生在畢業時皆能達到該系訂定之核心能力。

重要文件附件 ： 論文全文

Harmonization Efforts to Implement the Outcomes-based Approaches of Accreditation in Taiwan: The Difficulties and New Perspectives

Abstract

Inspired by the A successful implementation of an accreditation system for engineering education depends upon the strengths derived from top-down as well as from bottom-up approaches. The process itself is also sensitive, difficult, chaotic and full of complexities. For the past 10 years, the IEET are aiming to meet the challenges of a changing professional competence required by Washington Accord. First of all, this paper outlines the accreditation criteria used by (Institute of Engineering Education Taiwan (IEET) and to align the IEET accreditation criteria with the graduate attributes of International Engineering Alliance (IEA). Next, this paper aims to highlight the efforts of engineering programs in Taiwan to implement the outcomes-based accreditation approach and to summarize the main areas where these programs experience difficulties in complying with the IEET accreditation requirements. This study adapts the Soft Systems Methodology (SSM) to explore the efforts and difficulties within the departments during the implementation of higher education innovation initiatives from the perspectives of college deans, department chairs and faculty members in general. In-depth interviews were conducted among 20 subjects from colleges of engineering, information technology or electrical engineering who were willing to share their views truthfully and frankly. Finally, the paper also discusses the action towards assisting programs for remedying such difficulties. On the basis of the findings and discussion presented above, the

implications and recommendations are described.

Keywords: accreditation, outcomes-based approaches, qualitative study

I. INTRODUCTION

Lattuca, Terenzini and Volkwein (2006) indicated that the accreditation process resulted in changes in the faculty culture. However, they did not clearly indicate how the deans and chairpersons of engineering colleges could overcome and resolve issues derived from the changes in curriculum design and faculty culture during implementation of the outcomes-based accreditation process.

While the research undertaken by Lattuca et al. (2006) was largely based on quantitative data, qualitative data constitutes an important source of evidence in the present study. What appears from the questionnaire survey to be quite impressive results (with over 70% of faculty members expressing agreement with almost all questionnaire items) is in some cases undermined by the information provided by the in-depth interviews. For example, it appears that the reported increase of practical applications and teamwork by faculty members is mainly attributable to the need to be able to demonstrate that this is being undertaken (for accreditation purposes). Even though faculty members appear from the survey results to be using a diverse range of evaluation methods, the interviews suggest that, in reality, this is not the case. An even more significant point is that faculty members are apparently finding it difficult to implement the analysis and discussion of student evaluation results. Many faculty members fail to see that students' learning outcomes are linked with faculty members' curriculum planning, teaching and assessment approaches (Harper & Lattuca, 2010). However, most faculty members in higher education do not have formal training in outcome-based curriculum development and teaching approaches, and have limited opportunities to develop their pedagogical skills (Harper & Lattuca, 2010).

In some cases, accreditation can have the negative effect of leading faculty members to feel that the university authorities do not believe they are capable of doing their jobs properly (Arreola 2007). Similarly, Eijkman, Kayali and Yeomans (2009) also note that while educational innovation (such as outcomes-based accreditation) may provide faculty members with substantive opportunities to improve, it tends to be subject to considerable challenges and often encounters resistance and refusal. The process itself is sensitive, difficult, full of complexities and potentially chaotic. Even if the educational innovation might be valuable, its proponents must first resolve conflicts and address the entrenched organizational culture along with personal priorities, values and interests.

Previous studies did not address how on-going tensions had existed among faculty members during the accreditation implementation process (Eijkman et al., 2009).This study investigates the programs' decision-making and communication processes that can foster the best practice for accreditation implementation.

II. LITERATURE REVIEW

1. Engineering faculty's attitudes toward external evaluation

The iImplementation of accreditation systems for engineering education has not only resulted in major changes in engineering curricula but has had a significant cultural impact on engineering faculty members as well. Arreola (2007) pointed out that there are two types of outcomes resulting from the rejection of program evaluation: 1. opposition simply to going through the accreditation process, and 2. expressing indifference while cooperating reluctantly.

Moreover, during the accreditation process, faculty members may be confronted by areas outside of their fields of expertise, with which they are not familiar or in which they are not interested. These circumstances may indeed cause anxiety and

resistance. Thus engineering faculty members may remain skeptical about the effects of accreditation, even though they are not altogether unfamiliar with its purpose and procedures. This is largely because they lack a sufficient understanding of the rationale behind the accreditation process. Therefore, a major challenge to ensure the effectiveness of engineering education accreditation is to raise the level of recognition and acceptance of accreditation within the engineering faculty (Eijkman, H., Kayali, O. & Yeomans, S., 2009).

However, there are two characteristics regarding how university faculty members respond to educational innovation such as accreditation:

a. Faculties are typically resistant to change

Shaeiwitz (1996) observed that it is clearly not easy to change the behavior of university professors. However, if it can be done, students' learning can improve significantly as a result. Some faculty members are not concerned about using new approaches to assess the outcomes of their courses. Regarding the current quality of academic programs, some may consider it unnecessary to adopt a new assessment system. Therefore, before any innovation can be introduced, it is essential that the existing attitudes of faculty members be understood and taken into consideration, so that they will be willing to accept the innovation in question.

Most college teachers have a stronger sense of identification with their respective academic disciplines than in their institutions or departments (Olian, 1995). The reality in the academic world is that teachers work alone (Seymour, 1995). With a foundation in individualism, there is a individualism culture which is very difficult to change (Banta, 1995). When engineering education accreditation is being implemented over an entire department, if it conflicts with the individual needs of faculty members, they tend to be very protective of their time and valuable resources, which is an inevitable and understandable outcome (Tener, 1999).

b. Top-down one-sided communication yields little results when it comes to educational innovation or administrative affairs

Even when conducted with respect, how top administrative executives convey the messages to each faculty member remains a difficult task. Generally speaking, if a policy is promoted top-down in a forceful manner, any resulting changes will not be effective (Schachterle, 1998). While it is true that members of the team charged with promoting and implementing engineering education accreditation must first enlist genuine advocacy and support systems from the dean of the engineering college and heads of departments, what is even more important is that the support system must be derived from listening to and the respect for the voices of faculty members. Similarly, Olian (1995) also mentioned that unless the leaders offer incentives that are consistent with the accreditation implementation process, overall improvement in quality is unlikely to occur.

2. Soft Systems Methodology

Within systems thinking there are two complementary traditions. The ‘hard’ tradition takes the world to be systemic; the ‘soft’ tradition creates the process of enquiry as a system. The ‘hard’ approach has limited itself to dealing only with the logic of situations. But the Soft System Methodology (SSM) is concerned to go beyond it. It is taken as given that no objective and complete account of a situation can be provided.

A series of studies relating to SSM (Checkland, 1981; Checkland and Scholes, 1990; Eijkman et al., 2009) have noted that social- and cultural problems within the organization is a complex system that could not be clearly defined. An advantage of SSM is that it is the methodology that aims to bring about improvement in areas of social concern by activating the people involved in the situation. The Lancaster

researchers started their action research program by taking hard systems engineering as declared framework and trying to use it in very messy problem situations in which no clear problem definition existed. These were kinds of situation in which systems engineering used in an action research mode failed, and SSM emerged as an alternative. The development of SSM has shown a shift from the world of engineering thinking to the world of management thinking.

Summarizing the literature discussed above, those charged with promoting and implementing engineering education accreditation are advised to listen closely to those colleagues who ascertain their personal attitudes. This may reveal the reasons for their resistance. No current study on engineering education research has examined how the programs' decision-making and communication processes during the accreditation implementation. The purpose of this study is not to utilize SSM simply as consensus-seeking. What was looked for in this study was the emergence of some changes which could be implemented in the continuous improvement of accreditation which would represent an accommodation between different perspectives of faculty members, deans, and chairpersons. Which together lead to the implementation of changes to improve the situation.

III. METHODOLOGY

Elaborated from the findings of Lattuca et al. (2006), this study conducted an open-ended interview to hear the voices of 20 deans, chairpersons and faculty members regarding the decision-making and communication processes. When selecting volunteers for in-depth interviews, the following prerequisites were used:

(2) The interviewee has demonstrated a considerable level of interest and concern regarding the accreditation process.

(2) The interviewee played a key role during the accreditation process.

The rationale for using these prerequisites was to ensure that, regardless of whether the interviewee held a positive or negative attitude towards accreditation, they were able to perceive the accreditation process from a broad and unbiased perspective. These 20 interviewees included administrators and faculty members who had been actively involved in the process of implementing accreditation. Of these, many of the interviewees had served both as a member of the accreditation committee and administrative role within their universities.

IV. RESULTS

This study used the Soft Systems Methodology (SSM) (Eijkman, et al., 2009) to explore the decision-making and communication processes during the implementation of accreditation from the perspectives of college deans, chairpersons and faculty members. The results are described in the next section.

1. Who makes the decision to participate in accreditation?

(1) Support from the Dean

Apart from university policy, chairpersons were the key figures in deciding whether to implement engineering education accreditation. Professor O was the chairperson of the department at the time, and he felt that the accreditation of engineering education was a prevailing trend and decided to go ahead with it. Chairperson E also mentioned that at the time the chairperson wanted to implement the accreditation program because he considered it an important and useful system. Those departments that received support from the dean of the college were able to go through with the implementation process much more smoothly and effectively.

> Under such a trend, this [accreditation] was impossible to stop. If the top-ranking universities had already begun their accreditation process, we believed that there was no time to waste. So the College of Engineering began to call for the meetings to discuss the matters. I think that under the current trend, we could not hesitate any longer. Several

> departments in the College of Engineering were among the first batch of participants, and their involvement was entirely at the discretion of the department chairs. (O)

> After he took on the chairman position, he was very enthusiastic about this kind of improvement in teaching. So when he found out that top-ranking University was running the accreditation system, which was a fine system, he said, "If we don't it today, we will regret it later." His analysis convinced him that this [accreditation] would be really beneficial to students, so... he was the originator. He believed that if you don't do it today, you won't have the competitiveness to excel in the future. And he began to invest a great deal of resources in that direction. (E)

(2) Support from senior faculty members

While Professor O was the department chairperson, he decided to go ahead with the accreditation process and received tremendous support from the department's senior faculty members. This enabled him to announce during a departmental affair’s meeting that the accreditation process was going to be implemented.

> The important thing is that several senior faculty members in our department provided tremendous support, and this allowed me to make the formal declaration in the departmental affairs meeting that we were going ahead with accreditation. (O)

The same situation occurred in the department of a senior faculty member, professor B. Even though he was not the department chairperson, all the faculty members went ahead with the engineering education accreditation process after he proposed the idea to his department.

> I remember that I recommended it to the department and said that it was probably necessary to go through with accreditation, which would be very helpful to us. And that was my reason for proposing it. I explained the reason why we should participate in the accreditation process and everybody agreed because it seems to be very beneficial to our students. (B)

On the contraryIn contrast, Professor A, ran into many difficulties when he carried out the accreditation process. There was nothing he could do when many senior faculty members refused to cooperate.

> There's really nothing you can do. I have tried every possible ways to persuade them, but nothing works. Since I am not senior enough, sometimes I feel my hands are tied. There are

> a surprising number of people who don't stick to the facts. Ironically, seniority is a huge barrier during the accreditation processes (sigh)... (A)

Whether it was the dean's or the chairperson's decision, what these administrators considered were factors such as the prevailing trends, benefits to students and the impact on the department. These were the responsibilities associated with the legitimate leadership. Whoever has taken on that role must go through with the accreditation process no matter how difficult the job is. However, if they carried out the accreditation in an uncompromising manner, there were bound to be negative sentiments and reactions among faculty members. This was because one side of the battle was eager to complete an important mission, while the other side thought that the decision has been made without their consent.

In this study, "department/institute" was viewed as an organization (Eijkman, et al., 2009). To conduct an in-depth analysis of the decision-making process of accreditation implementation in each department, one must further explore the relationship between decision-making and communication processes within the department/organization. The results are illustrated in the next section.

2. The consensus-building process: communication versus indoctrination?

Mutual communication refers to the expression of logical or rational opinions based on facts and data by members of an organization in a formal setting. It also involves persuading faculty members in an open, honest and direct manner. Most academic departments and graduate institutes have conducted regular meetings as the medium to introduce engineering education accreditation to members of the faculty.

> So we were talked to the faculty face-to-face... And we also mentioned what was happening in other colleges within the university or even at other universities, and we analyzed the accreditation practices of ABET and the resulting benefits. In other words, we provided the information so that they could figure it out for themselves if accreditation was worth doing... (A)

However, the information provided at the meeting appeared to be a one-way indoctrination event rather than two-way communication and discussion. Professor I recalled what happened in his department. At the time he was not yet the department chair, but he was aware that the department had decided to go ahead with accreditation, although he had no idea what the accreditation was all about until he learned it via related websites.

> In the beginning, accreditation was briefly mentioned and no details were provided. It was not until I visited the websites did I become aware of what the accreditation was all about... (I)

Communication is both a social and psychological process. From the above information we can see that the process of implementing accreditation does not necessarily involve two-way communication. If faculty members did not understand what exactly engineering education accreditation was, it would be difficult for them to approve or accept it. Only under an appropriate feedback mechanism could the effectiveness of communication be ensured, and two-way communication was essential to avoid conflicts. If there was only a one-sided distribution of information, or if faculty members were not convinced despite having had numerous discussions, it was obvious and understandable that the accreditation process encountered with passive and halfhearted responses.

3. Passive faculty participation

(Arreola, 2007). During the early stages of implementing engineering education accreditation, each department had to prepare a great deal of information, such as establishing educational objectives, revising curricular framework and setting student outcomes. To the faculty members, this was a substantial increase in their workload since they had very superficial knowledge about accreditation of engineering education. For these reasons, negative responses among faculty members gradually arose.

> No faculty members believed that accreditation was necessary, whether they worked in a public or private institution. I knew this because we have colleagues at top 10 universities. They were actually pretty much pressured into participating in the implementation of accreditation. If you let everyone choose whether or not to do it, no one would opt for accreditation. But I was not surprised about this outcome. Why? Whatever it is, as long as it created extra burdens, no professors will choose to do it. This is absolutely normal! (J)

> Some faculty members in the department were just adopting a wait-and-see attitude or they flat-out rejected it. They would say that the outcomes might not be very positive and the process would bring more harm than good. (O)

Generally speaking, faculty members' reluctance to participate can be attributed to two major reasons. One was that accreditation was not within the domain of expertise of the professors. If they were to spend time on filling out forms, they would then have less time for interacting and discussing with students. The other reason was that it would take the professors a lot of time and effort to handle the cumbersome and tedious preparatory work, which would add to their already heavy workload.

> Engineering accreditation... Everyone would just ask you to do this and that by assuming you haven't done your part. So you had to do a lot of extra work. In other words, there are a lot of things that I've been doing all along but now I have to prove that I've done them by producing the paperwork. Like any teacher, I'd rather spend an hour with my students than on administrative paperwork, if I have a choice. We've spent so much time on the paperwork, there was just a lot less time left for real work. This was just my opinion! What I was trying to say was, we've been doing too much paperwork, and it's just too cumbersome. (H)

> [Engineering accreditation was also an annoying thing; it's all the same. Actually I think that these administrative and teaching evaluations and accreditation process were just additional burden to professors. In the past, when students raised questions, I would stay and spent time explaining to them. I just thought that our students lose out. These things just happened all the time... (S)

> Life was quite complicated already in our daily teaching. Now we had to deal with tons of trivial chores and forms to complete. I'd rather spent the time with my students and discussed things at a more self-control pace. If I spent too much effort on administrative work, where did I find time to attend to my students' needs? (T)

> We had to prepare a lot of information in writing but we don't have that many people in our administrative staff to help out with the work. This was the hardest part. We've already got a busy schedule, and we still had to take care of this extra work. What troubled me the most was the chores like making photocopies when you had to prepare a lot of information in writing for self-study reports. It was just nothing but stress and burden. (S)

Even though faculty members had many doubts about the engineering education accreditation process, they remained cooperative in performing duties such as submitting information, completing forms or checking student outcomes. Perhaps this was because they understood it was futile to resist, and so they just did their part to cooperate, albeit reluctantly. Or it might be because the department had a friendlier environment and the professors are willing to comply in order to maintain their solidarity.

> This was university policy! And it's our duty! Some faculty members may not approve but once they're been assigned their tasks they just had to go through with it. (L)

> Our department was one of those that were relatively peaceful... Once the decision was made [to go ahead with accreditation] no one would come out and said no or expressed their concerns. (I)

> We were rather harmonious. Once faculty members have been asked to be in charge of something, they would do it, although not entirely enthusiastically. (F)

The above information showed that this type of top-down approach to implementing a policy was not entirely a matter of subordinates following orders of their superiors and completely without problems. On the surface everything appeared to be calm and smooth, but occasionally negative reaction or complaints emerged.

4. Dilemma of department chairpersons

Even if the department did not have an engineering education accreditation task force, it tended to rely on the chairperson to carry out all the procedures. The department chairperson had to devote all his or her efforts and resources to minimize

faculty members' workload for preparing the accreditation documents. Here was an example. To decrease the objections from faculty members, the department chair would shift most of the work to administrative staffs and assistants in order to reduce the workload of faculty members, who only needed to double check the paperwork drafted by the staffs.

> I asked a colleague, Ms. X, to be in charge and I also asked her to make the necessary preparations and contacts before proceeding. So many follow-up tasks and responsibilities were handled by Ms. X. Faculty members in the department would prepare material that they had been asked to provide, for example the syllabuses. Of course we'd always had syllabuses, but now they had to comply with those [student outcomes]. We just added a few more words and asked the professors to see if that was good enough. (F)

> My impression was that, for most of the professors, as long as you didn't bother them with administrative matters, they wouldn't give you any trouble. Therefore we usually just asked teaching assistants to help faculty members to prepare data required for the accreditation process. The professors were then able to gradually accept the whole thing, because after all they weren't being bothered too much. (O)

Some departments hired teaching assistants to interview all the professors, who would provide the required information so that the administrative staffs could key-in the data. Gradually, as accreditation-related work became routine, or when no faculty members were willing to share the work, accreditation would become the sole responsibility of the department chair.

> Actually in almost every department, in the end it was the department chair who assumed the ultimate leadership. What was nice about it was that the department chair was able to mobilize faculty members to take charge in different areas. On the other hand, we also encountered a case at another university (I forget which one), where different professors were charged with different responsibilities. But in the end when all the data needed to be consolidated, some of the data might have been inconsistent, or perhaps no data analysis was even done yet. What was being submitted by faculty members was simply raw data, and that was all. (F)

Despite the existence of an accreditation task force, it was not difficult to realize that toward the latter part or during mid-term period, the chairpersons and administrative

staffs gradually took the whole responsibility for accreditation paperwork.

> During the first half of my tenure, nobody paid any attention to me, and I alone was responsible for convening the meetings and proceeding to set the educational objectives. It wasn't until Professor X was kind enough to indicate that he was quite familiar with these procedures and was willing to help me out that I delegated some of the later work to him. He was responsible for drafting the final reports as well as the surveys and questionnaires with the help of teaching assistants. At the end, it was two of us who finished the entirely self-study report together. (O)

Even though the position of the department chairperson was not at the highest level of the university executive hierarchy, the chairperson was nevertheless the top leader at the department level. Professor L is the current department chair, and in his department, all of the professors were involved in the accreditation process. When the department first began to participate in accreditation, Professor L was not the chairperson yet. When the researcher asked, "At that time how was the department chair able to resolve the different opinions from professors within the department?" Professor L's response was nothing short of shocking.

> When the chairperson spoke, everybody listened. The upshot was that although some faculty members were unable to identify with the need for accreditation, they would still try to comply. It wasn't possible not to help. Whatever work the chairperson assigned, the [professors] had no choice but to participate in it. That was all! (L)

These comments revealed that the chairperson was quite a formidable figure to the faculty in that department, where the chairperson simply "declared" his intention to carry out accreditation. What can be understood was that in order to implement a policy, a leader sometimes must employ forceful means.

On the other hand, not all faculty members in every department exhibited such high level of compliance with their department chair. On the contrary, Professor A encountered considerable difficulties during the implementation of accreditation. However, Professor A chose to mention what happened in a casual manner.

> When faculty members have very different opinions and viewpoints on a certain issue, how did I resolve them? I think the most basic problem was that some faculty members

> didn't give a damn. There were situations where we would put an issue to a vote but those who were in the minority would still insist on their own ideas. It was really difficult. (A)

Professor A, who was a newly department chairperson then, ran into considerable difficulties when he carried out the accreditation process. There was nothing he could do when many senior faculty members refused to cooperate.

> When you had quite a few strong-headed senior faculty members, there was really nothing you can do. You could try every possible way to persuade them, but nothing worked. Since my raking was not senior enough, sometimes I felt my hands were tied up. There were a surprising number of people who didn't stick to the facts. It depended on the ranking, really, and seniority is an important fact (sigh)... (A)

During the interview, Professor A described the situation with reservations with some degree of helplessness. These resistance from faculty members made the job of a newly department chairperson extremely difficult. Especially when he was asked "Did you feel helpless during the communication or decision making process?" Professor A's answer was a simple and unequivocal "Absolutely!"

In this study, a phenomenon that cannot be ignored is the amount of power held by a department chair. Schein (2004) noted that although the authority of a given position represents an important basis of power, its value is restrictive. Professor A, despite being a department chair at the time he implemented the accreditation process, did not possess the administrative authority. In comparison, one advantage that Professor O had was that he enjoyed the ardent support of senior faculty members in addition to his position as the department chair.

5. Confrontational relationships between faculty members and administrators during the accreditation process

Implementing engineering education accreditation requires the collection of a great deal of data on curricula, instruction, student learning outcomes and other relevant information. These existing files may not have been retained by the individual departments but rather under centralized management at the university

level (e.g. office of academic affairs). In this case, the accreditation implementation process requires assistance and coordination from university administration. If more than one department is involved in the accreditation at a university, then administrative units at the university level could play a coordinating role to help each department obtain the required information and statistics.

When Professor C was the dean of academic affairs, he designed a system and provided it to faculty members in order to reduce the burden of each program and to assist the faculty in achieving the goal of continuous improvement in the curriculum, instruction and assessment processes.

> The progress in human civilization is accompanied by the development of tools. Otherwise it will just be empty talk, just as talking about ideals and dreams with hollow words implies that you cannot realize them. Realizing these dreams takes time. This is because the first step is to change the minds and ideas of faculty members, and the second step is to use tools to turn [accreditation] into a system. There is an advantage with a system, it's easy to change things in the future and it's not necessary to start everything from scratch. I've always believed that you have to use good tools if you want to do a job well, and excellent tools cut your efforts and time in half. (C)

This outcomes-based accreditation system helped each program to establish its own statistical databases in a comprehensive manner. Each college would then be able to perform information retrieval and analysis on the data stored in this system when participating in accreditation. However, not all universities are able to provide these services at the top administrative level. Some departments assumed that it was the responsibility of the academic affairs office, and each department should only participated in collecting and providing the data as needed. Conversely, the administrative offices at some universities considered accreditation-related work was the obligation of the respective departments and these departments should carry out the work by themselves. The result was an antagonistic relationship between the university's administration and academic departments under such circumstances.

> The tasks that should have been completed by the Office of Academic Affairs became the responsibilities of the department. All of them! These were just annoying! Sometimes I would ask the staffs: "Why has this job become yours?" These tasks should have been done by them [university administration], but a lot of work was passed around and finally landed on the desks of the department, and so their assistants were complaining. It was just a lot of hard work. (B)

> Unless each department has its own manpower and capability, or the university has dedicated personnel to take care of accreditation full-time, or there is a computer-based or semi-automated system available, there was really no point for each department to do its own thing. The Office of Academic Affairs would claim, "Accreditation for the department was your obligation, not ours," and even the Computer Center declared "It's not my responsibility" in the very beginning. (F)

From the findings above, it should not be difficult to see that when the university or department head carried out the accreditation in an uncompromising manner, there were bound to be negative sentiments and reactions among faculty members. This was because one side of the battle was eager to accomplish an important mission while the other side thought that the decision has been made without their consent. If the two sides could reach a consensus and shared a common goal to benefit the students and the university, then it would be possible to turn resistance into support.

V. CONCLUSIONS AND IMPLICATIONS

study agrees with the results of Lattuca et al. (2006) that there are differences between the attitude towards engineering education accreditation taken by faculty members, deans and department heads. Based on the findings, this section provides a series of conclusions and recommendations so that each program undergoing accreditation can proceed more efficiently and avoid unnecessary mistakes, hence faculty members will be able to approve of or acknowledge the necessity of accreditation.

1. Top-down implementation approach left few faculty members approving of

accreditation.

Tener (1999) emphasized that whenever the university intends to conduct any educational innovation, it is a challenging but necessary task to reach a consensus with faculty members by every possible means. McGourty et al. (2002) found that one of the major challenges for a program to implement outcomes-based accreditation system is to persuade the faculty members to understand how such an approach could be integrated with their previous teaching and assessment methods.

However, this study found that most engineering programs administrators announced the decision to be accredited at the departmental meetings, where no consensus was built to justify the value of devoting to accreditation preparation efforts. Such one-way decision making seemed to leave many faculty members confused about the purposes of accreditation. Faculty members were informed about the end results of decision-making with very limited authority or opportunities to consider the decision.

2. Program chairpersons are key figures in implementing accreditation

This study found that program chairpersons usually served as a catalyst at the inception of accreditation efforts. They coordinated the multiple sources of data collection and integrated all sorts of information as required by each criterion of accreditation, guided the administrative staffs to update data, as well as helping the faculty members with submission of curriculum documents. Moreover, their attitude significantly influenced the organization’s capability for sustained improvement.

For instance, Teacher E, who was the previous chairperson, mentioned that he worked closely alongside his program’s accreditation task force to inspire new ideas, viewpoints or perspectives. Through departmental meetings and constant dialogues, he constantly encouraged the faculty members to work as a team and eventually change their resistant attitude and actions.

There are five factors of a program chairperson's success in education accreditation efforts. 1) the intention to bring about a positive change; 2) gradually building consensuses and goals through understanding or guidance; 3) a sound leader-member relationship; 4) the ability to create and share knowledge; 5) the pursuit of consistency between the reform policy and strategy execution (Fullan, 2004). Teacher E happened to fulfill all these five characteristics with the intention of helping the program to improve. He was optimistic and enthusiastic about the accreditation and conducted several meetings with faculty members until the consensus was finally reached. To effectively instill the accreditation into the program, program chairperson not only must have a clear vision of changes ahead, but also fully aware of the program's organizational culture, as well as the faculty members' needs and attitudes (Garrett, 2005).

3. Faculty members with administrative experience within the university perceived greater identity with the impact of accreditation than those without such experiences.

One of the results of this study echoes the finding of Lattuca et al. (2006) that program chairpersons and non-administrative faculty members differ substantially in their attitudes toward innovative changes. This may be due to the university chairpersons' sensitivity to university change. Besides, chairpersons take most of the responsibilities during the accreditation procedures. Therefore, they have greater awareness of how the outcomes-based teaching and assessing approaches to the effects of students' learning results than non-administrative faculty members.

4. Faculty members' resistance to accreditation was substantially related to their confusion about the purpose of accreditation.

Most programs relied heavily on questionnaires to evaluate students' learning outcomes. However, the results of these questionnaires were not examined afterwards

and therefore contributed little to the program goal of sustained improvements. Apparently, the engineering program remained unfamiliar with how to implement the results of outcomes-based assessment to pursuit the future improvement of students' learning. For example, the interviews showed that although faculty members did seek to expand the amount of time for hands-on practices, group discussion, team work, or global issues in the classes they taught. In fact, they appeared to have made these modifications largely to fulfill the requirements of accreditation, and only a minority of faculty members had changed their teaching strategy from their own internal motivation. During the interviews, the faculty members displayed a lack of familiarity with different evaluation methods, and evaluation results were merely kept on file without further analysis or attempts at continuous improvement.

5. Faculty members still doubted that whether the accreditation implementation could bring sustainable improvement.

Most teachers interviewed in this study agreed that the accreditation not only brought improvements to the program, but also served as a good mechanism. By adjusting the curriculum and instruction design as required by the criteria of accreditation, they admitted the alignment between educational objectives and corresponding assessment methods of outcomes-based curriculum can better meet the needs of students' learning in a systematic way. However, there were two aspects of the university faculty members' concerns about the accreditation program: 1) Even though enhanced teaching and learning outcomes is the main purpose of the accreditation program, the teachers argued that the overly labor-intensive compilation of paperwork seemed to enhance their teaching and students' learning effects only to a very limited extent; 2) Since some scholars are skeptical of outside opinions, once the under-qualified on-site accreditation evaluators fail to give the appropriate advice, it may cause the faculty members to be suspicious about the efforts to implement

accreditation.

6. A set of shared values, role and norms that interact with one another within the program is the key point for best practice of accreditation.

After analyzing the social system within the program based on the Soft System Methodology theoretical framework, this study found that whenever a program's own values were consistent with the purpose and underlying rationale of accreditation, the sustainable improvement mechanism will be easier to carry out and maintain, rather than making superficial, pro-forma attempts to force the faculty members to fill in all the forms passively.

From the information above we can see that this type of top-down approach to implementing the accreditation is not entirely without problems. On the surface everything appears to be calm and smooth, but occasionally negative reaction or complaints emerge. More often than not, the faculty members being interviewed would simply smile and said "All is fine." With only one-shot interview, it was quite understandable that the interviewees were reluctant to talk about conflicts any further. However, their polite smiles seemed to have masked the bitterness, or perhaps triumphs, of untold stories.

This study explores the decision-making and communication processes within the departments during the implementation of engineering education accreditation from the perspectives of college deans, department chairs and faculty members in general. The following implications are discussed.

1. Department chairperson is the vital figure in the accreditation process.

In this study, we found that early on in the implementation of engineering education accreditation, the department chair plays the important role of a catalyst. He or she could provide a guideline to facilitate the consolidation of the data in order to fulfill the accreditation requirements. When the accreditation process has gradually

taken shape, the department chair then becomes a manager to systematically update the information as well as to assist faculty members in preparing and submitting the required information.

2. Increasing the level of faculty members' identification with the educational innovation is the key to its success.

Resistance and defiance are problems encountered during the process of educational innovation and organizational reforms. When implementing the engineering education accreditation, the dean of college and heads of departments could convince faculty members of the necessity and inevitability of accreditation by launching a series of professional development seminars as well as providing appropriate channels of communication in order to build a sense of cohesion and identification with the accreditation.

3. Top-down assistance is an enormous boost to facilitate the process.

Members of university-level administrative units and those from academic departments work in different environments. If the university administrative office is able to provide assistance to the departments to systematically compile data, the faculty members will be relieved of the excessive workload and be able to spend their efforts more efficiently on the analysis and preparation for accreditation data.

Even though this study does not mention how such tensions can be resolved, the results and findings pointed out what factors might lead to those tensions and how they can be prevented in the first place. The recommendations are described in the next section.

VI. RECOMMENDATIONS

Earning faculty members’ support is a great challenge for program aiming to effectively carry out the accreditation implementation. Based on the results of this

study, the following approaches are recommended to accelerate the accreditation implementation within the program.

1. Combining both the bottom-up and top-down approaches is the best strategy to expedite the implementation of the accreditation.

, however, each program should develop an internal mechanism and provide a basis for continuous improvements. It is impossible to rely solely on external monitoring for education quality assurance and, as demonstrated by the present study, programs that are successful in their accreditation efforts take the combination of top-down and bottom-up approaches encourage faculty members to pursue self-improvement, but the support of senior faculty members and the assistance from university-level authorities also expedites the accreditation implementation within the program.

2. Two-way communication is crucial for faculty members to share the same values for continuous improvement.

The An important prerequisite for a program's continuous improvement is a set of values that are shared among all its faculty members. Sustained improvements would be possible only if the faculty members' shared values are consistent with the intention of the accreditation for the program. Since sufficient communication is needed to establish common values within a program, the chairpersons must ensure ample opportunity for intra-organizational dialogue, while also eliciting the faculty members' opinions through a participatory communication process that involves rational, diversified perspectives. In this way, the faculty members can better achieve mutual understanding, become cooperative, and eventually reduce their resistance to program change.

3. University-level authorities should minimize the burden of collecting data

Regardless of It is advised that each university establish a platform to compile the information systematically. For instance, in order to reduce the teachers' workload and

resistance to accreditation while efficiently monitoring students' learning results, Teacher C, a former Dean of Academic Affairs, mentioned that he constructed a matrix of rubrics into an e-portfolio system and to minimize the workload of faculty members' evaluating and analyzing students' performance. The computerized assessment tool did reduce teachers' resistance to accreditation.

Meanwhile, this university-wide system should be shared by all the programs to avoid conflicts between university-level and program-level administration regarding data collection/compilation, and therefore ensure on-going improvements. In fact, most of the participants in this study did not completely reject the accreditation, even if they found it inconvenient in many ways. In fact, most of them appreciated the intention of accreditation to improve their teaching. Hence, clarifying all of the faculty members' concerns about the value of accreditation should be an on-going effort at the university- and program levels.

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