

## Session II

Compatibility between Education Output and  
Development Plans Requirements

## **Attitudes toward the Effects of Privatization on the Employment System: A Study of Undergraduate College Students in Saudi Arabia**

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**ABSTRACT.** Effective and stable economic and social development relies mostly on good education environment. Such environment includes not only the knowledge and skills but also the personal attitudes of the students, through which education outcomes fit into the economic structures. This study aims to examine the attitudes of the Saudi undergraduate college students toward the anticipated effects of privatization on the employment system of the Saudi privatized SOEs. Using survey questionnaire data collected in May 2002 from 762 Saudi undergraduate college students, the study results reveal varied attitudes. On the one hand, large percentages of the respondents prefer working under close supervision of Saudi management, having a salary based on productivity, being promoted based upon performance (rather than seniority), and adhering to prescribed procedures in executing job tasks. On the other hand, high percentages of the study respondents tend to dislike the concepts of putting forth more effort to meet management's plans, of working on nights and weekends, and of compromising job security in return for a higher salary. In addition, while the majority of the study respondents believe that privatization of state-owned enterprises is best for the local economy, their support for privatization is qualified by their insistence or desire that it not negatively impacts their own interests.

The statistical significance and association analyses reveal that the effects of academic majors and province on respondents' attitudes toward promotion criteria, teaming, and management's nationality are indeed significant. In addition, gender, SES, living areas prior to college entry, and adherence to religion are significantly related to respondents' attitudes toward privatization in general and toward some of its potential effects on the employment system. Recommendations are provided.

### **Introduction**

In the last several decades, the world's economies have undergone rapid successive and innumerable changes. Due to changes at the macro- and micro-economic level—such as

technological changes, global trade, a high rate of unemployment and budget deficits—the economies of many nation states worldwide have been experiencing difficulties sustaining growth (Bangura, 2000). These states, in turn, have taken different techniques to prevent or minimize the negative effects of such changes. Among the most recognized of these techniques is privatization. Since the 1980s, privatization of state-owned enterprises (SOEs) has become a well-prescribed solution to overcome these economic constraints (Danson, 1999; Austin, Wortzel, and Coburn, 1986). Bangura (2000) points out that many developed (e.g., UK), as well as developing countries (e.g., Argentina, Chile), have applied privatization, to different degrees, as a reform policy to promote national development, boost the local economy, increase levels of efficiency, and raise revenues.

Saudi Arabia is in the mainstream regarding this issue. Due to significantly fluctuating oil prices (\$7-38 per barrel); explosive population growth (3.9%) -- recent unofficial reports suggest a lower percentage--; and a competitive global market (Kronemer, 1997), the Supreme Economic Council (SEC) in Saudi Arabia has recommended privatization as a reform policy. Therefore, in August 1997, the Council of Ministers in Saudi Arabia approved the implementation of privatization for selected state-owned enterprises in order to generate direct and indirect revenues (through selling and taxation) and to improve competition in the local economy<sup>(1)</sup>. Accordingly, some of the state-owned enterprises that are facing structural problems and large financial deficits but can be profitable for private owners, such as the Saudi Telecommunication Company, the Saudi Electrical Company, Saudi Airlines, and others, will be sold, leased, or transferred, or the services that these companies provide will be contracted out to the private sector. Aside from the various economic changes (e.g., efficiency, input/output, or profit), previous research indicates that privatization of state-owned enterprises (SOEs) leads to changes in certain aspects of the employment system (e.g., employment type and recruitment system; promotion and salary system; workload and work time; job security; and behavioral attributes) in these SOEs. This study aims to explore the attitudes among undergraduate college students in Saudi Arabia regarding these anticipated changes.

### **Statement of the Problem**

Privatization of the state-owned enterprises (SOEs) in Saudi Arabia is expected to cause significant changes to the system of employment in these enterprises. Significant changes already have been found when this process has occurred in other countries. A review of previous research shows these changes: type of employment and jobs, criteria regarding recruitment and promotions, and systems of hiring and firing (Beker, 1992; Bickerton, 1993; Cam, 1999; Davidson, 1990; Dereli and Isik, 1993; Geldstein, 1997;

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(1) Unlike forced privatization in some Third World countries where the World Bank and the International Monetary Fund (IMF) require receiving loan countries to restructure local economy, the privatization experience in Saudi Arabia is of a selective type. The state government has relative control and freedom over the selection process of what to privatize and what not.

Washington, 1994); flexibility and work load (Davidson, 1990; Geldstein, 1997); and salaries, wages, and job security (Becker, 1992; Bhaskar and Mushtaq, 1995; Bickerton, 1993; Cam, 1999; D'Souza and William, 1999; Mondaq Business Briefing, 1998; Rapacki, 1995). As more jobs in the public sector become privatized, and as more Saudi employees and workers <sup>(\*)</sup> work in a more competitive environment, it is important to probe how those employees perceive privatization's effects on employment system (PEES), and what kind of attitudes employees hold toward the new system of employment in the privatized SOEs so that officials in charge of planning privatization will be able to re-design and modify the Western model of privatization to fit the nature and needs of those students who soon will be in charge on managing and running the privatized SOEs. Undergraduate students, the major labor pool for the newly privatized enterprises, are expected to hold a variety of attitudes toward the new employment system based on several factors. The purpose of present work is to describe, understand, and explain the attitudes of undergraduate college students in Saudi Arabia toward the effect of privatization on employment system.

### **Significance of the Study**

This study is important for several reasons. First, to date, privatization efforts in Saudi Arabia have not fully been studied, therefore, there is a considerable need for theoretical and empirical studies of privatization in Saudi Arabia. Second, this study is expected to reveal essential information on how the Saudi labor force perceives PEES, which can be used by the policy makers and privatization modelers in Saudi Arabia to help make the transaction as smooth and effective as possible. Also, by knowing what the employees of the future, the undergraduate students, think of PEES, the planning of privatization in Saudi Arabia will be more organized and systematic. Students' reactions may not change the general outlines of privatization, but they may bring to attention some hidden aspects of privatization in the Western model that may not fit the needs and nature of the Saudi society.

Moreover, the goal is to examine how the social and economic backgrounds of undergraduate college students—parents' occupation and education, previous work experiences, and gender—influence their attitudes toward changes in the structure of the workplace. This information is essential for accurate planning. If employers have accurate information about the characteristics of the Saudi labor force, they will be better prepared to meet the needs and interests of employees and workers, which may lead to higher rates of production and efficiency. The Saudi market is now more open to foreign investors than ever before as the laws and regulations of foreign investment have gone under several and deep modification to prompt investment in the Saudi market (Asharqalawsat, 2000). Consequently, this study provides foreign investors with needed information about the attitudes of the Saudi labor force concerning employment system.

In addition, this study contributes to the existing body of literature regarding

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(\*) The terms employees and workers will be used interchangeably, with no difference in meaning.

privatization's effects on employment system. With more nation states moving toward privatization (Austin, *et al.*, 1986; Becker, 1992; and Geldstein, 1997), there is a need for more studies concerning how employees perceive changes in employment system since their job satisfaction is very essential for higher levels of productivity. Such a study answers some of the questions about undergraduate students' attitudes toward privatization that other countries in the region (ex. Kuwait, Qatar, and Oman) may face, since these countries share very similar cultural, social, economic, and political systems. The data collected in this study serve as a benchmark for future longitudinal studies aimed at examining changes in the attitudes of the Saudi labor force with regard to employment system.

### Review of the Literature

#### ***Observed Changes in the Employment system in Privatized State-Owned Enterprises***

As the preceding discussion suggests, it is very important to analyze specific dimensions of employment system that are being affected significantly by privatization of SOEs. Here then is a brief discussion of how privatization affects employment practices.

#### *Employment System and Promotion Criteria:*

Privatization of state-owned enterprises is believed to bring substantial changes in job relations and employment system (Washington, 1994; Dereli & Isik, 1993). The first changes occur in the employment and promotion systems. For many, the public sector has always been a safe, predictable, and highly desirable source of jobs. In many countries, "the public sector has always been an important employer, traditionally acting as a counter-cyclical employer especially at the provincial and local levels" (Geldstein, 1997). In fact, the public sector's main goal is to increase the social welfare even at the expense of the financial aspects. However, an expected result of this policy is what Bhaskar and Khan (1995) call *overstaffing* and *excessive employment*, a situation, which in turn raises production costs and reduces profits.

What about the criteria for recruitment, hiring, firing, and promotion in the privatized companies? In SOEs, nepotism is often a common practice, and promotions are based usually on seniority and experience. However, with privatization, recruitment and promotion are based on qualifications. Educational degrees, standardized test results, interviews, and social skills are the main criteria for obtaining a job in a privatized company (Geldstein, 1997). Another positive attribute of privatized SOEs is that management believes it must provide valuable employment packages to recruit and keep workers with required knowledge and skills. The criteria for dismissing an employee also differ from those of the public sector. Unless a "no layoffs" agreement has been signed, employees of privatized SOEs can be dismissed at management's discretion (Dereli & Isik, 1993). In short, the main employment trends are to hire younger, more qualified, and non-unionized workers, and to fire experienced, unionized, and high salaried workers (Geldstein, 1997).

The criteria for promotion also differ in privatized SOEs. Who is promoted? Based upon what criteria? Occupations and qualifications, rather than seniority and experience, form main bases for promotion. Supervisors are to be upgraded and clerks are to be left at the same level. In addition, unlike promotion in the public sector, which is seniority-based; with privatization, promotion is performance-based (Davidson, 1990).

Employee skills are also stressed in privatized SOEs. For what kind of workers do employers look? What kind of skills are indeed key factors to qualify for jobs in the privatized enterprises? Most employment models tend to link good employment packages with high levels of skills (Davidson, 1999). Williamson (1985) argues that firms that execute complex functions are forced to seek skilled workers and to provide them with more training. Not only that, but to avoid a possible high turnover rate, those firms must also work diligently to maintain good relations with their employees. On the other hand, it is only logical that workers who have spent time and money to acquire specific skills for such jobs are less likely to leave because their abilities might not be easily transferred to another position in another industry (Davidson, 1999). However, this theory does not go far enough. Certainly, workers with lower skill levels must also attempt to maintain continuous employment since it would be more difficult for them to find other positions. Studies have indicated that those with higher levels of skill are more likely to be re-employed and at a quicker rate than those with lower levels (Carnoy, 1997; Lipset and Marcella, 1996; Castells, 1996; Aaronson and Kenneth, 1999; Berman, 1998; Levinson, 1996).

#### *Workload and Time Required:*

Jobs in the public sector differ from those in privatized firms in terms of workload and the time required for their completion. Employees in privatized SOEs are expected to perform more work within a longer working day. Recent research on privatized enterprises indicates several of the most obvious changes in employment system are an increase in workload in terms of quantity of work (Bhaskar & Mushtaq, 1995); lengthening of the working day (Davidson, 1993); a significant increase in labor intensity (D'Souza & William, 1999); and reduction in number of days off (Geldstein, 1997).

Flexibility is a very important component of work content. This, in turn, has a significant effect on employment system and relations (Davidson, 1990). Previous research indicates that concerning employment-related systems, public sector jobs are more flexible. In other words, compared to those in the public sector, jobs in the privatized SOEs are less flexible and very strict. As Geldstein (1997) points out in her study of privatized and public sector firms in Argentina, "working conditions in the public sector are ...more flexible than in the private sector, with fewer required hours, more days off per year, and on-site child care."

Nevertheless, because it clearly relates to quality of job execution, flexibility is one of the issues that privatized SOEs must address in order to achieve success. In her study of how office work changed in one of the privatized national public utilities in

Britain, Davidson (1990) points out that management expressed concern about introducing specific changes to a work system already in place. Flexibility was one of the first aspects to be addressed. New management must seek more flexibility in terms of work shifts, weekend and overtime work, use of part-time employees to meet peak demand, and staff mobility between sections and locations.

#### *Job Security:*

While the preceding discussions focuses mainly on how privatization of SOEs contributes to changes in employment system and relations, this process also has significant effects on other crucial aspects of employment. Job security and salaries are key employment factors. The following paragraphs will touch on some of what previous researchers have discussed about job security and salaries.

What workers fear the most is the loss of jobs. Although this issue is still the subject of debate, privatization has played a role in the layoff of workers and in general employment reduction (Davidson, 1993; Eggers, 1997; Martin, 1999; Mondaq Business Briefing, 1998; Washington, 1994). In order to survive in a highly competitive market, privatized SOEs must be able to reduce production costs, and this process inevitably leads to staff reduction. Such a situation can put extra stress on workers, who are never sure whether they will be affected next by a reduction in numbers. The atmosphere of insecurity leads to more tension in the work place, which negatively affects workers' productivity (Bickerton, 1993). Geldstein (1997) points out that the most negative outcomes of privatization involve an increase in workers' fears about job loss and a reduction in benefits. In order to feel more secure about their jobs, some workers even express a willingness to accept lower wages. When asked about their preference between a position offering an adequate income but high job security and a job offering high income but low job security, 80% of the workers in a privatized Turkish cement company said "they did not want to compromise over their job security in return for higher incomes" (Cam, 1999).

#### *Salaries and Wages:*

Along with other changes in employment system, privatization of SOEs affects salaries, wages, and income. In her study, Geldstein (1997) concludes that new employees in privatized SOEs earn higher salaries. Most studies agree with Goldstein's findings (D'Souza and William, 1999; Eggers, 1997; Mondaq Business Briefing, 1998; 1999; Washington, 1994). Based on a study conducted by the World Bank of 12 privatized firms in different countries, "workers as a group generally benefited from privatization through higher wages for those who remained employed, generous severance pay, and employee participation in stock-ownership plans" (Becker, 1992). For new employers, keeping current employees who have the required knowledge and skills is very essential, at least in the short run. As noted in Davidson (1990), in an effort to encourage employees to stay with the company, new employers often provide them with attractive financial packages and social benefits. In the privatized SOEs, management also uses different techniques to improve employees' performance. One of

these techniques is to set a financial target and assess employees' work against these targets to motivate and improve their overall performance (Davidson, 1990). Moreover, as a study of privatized SOEs in Mozambique verifies, privatization can be linked directly to an increase in wages (Mondaq Business Briefing, 1998). Before closing the discussion of how privatization affects wages, it is essential to point out that in privatized SOEs, there are specific criteria for salary raises. Unlike those of public sector jobs, the criteria for salary raises in privatized companies are linked to productivity. According to Geldstein (1997), workers often receive productivity bonuses twice a year that may reach up to 50 percent of their salary.

### ***The Saudi Labor Market***

Saudi society can be described as a youth society. According to a report by Ashdadi (2002), the 1999/2000 population survey indicates that more than 60 percent of the Saudi population, 15.7 million, is eligible for work. As the survey indicates, the population growth in Saudi Arabia is almost 4 percent—6.2 percent for ages under 16 years old. These numbers indicate that in the immediate future, there will be a high demand for jobs. It is clear, therefore, that the involvement of the private sector has become a necessity for economic development (Al-Jazirah Newspaper, 2002).

According to the Saudi Council of Labor Force, the Saudi labor market consists of 7,176,100 employees and workers. The private sector accounts for 6,260,100 jobs; the public sector, 916,000 jobs. Saudi employees and workers account for as few as 7 percent of jobs in the private sector and as high as 96 percent in the public sector (Al-Watan Newspaper, 2002). The lesson of these data is that among Saudi workers, there is a preference towards seeking public sector employment. This fact begs two questions: First, what are the factors behind the low representation of Saudi citizen employees in the private sector jobs? Second, after privatization, how would the Saudi citizen employees, public sector employees, feel, like or dislike, about the structure of the private sector jobs? In other words, how would public sector employees feel about working in the future for private owners under different employment system?

To answer the first question, one can say that through privatization, the state government hopes that the private sector will be more effective in creating more jobs to reverse the currently increasing unemployment rate of almost 18 percent (not officially confirmed). However, with more than five million foreign workers in the Saudi labor market, many think that the current unemployment rate involves not as lack of jobs but other factors. Jobs are available, they argue, but tend not to attract many Saudis because of what many claim to be overly-demanding requirements (e.g., long workdays) and low incentives (e.g., low pay). This argument takes us to the second question. The response is that with privatization, employment system is going to change and except for a slight increase in wages and salaries, resemble employment system of currently rejected by the Saudi employees. In other words, jobs in the privatized SOEs require longer workdays, higher levels of accountability, precise keeping of hours, and individual recognition; rather than, collective reward.

Therefore, the real question focuses on the characteristics and attitudes of the Saudi employees and how (and whether) they would fit the requirements of privatized jobs. Saudi employees are viewed by many as non-productive. Kronemer (1997) points out that even Saudi employers believe that “Saudi workers are as both less productive and more expensive than the workers from Asia and [other countries]”. Some of the most common complaints made against a large number of Saudi workers are chronic absenteeism, more than occasional tardiness, and weak work effort. In addition to that, the geographical characteristics of the country as a desert land affect the lifestyle of its people, which in turn shapes their perception and behavior in work. Saudi workers pay more attention to interpersonal relationships during working hours, give less attention to the importance of being punctual, and show little interest and willingness to work 40-hour weeks. As Kronemer (1997) puts it “It [desert] has made for a population that is not naturally suited to the routines of a 40-hour-per-week job, or to many occupational that require working with one’s hands or performing service or support duties. Particularly regarding absenteeism and tardiness, these desert values make it difficult for an individual to accept the control of a clock over the daily rhythms of one’s personal life”(Kronemer, 1997). Such work habits are not in line with privatization requirements where personal achievements are encouraged and the time clock controls all work processes.

Equally significant, many young Saudis find it difficult to accept certain jobs, such as those involving physical labor; to work under foreign supervisors, and even to wear certain types of work-related clothing, such as overalls (MacFarquhar, 2001). Not only that, but also the majority of Saudi employees and workers show little interest in acquiring new skills and knowledge, and they are unwilling to physically move to other work locations, especially when it is far away from the family home (Alfarian, 2002).

Nonetheless, Saudi workers possess many positive attributes. During a recent workshop forum on employment and Saudization (the process of replacing non-Saudi employees by Saudi employees), private sector employers pointed out that Saudi workers with college degrees are usually very commendable employees. Trust, compliance, teamwork, and productivity are among the very best aspects of Saudi’s private sector employees (Alfarian, 2002). As privatization looms, the need for such a study becomes essential. One major question this study aims to answer is what type of attitudes young Saudis, specifically undergraduate college students, have toward the new system of employment s in the privatized SOEs. Two major factors make surveying this particular category of population very significant: 1) this generation will provide future employees for these privatized SOEs; and, 2) this generation is living the experience of unemployment involving themselves, colleagues, and relatives.

### ***The Effect of Culture and Family on Work-Related Values***

In many ways, Saudi Arabia can be compared to a capitalist welfare state. The market has its own system, and the government provides citizens with free health, education, and social security services. Although it is rapidly developing, however, Saudi society remains a traditional society. Culture and family dramatically affect

people's attitudes and behavior, which can be observed quite clearly in the marketplace. A study undertaken by Al-Ghamdi (1992) revealed that cultural factors had a greater effect on the attitudes of Saudi students toward work than did education and mass media consumption. The result of Al-Ghamdi's study showed that while religious commitment positively affected students' attitudes toward work, tribal attachment negatively affected it (cited in Al-Ghamdi, 1992). These results do not seem surprising. Traditional Islamic roles and teachings encourage commitment toward work (Al-Modaf, unpublished work), while tribal attachments present a direct resistance to or challenging of authority and reveal a preference for kinship loyalty, or nepotism, in the workplace.

Another study on the attitudes of Saudi university students toward work showed that the respondents have attitudes that are more traditional. In 1982, Al-nimir Saud examined attitudes among Saudi bureaucrats and compared them to those held by university students. The study results showed that both bureaucrats and students exhibit little interest in change, an unwillingness to take risks, and a reluctance to relocate (cited in Al-Ghamdi, 1992)

It seems only logical then that family structure and values affect work-related attitudes in Saudi society. Al-Towaijri (1992) points out that the effect of family is very significant in this regard. He argues that the family strongly influences not just decisions about employment in the public or private sector, but also an individual's willingness to work away from the traditional home. More often, he says, individuals are urged by their family to work in the private sector close to home. Al-Towaijri relates such pressures to the cultural ideology, which directly affects family members' participation in the labor market. Individuals are expected to live close to their parents and youngsters so they can provide assistance whenever needed. Therefore, those individuals are more likely to seek a government job, which will allow the extended family to remain within a short distance of each other. Since private sector jobs very often require moving away to another location or city, they are less desirable to traditional families (Al-Towaijri, 1992).

### ***Hofstede's Uncertainty Avoidance and Cultural Differences***

To extend the argument of why employees fear privatization, one might think of Geert Hofstede's work (1980), who provides the result of the international HERMES survey, which surveyed people in 40 countries to find out how culture affects work-related values. Four major cultural dimensions were under investigation: power distance, uncertainty avoidance, individualism, and masculinity. The second dimension, uncertainty avoidance (UA), is very relevant to the discussion of the anticipated effects of privatization on the employment system. Traditionally, what public employees and workers fear about privatization is that under it they would lose the security, stability, and certainty about the future that work in the public sector affords them. To measure the level of UA, respondents were asked first about their willingness to follow company rules. People with high UA levels were found to be less willing to break the company's rules even if it was in the employer's best interest. These same respondents also were asked questions about employment stability and stress. The results of these questions

discovered that fewer people were planning to leave their job within five years, and that people who were experiencing higher level of stress would learn to cope with it through rule orientation and employment stability.

The study results showed that higher levels of UA could be expected to indicate a number of things about employees. They would:

- a) have some resistance to change,
- b) be unwilling to break company rules,
- c) prefer that seniority be a factor in manager selection,
- d) worry more about the future,
- e) demand more information about career requirements,
- f) call for greater levels of on-the-job instruction,
- g) exhibit little desire to work for foreign managers, and
- h) be less prepared to live abroad.

Some of these results can be found among Saudi employees and university students, for very simple reasons. The study results revealed that levels of UA correlate with economic and political systems; that is, new democratic countries with faster economic growth tend to reveal higher levels of UA. Since Saudi Arabia is a developing country with a monarchy political system, higher levels of UA are expected to be prevalent among the members of its society, which might not favor some of the anticipated effects of privatization on employment systems i.e., job relocation, willingness to be creative at work.

### **Findings**

Data analyzed in this study were collected from 762 Saudi undergraduate college students from several areas e.g., Jeddah, Riyadh, Dammam, Abha. Approximately two-thirds (65.5%) of these students were male, and almost 85 percent were single. The mean age of the study sample was 22.5 years. Coming from different academic majors, the study respondents tended not to have worked before; in fact, only 15 percent possessed work experience. Only a small number of respondents had parents who have/had held jobs in the private sector: 19 percent reported that their fathers have or had held such positions; while 2 percent reported that their mothers have or had.

Of the study respondents, the majority (70-80%) preferred working under close supervision of Saudi management, having a salary based on productivity, being promoted based upon performance (rather than seniority), and adhering to prescribed procedures in executing job tasks (see Table 1). Moreover, considerably high percentages of the study respondents tended to dislike the concepts of putting forth more effort to meet management's plans (71.9%), of working on nights and weekend (58.8%), and of compromising job security in return for a higher salary (58.8%), (see Table 1). In addition, while the majority (71%) of the study respondents believe that privatization of state-owned enterprises is best for the local economy, their support for privatization is qualified by their insistence or desire that it not negatively impact their own interests (see Table 2).

Table 1 : Frequency Distribution Regarding Attitudes toward the Effects of Privatization on the Employment System

|       |                                                                                                                                          |                     | 1             | 2             | 3             | 4             | 5             |
|-------|------------------------------------------------------------------------------------------------------------------------------------------|---------------------|---------------|---------------|---------------|---------------|---------------|
| ITEMS |                                                                                                                                          | $\bar{X}$<br>(S.D.) | SD<br>(%)     | D<br>(%)      | N<br>(%)      | A<br>(%)      | SA<br>(%)     |
| 1     | BASUPRVS: Management should keep a close supervision over employees.                                                                     | 3.95<br>(.99)       | 28<br>(3.7)   | 44<br>(5.8)   | 94<br>(12.3)  | 368<br>(48.3) | 228<br>(29.9) |
| 2     | WLTEFORT: I am not willing to put forth more effort to meet management plans.                                                            | 2.10<br>(1.1)       | 253<br>(33.2) | 295<br>(38.7) | 120<br>(15.7) | 69<br>(9.1)   | 25<br>(3.3)   |
| 3     | WLTEFORT: Salary should be based on employee's productivity.                                                                             | 3.81<br>(1.2)       | 45<br>(5.9)   | 95<br>(12.5)  | 81<br>(10.6)  | 283<br>(37.1) | 258<br>(33.9) |
| 4     | PROMPERF: Promotion should be based on performance rather than seniority.                                                                | 4.04<br>(1.1)       | 33<br>(4.3)   | 57<br>(7.5)   | 104<br>(13.6) | 224<br>(29.4) | 344<br>(45.1) |
| 5     | EMSHIFTS: I am willing to accept shift changes in my job.                                                                                | 3.15<br>(1.1)       | 89<br>(11.7)  | 134<br>(17.6) | 182<br>(23.8) | 287<br>(37.7) | 70<br>(9.2)   |
| 6     | JDSECLEV: One of the most important things about a job is the level of security it offers.                                               | 4.3<br>(.96)        | 16<br>(2.1)   | 37<br>(4.8)   | 67<br>(8.8)   | 227<br>(29.8) | 415<br>(54.5) |
| 7     | BATEAMNG: I prefer working in a team than working alone.                                                                                 | 3.73<br>(1.2)       | 47<br>(6.2)   | 84<br>(11)    | 122<br>(16)   | 286<br>(37.5) | 223<br>(29.3) |
| 8     | WLTSHORT: I would prefer a job with a shorter workday, even if the position offers less pay.                                             | 2.2<br>(1.1)        | 236<br>(31)   | 278<br>(36.4) | 133<br>(17.5) | 86<br>(11.3)  | 29<br>(3.8)   |
| 9     | SOVRTIME: I am willing to work overtime if I will be paid double what I make on regular working time.                                    | 3.9<br>(1.05)       | 36<br>(4.7)   | 53<br>(7)     | 86<br>(11.3)  | 357<br>(46.8) | 230<br>(30.2) |
| 10    | PROMMOVE: I am not willing to move to another location/city/town in order to be promoted.                                                | 2.8<br>(1.3)        | 146<br>(19.2) | 205<br>(26.9) | 160<br>(21)   | 157<br>(20.6) | 94<br>(12.3)  |
| 11    | EMTSTINT: Prospective employees should take standardized tests and undergo personal interviews before they can be hired.                 | 3.5<br>(1.2)        | 68<br>(8.9)   | 73<br>(9.6)   | 132<br>(17.3) | 307<br>(41.6) | 172<br>(22.6) |
| 12    | JDFIREMP: Firing employees should not be at the discretion of lower management (e.g., foreman, supervisor).                              | 4.1<br>(1.1)        | 32<br>(4.2)   | 46<br>(6)     | 89<br>(11.7)  | 276<br>(36.2) | 319<br>(41.9) |
| 13    | BAINOVAT: In executing my job, I prefer to stick to the procedures prescribed by management.                                             | 4.01<br>(.85)       | 9<br>(1.2)    | 48<br>(6.3)   | 74<br>(9.7)   | 426<br>(55.9) | 205<br>(26.9) |
| 14    | WLTMTTHD: The employer has the right to use precise methods (e.g., punch card) to ensure that all employees complete a full working day. | 3.7<br>(1.2)        | 60<br>(7.9)   | 84<br>(11)    | 100<br>(13.1) | 321<br>(42.1) | 197<br>(25.9) |

Table 1 (continued)

|       |                                                                                                                                                                                           |                     | 1             | 2             | 3             | 4             | 5             |
|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|---------------|---------------|---------------|---------------|---------------|
| ITEMS |                                                                                                                                                                                           | $\bar{X}$<br>(S.D.) | SD<br>(%)     | D<br>(%)      | N<br>(%)      | A<br>(%)      | SA<br>(%)     |
| 15    | SPAYPCKG: I would like to be offered various employment packages (e.g., housing, medical insurance), even if it means accepting a lower salary than that of the wage market.              | 3.7<br>(1.1)        | 25<br>(3.3)   | 105<br>(13.8) | 124<br>(16.3) | 321<br>(42.1) | 187<br>(24.5) |
| 16    | PROJDEMO: I expect to be demoted if I am not achieving the minimum requirements of my job.                                                                                                | 3.2<br>(1.1)        | 64<br>(8.4)   | 158<br>(20.7) | 180<br>(23.6) | 293<br>(38.5) | 67<br>(8.8)   |
| 17    | EMTEMJOB: I will not accept a temporary job.                                                                                                                                              | 3.2<br>(1.4)        | 129<br>(16.9) | 140<br>(18.4) | 159<br>(20.9) | 135<br>(17.7) | 199<br>(26.1) |
| 18    | JDCOMPSC: I am willing to compromise job security in return for a higher salary.                                                                                                          | 2.5<br>(1.2)        | 198<br>(26)   | 250<br>(32.8) | 137<br>(18)   | 113<br>(14.8) | 64<br>(8.4)   |
| 19    | BAAUTHDL: If I work as a manager, I would be willing to delegate authority to my employees.                                                                                               | 3.2<br>(1.2)        | 67<br>(8.7)   | 144<br>(18.9) | 194<br>(25.5) | 261<br>(34.3) | 96<br>(12.6)  |
| 20    | WLTEMRGNC: In the case of an emergency, employees should be allowed to take the day(s) off without having the number of annual days reduced.                                              | 4.4<br>(.99)        | 17<br>(2.2)   | 23<br>(3)     | 55<br>(7.3)   | 251<br>(32.9) | 416<br>(54.6) |
| 21    | SONEWEMP: New employees should not be offered a higher salary than those already employed at the same level even if the new employees have more experience and higher educational levels. | 2.4<br>(1.3)        | 221<br>(29)   | 231<br>(30.3) | 132<br>(17.3) | 115<br>(15.1) | 63<br>(8.3)   |
| 22    | PROSENIO: Senior workers should always be promoted first.                                                                                                                                 | 3.2<br>(1.3)        | 76<br>(10)    | 166<br>(21.8) | 173<br>(22.7) | 200<br>(26.2) | 147<br>(19.3) |
| 23    | EMNWEKND: I am willing to work on nights and weekends.                                                                                                                                    | 2.04<br>(1.3)       | 249<br>(32.7) | 199<br>(26.1) | 122<br>(16)   | 134<br>(17.6) | 58<br>(7.6)   |
| 24    | BAFORMNG: I prefer my direct manager to be a Saudi manager.                                                                                                                               | 4.05<br>(1.1)       | 25<br>(3.3)   | 34<br>(4.5)   | 168<br>(22)   | 183<br>(24)   | 352<br>(46.2) |
| 25    | EMSOCREL: If one's social relations can help him/her to get a job, he/she can use them for that purpose.                                                                                  | 3.4<br>(1.3)        | 105<br>(13.8) | 83<br>(10.9)  | 134<br>(17.6) | 285<br>(37.4) | 155<br>(20.3) |

N=762

SD = Strongly Disagree; D = Disagree; N = Neutral; A = Agree; SA = Strongly Agree

Table 2: Frequency Distribution Regarding Attitudes toward Privatization

|       |                                                                                                                                                                                                                         |                     | 1             | 2             | 3             | 4             | 5             |
|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|---------------|---------------|---------------|---------------|---------------|
| ITEMS |                                                                                                                                                                                                                         | $\bar{X}$<br>(S.D.) | SD<br>(%)     | D<br>(%)      | N<br>(%)      | A<br>(%)      | SA<br>(%)     |
| 1     | PRPRFAVR: I personally favor privatization of state-owned enterprises.                                                                                                                                                  | 3.55<br>(1.15)      | 54<br>(7.1)   | 85<br>(11.2)  | 170<br>(22.2) | 294<br>(38.6) | 159<br>(20.9) |
| 2     | PRGDECON: I believe that privatization is good for the Saudi economy.                                                                                                                                                   | 3.83<br>(.95)       | 25<br>(3.3)   | 37<br>(4.9)   | 158<br>(20.7) | 366<br>(48)   | 175<br>(23)   |
| 3     | PRSEREFF: Privatization of state-owned enterprises(e.g., electricity, telecommunication, transportation) will increase the efficiency of the services they provide.                                                     | 3.97<br>(1)         | 23<br>(3)     | 50<br>(6.6)   | 108<br>(14.2) | 328<br>(43)   | 253<br>(33.2) |
| 4     | PRSLFSUP: I support the idea of privatization even if it will affect me directly.                                                                                                                                       | 3.12<br>(1.18)      | 70<br>(9.2)   | 178<br>(23.4) | 209<br>(27.4) | 203<br>(26.6) | 102<br>(13.4) |
| 5     | PRPRSECT: When the public sector fails to provide efficient services (high quality and quantity), the private sector should be allowed to provide these services.                                                       | 3.97<br>(.90)       | 12<br>(1.6)   | 39<br>(5.1)   | 130<br>(17.3) | 358<br>(47)   | 221<br>(29)   |
| 6     | PRPRVJOB: I would recommend private sector jobs to my friends and relatives.                                                                                                                                            | 3.37<br>(1.06)      | 46<br>(6)     | 105<br>(13.8) | 229<br>(30.1) | 286<br>(37.5) | 96<br>(12.6)  |
| 7     | PRPUBOPN: The public holds negative perception about the performance of the public sector.                                                                                                                              | 3.31<br>(1.10)      | 48<br>(6.3)   | 129<br>(16.9) | 224<br>(29.4) | 259<br>(34)   | 102<br>(13.4) |
| 8     | PRSLFEFC: I support the idea of privatization even if it has/will have negative effects (e.g., increase in working hours, reduction in annual days off, more responsibility) on my job or on the job of someone I know. | 2.77<br>(1.18)      | 123<br>(16.1) | 215<br>(28.2) | 188<br>(24.7) | 184<br>(24.1) | 52<br>(6.8)   |

N = 762

SD = Strongly Disagree; D = Disagree; N = Neutral; A = Agree; SA = Strongly Agree

The statistical significance and association analyses, as indicated in Figure 1, reveal that the effects of academic majors and province on respondents' attitudes toward promotion criteria, teaming, and management's nationality are indeed significant. More specifically, respondents with *Sciences* and *Business* majors seem to support the criteria of promotion under privatization, compared with *Arts* and *Science* and *Technical Study* majors, which emphasize performance over seniority. Moreover, *Science*, *Arts* and *Science* majors show a high preference for teaming when compared with *Business* and *Technical Study* majors. Province of respondents seems to affect attitudes toward working under non-Saudi management. As the study data reveal, the respondents from the more traditional provinces, the *Middle* and the *Southern*, show less interest to work under the supervisions of non-Saudi management when compared with the respondents from the other provinces i.e., *Western* and *Eastern*.

| Dependent Variable (s)                             | Independent Variable                              | Hypothesized Relationships | Results |
|----------------------------------------------------|---------------------------------------------------|----------------------------|---------|
| Job-time requirements                              | Science majors                                    | Positive                   | - ns    |
|                                                    | Female                                            | Negative                   | - **    |
|                                                    | High religiosity                                  | Negative                   | - ns    |
|                                                    | More adherence to religion                        | Negative                   | - **    |
|                                                    | Parents' job in the private sector                | Positive                   | + ns    |
| Promotion criteria & Job re-location for promotion | Non-urban residence prior to college entry        | Positive                   | - ns    |
|                                                    | Older sons/daughters                              | Negative                   | - ns    |
|                                                    | Science majors                                    | Positive                   | + **    |
|                                                    | Parents' job in the private sector                | Positive                   | + ns    |
|                                                    | Living with parents                               | Negative                   | - ns    |
| Job security                                       | Science majors                                    | Positive                   | - ns    |
|                                                    | High parental involvement in employment decisions | Negative                   | - ns    |
|                                                    | Work experience in the private sector             | Negative                   | - ns    |
| Hiring criteria                                    | Non-urban residence prior to college entry        | Positive                   | - ns    |
|                                                    | Female                                            | Positive                   | + ns    |
| Social networks and job search                     | High SES                                          | Positive                   | - ns    |
| Teaming                                            | Science majors                                    | Positive                   | + **    |
| Supervision of non-Saudi management                | Traditional provinces                             | Negative                   | - ***   |
| Privatization                                      | High religiosity                                  | Positive                   | + ns    |
|                                                    | Female                                            | Positive                   | - ***   |
|                                                    | High SES                                          | Positive                   | + **    |
|                                                    | Urban residence prior to college entry            | Positive                   | + ns    |

Note. \*\*\* p < .001, \*\* p < .05, ns = not significant

Fig. 1: Summary of the Hypothesized Relationships and Findings of the Study Dependent and Independent Variables

In addition, gender, SES, living areas prior to college entry, and adherence to religion are significantly related to respondents' attitudes toward privatization in general and toward some of its potential effects on the employment system. In this regard, female respondents and the respondents with more adherences to the religion show significant negative attitudes toward the effects of privatization on time-requirements of the job, where employees may be asked to work on various time shifts, as well as over nights and weekends. In addition, males, high-class, and respondents from urban areas show more support for privatization as an economic reform policy for the Saudi economy.

### Conclusion

In August 1997, the Supreme Economic Council (SEC) in Saudi Arabia recommended privatization as a reform policy. Privatizing state-owned enterprises (SOEs) is believed to generate direct and indirect revenues (through selling and taxation) and improve competition in the local economy. Aside from the various economic changes that accompany privatization (e.g., efficiency, input/output, or profit), previous research indicates that privatizing state-owned enterprises leads to changes in certain aspects of the employment systems: types of employment and recruitment; promotion and salary; workload and work time; job security; and behavioral attributes. This study has attempted to explore the attitudes among undergraduate college students in Saudi Arabia regarding such anticipated changes.

During the first two weeks of May, 2002, several hundred Saudi undergraduate college students were surveyed. Various analyses of 762 survey questionnaires were conducted. Based on the study findings, we can conclude the following:

- The majority of the study respondents have *positive* attitudes toward anticipated changes in promotion criteria, as well as the salary and hiring systems.
- The majority of the study respondents have *negative* attitudes toward anticipated changes in the work time, workload, firing system, and levels of job security.
- The majority of the study respondents prefer teaming.
- The majority of the study respondents prefer working under Saudi management.
- The majority of the study respondents favors privatization of the state-owned enterprises and thinks it is good for the local economy.
- The majority of the study respondents will not support privatization if it has negative effects on their interests or on those of their significant others.
- Compared to those from rural areas, the respondents who lived in urban areas prior to entering college have positive attitudes toward privatization in general and to anticipated changes in the hiring system and promotion criteria.
- Respondents who live with their parents, and in particular, the older

sons/daughters, are less willing to accept job promotion if it necessitates relocation far from the parents' home.

- Compared to business and science majors, the respondents who are technical study and arts and social science majors have more positive attitudes toward jobs that require working on shifts and over nights and weekends, as well as those that provide less job security.
- Science majors have more positive attitudes than other majors toward performance-based promotion and working in teams.
- More than those from other provinces, respondents from the Southern and Middle provinces prefer to work under Saudi management.
- Female respondents have positive attitudes toward privatization in general and toward its anticipated effect on the hiring system, but have negative attitudes toward job-time requirements.
- Compared to those from lower social classes, respondents from higher social classes show more support for privatization in general and less of a need for using social relations in the job-finding process.
- Respondents with higher levels of religiosity prefer privatization in general, but have negative attitudes toward its anticipated effects on job-time requirements.
- Respondents with a higher level of parental involvement in their employment decisions value job security over higher salary.
- Respondents with at least one parent working for the private sector have more positive attitudes toward the anticipated effects of privatization on promotion criteria and job-time requirements.
- Respondents who have work experience in the private sector show more negative attitudes toward accepting jobs with low levels of security.

### **Recommendations**

#### ***General Recommendations for Policy Makers in Saudi Arabia:***

The study respondents seem to support privatization of state-owned enterprises. However, to increase the success of such a policy or at least to minimize any negative effects, the state government may consider the following:

- a) Attempting to benefit from the experiences and expertise of other countries that have attempted wide-scale privatization.
- b) Monitoring the process of privatization to ensure smooth transformation.
- c) Implementing "no-lay off" agreements with the private sector at least for a period of time—five years, for example.
- d) Taking responsibility for those who lose their jobs due to privatization by re-employing them in other public jobs or helping them find jobs in the private sector; providing them with monthly allowances during the process of finding jobs; providing them and their families with health insurance; and offering them training programs to re-qualify them for the available jobs in the labor market.

- e) Helping the new private owners keep public sector employees by providing those owners with subsidies (i.e., paying a percentage of the employees' salaries)
- f) Strongly recommending that the private sector, especially foreign investors, observe the specific nature of Saudi Arabia as a Muslim society (i.e., allow time for prayers, and provide females with separate-job locations from males). In addition, the new owners should consider the structure of the Saudi family where mothers/wives/ sisters/ and older daughters do much of the household tasks, which means jobs with shifts, night works, and weekends hours are not preferable and may not fit the needs and schedules of the family.
- g) Encouraging the younger Saudi generation to work for the private sector (i.e., subsidies for working in private jobs)
- h) Educating the younger generation about the importance of work, work ethics, and professionalism (i.e., provide one course at the undergraduate level about professionalism).
- i) Encouraging the younger generation to work at early ages (i.e., high school or college). The experience gained through early work is essential in building one's self image, work skills, and work ethics. In addition, early work experience will ensure that expectations for future jobs will be more reasonable. By working in low paying jobs, manual jobs, night and weekend jobs, the younger generation will be more realistic in their conception of future jobs and will be more familiar with the requirements and responsibilities of work.

***Specific Recommendations for Policy Makers/Private Owners Concerning the Labor Force, with Respect to Recruitment for Privatized Jobs, include:***

- a) The design of female occupations must consider the other commitments such employees have toward their families/household members. Since females in Saudi society are responsible for such traditional activities as raising children and taking care of the household, including preparation of meals, work times for them must not go beyond regular 8-to-5 shifts. In addition, because Saudi society is both Muslim and conservative, night work should be avoided since it can impinge on traditional religious and social norms.
- b) Female employees should be provided with on-site child care, even if it must be done for a nominal charge. Such accommodation has been found to help such employees better focus and concentrate, which means that their productivity and efficiency will increase.
- c) Work places and times must accommodate religious activities. More specifically, accommodation should be provided for prayers: prayer facilities must be made available and adequate preparation and prayer time allotted to workers. Moreover, employees should be permitted to leave work early on Fridays to participate in the congregational prayer. In sum, the organization and structure of the work day should not conflict with the most important form of religious worship in Saudi society, that of prayer.

- d) Promotion criteria should be based on more factors than task outcomes or purely measurable results. Not all tasks can be precisely measured; in fact, the final product might not match the anticipated one, and in some projects, the intended results might take longer to appear. Social projects or programs designed to improve productivity or combat violence, for example, tend to vary in their degrees of success depending upon other factors associated with the problems in question. Promotion criteria should not neglect this fact. In other words, the measured result is not always an accurate or even representative measure of the effort put forth by the employee or employees.
- e) Employees with social science and business degrees should be encouraged to work in teams. The curriculum involved in such degrees might not automatically include more emphasis on teaming, sharing equipment, and working collectively on projects, but the students who attain such degrees often develop other, related skills that enhance their ability to work in teams. For example, students in social science and business engage in more scientific debates and discussion through which they develop the more precise communication and brain storming skills that prove crucial to effective teaming.
- f) Special orientation sessions should be implemented to assist the transition of those workers who might find non-Saudi management objectionable. For employees with stronger tribal attachments—for example, those coming from the more traditional and conservative areas—accepting the supervision of non-Saudi management cannot be accomplished by the written organizational structure of the job alone. Employees coming from the Southern and Middle provinces should participate in specific orientation sessions designed to introduce them in a non-threatening way to the concept of non-Saudi supervision. In such orientation, they will learn that management or supervision is an essential part of the production processes—that management is merely a workplace authority invested with the responsibility of organizing, supervising, and controlling the production processes in a way that leads to higher productivity and thus increased benefits for all, including workers themselves. In addition, such orientation should emphasize the fact that professionalism means objectivity, and objectivity entails no ethnocentrism.
- g) Whenever possible, private owners should recruit, train, and hire Saudi managers, specifically at the more tribal-based enterprise locations, to minimize any potential cultural or ideological conflict.

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## الاتجاهات نحو تأثيرات التخصيص (الخصخصة) على نظام الوظيفة: دراسة على طلاب وطالبات مرحلة البكالوريوس في المملكة العربية السعودية

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**المستخلص:** تعتمد التنمية الاقتصادية والاجتماعية الفعالة والمستمرة بشكل كبير على توفر بيئة تربوية جيدة. مثل تلك البيئة لا تقتصر فقط على الجوانب المعرفية والمهارية ولكن تمتد لتشمل الاتجاهات الشخصية للطلاب والطالبة الأمر الذي يحدد إلى درجة كبيرة مدى تلائم مخرجات العملية التربوية مع البناء الاقتصادي. تهدف هذه الدراسة إلى بحث اتجاهات طلاب وطالبات درجة البكالوريوس في المملكة العربية السعودية نحو التأثيرات المحتملة في نظام الوظيفة والتوظيف الناتجة عن عملية تخصيص القطاع العام. باستخدام منهج المسح الاجتماعي، تم في شهر مايو عام ٢٠٠٢ للميلاد جمع بيانات من عينة من الطلاب السعوديين بلغت 762 طالب وطالبة. ولقد جاءت النتائج متفاوتة. فبينما أظهرت نسبة كبيرة من الباحثين تفضيلهم للعمل تحت إدارة محلية (سعودية)، واستخدام معدل الإنتاجية كمحدد للراتب، واللجوء إلى نوعية الأداء كمعيار للترقية (وليس الأقدمية)، والالتزام التام بالقواعد المنصوص عليها لتنفيذ المهام، أجابت نسبة كبيرة بأنها لا تحبذ بذل المزيد من الجهد حتى يمكن تحقيق الخطط الإنتاجية الموضوعة من قبل الإدارة، ولا تحبذ أيضا فكرة العمل في الفترات المسائية أو خلال العطلة الأسبوعية أو التنازل عن الأمن الوظيفي في مقابل مرتبات عالية. بالإضافة إلى ذلك، أجابت نسبة كبيرة من الباحثين بأنها ترى في عملية التخصيص فائدة للاقتصاد المحلي السعودي، وإن كان تأييدها ودعمها لعملية التخصيص قائم مادامت مصالحهم الخاصة بعيدة عن أي تأثيرات سلبية ناجمة عن ذلك. وتشير عملية التحليل الإحصائي ومعاملات الارتباط إلى أهمية التخصيص الأكاديمي والمنطقة الجغرافية للباحثين في تحديد اتجاهاتهم نحو معايير الترقية، والعمل في فريق، وجنسية الإدارة. وبالإضافة إلى ذلك يعتبر النوع والطبقة الاجتماعية ومكان العيش قبل الدراسة الجامعية ودرجة التدوين متغيرات هامة في بناء وتشكيل اتجاهات الطلاب والطالبات نحو عملية التخصيص بشكل عام وتأثيراتها على نظام الوظيفة والتوظيف بشكل خاص. وفي النهاية تقدم الدراسة بعض التوصيات.

## **A Comparison of Coupled BSc and Associate Diploma Programs in the College of Engineering, University of Bahrain**

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**ABSTRACT.** Since its establishment in early 1980's, the college of engineering at the University of Bahrain has been offering both BSc and Associate Diploma programs. This was in response to the job market's requirement for both engineers and technicians. Also, this was a result of the natural development of the college of engineering prior to becoming part of the University. Historically, the college of engineering was a department in the Gulf Technical College, which offered certificates and diplomas and later part of the Gulf Polytechnic, which offered certificates, diplomas and BSc degrees. When it joined the University of Bahrain in mid 1980s, the college of engineering decided to continue offering both associate diploma and BSc degrees. The method of distributing the students between these two routes has been lately modified. Up to the academic year 1999/2000 , a single track system was followed, in which all the new students admitted initially to the associate diploma program, and only the graduates from this program who achieved a GPA of 2.5 or more were allowed to join the BSc program. Starting from the second semester of the academic year 1999/2000 a new "two track system" has been adopted, in which all of the new students are admitted to the BSc program. After completing one academic year, the students who do not achieve a satisfactory performance are transferred to the associate diploma program. The objective of this paper is to present the experience of the college of engineering at the University of Bahrain with respect to these two systems. The paper discusses the advantages and disadvantages of these two systems with respect to the length of the programs, the rates of dismissals and meeting the job market requirements.

### **1. Introduction**

The undergraduate academic programs in the college of engineering at the University of Bahrain follow a scheme which is unique and not often practiced at other universities. This scheme has adopted a coupling between the BSc and Associate diploma tracks.

The main reason for this choice has been to meet the local needs for both engineers and technicians. The academic programs in the college of engineering at the University of Bahrain have gone through different phases since its establishment in 1980. The college of engineering at its early stages was part of the Gulf Technical College which was later converted to the Gulf Polytechnic. The engineering programs in the Gulf Polytechnic aimed at supplying the private and public sectors with their requirements of engineers and technicians. The ratio of technicians to engineers required by the local markets was estimated at that time to be 4 to 1. In 1986, the Gulf Polytechnic was merged with another college called the University College of Bahrain to establish the University of Bahrain. The students admitted to the various engineering departments had to follow what was referred to as "the single track system". Starting from the second semester of the academic year 1999/2000 a new system was implemented, which was referred to as "the two track system". The differences between these two systems are described in the next section. The objective of this paper is to present the experience of the college of engineering at the University of Bahrain with respect to offering these two systems for achieving associate diplomas and BSc degrees.

## **2. Single- and Two-Track Routes**

In the single track route which had been followed in the College of Engineering at the University of Bahrain since its establishment and upto the academic year 1999/2000, all students admitted to the College had to join the associate diploma program after completing an orientation program for a period of one academic semester. In the associate diploma program, students were required to complete 75 credit hours of science and engineering courses. The science courses mainly consisted of first year BSc (100 level) courses while the engineering courses were of diploma level. This was normally covered in four to five semesters. After completing the associate diploma program, those students who scored a GPA of 2.5 or more (out of 4.0) were allowed to continue in the BSc program which required an additional five semesters of course work. One of the disadvantages of this method was that some of the courses covered in the diploma level had to be repeated at a BSc level, which resulted in an unnecessary longer duration for students to graduate (a total of 157 credit hours). On the other hand, some of the diploma courses were considered as a prerequisite for the BSc level courses. This necessitated handling these diploma level courses at a level which was higher than what is normally required for the preparation of technicians. The laboratory and practical contents of these courses were not considered to be sufficient.

In the two-track system, which was practically launched in the academic year 2000/2001, all students who are accepted in the engineering college join the BSc program. After completing a full academic year (two semesters and an optional summer semester), students who achieve satisfactory performances continue along the BSc track, while those with lower performance are re-routed to the associate diploma program. The criteria for the satisfactory performance are specified as successful completion of 27 credit hours with a GPA of 2.0 or more. A compulsory requirement of

the 27 credit hours is that the courses successfully completed should include two mathematics courses and two other basic science courses. Starting from the academic year 2002/2003 a new associate diploma program was adopted. The main feature of the new programs is that they are technically oriented. The graduates of the new associate diploma programs are not allowed to transfer to the BSc program. The advantage of the two-track system is the decoupling between the BSc and diploma level courses and, hence, avoiding the shortcomings of the old single-track systems mentioned above. Moreover, students who face difficulties in continuing the BSc programs are allowed to transfer to a diploma program at an early stage and would obtain an associate diploma certificate to join the job market as technicians. If those weaker students were allowed to stay in the BSc program without a diploma option then they would waste several semesters before realizing that they cannot obtain a BSc degree and they would end-up with no certificate at all.

Figure 1 shows flowcharts of the different phases of the BSc/Diploma relationships discussed above.

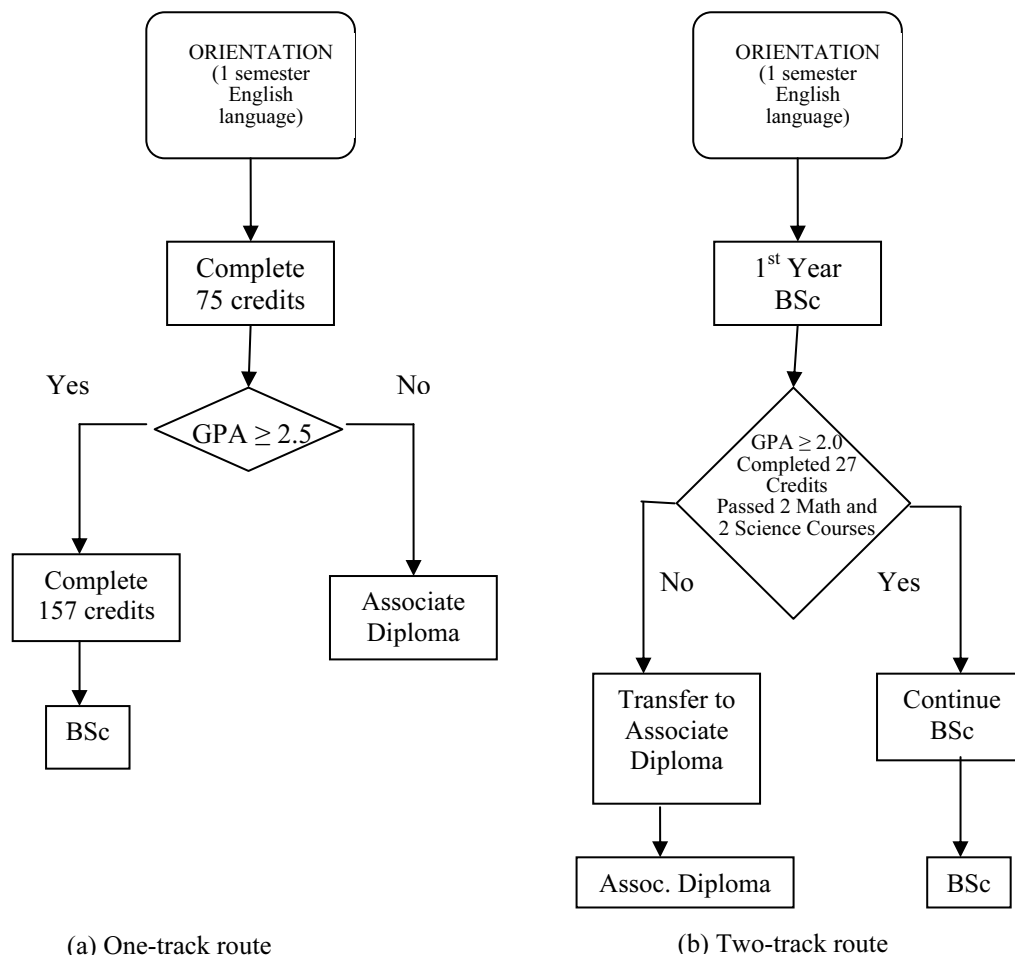


Fig. 1. Past and current systems of screening engineering students to BSc and Associate Diploma programs at the University of Bahrain.

### **3. Student Transfers and Admissions**

As an indicator of the general performance of the coupled BSc-Diploma programs in the engineering college, data for the numbers of students graduated, dismissed and transferred to other colleges were studied for the period from the academic years 1996/1997 to 2002/2003. Fig. 2 shows the numbers of students accepted in the college of engineering for this period. It can be observed that the number of students accepted annually has jumped from an average of about 300 students prior to the academic year 1999/2000 to about 500 students starting that year i.e. an increase of 60%. This sudden rise was due to a new University policy to accept more students in all programs and colleges. The implementation of the new two-track system was practically started in the academic year 2000/2001, although a few students were admitted in the second semester of 1999/2000. Most of the students from that batch will graduate at the end of the academic year 2003/2004. Figs. 3 and 4 show the numbers of BSc and associate diploma graduates, respectively, for the academic years 1996/1997 up to 2002/2003. It can be seen that the numbers of BSc graduates have steadily risen from about 60 in 1996/1997 to more than 100 in the years beyond 2000/2001. On the other hand, the number of associate diploma graduates have declined from about 200 in 1996/1997 to about 150 in 2002/2003. About one third of the diploma graduates each year joined the BSc programs (those students with GPAs of 2.5 or more). The remaining associate diploma graduates joined the job markets to be trained as technicians and operators. The data presented in Fig. 4 includes the students from the old single-track system which has been almost completely phased out by the year 2002/2003. The numbers of students transferred from the college of engineering to other colleges are shown in Fig. 5. One of the main drives for students to transfer to other colleges is the poor performance in the engineering programs. In addition, the sharp rise in the number of transfers in the year 2001/2002 may be due to the start of the implementation of the new associate diploma which leads to no BSc. Many students who were re-routed to the associate diploma program chose to transfer to other colleges. However, according to the University's regulations, if these students don't score a GPA of 2.33 in the subsequent semester, then they are returned to their original college. As a result, many of these students end up returning to the engineering college after one semester. Fig. 6 shows a sharp rise in the number of students dismissed from engineering programs in the academic year 2002/2003. This is thought to be mainly due to the lower levels of the students accepted in the engineering college. Normally, the dismissed students are allowed to transfer to other departments within the college of engineering. Most of the dismissed students are from the associate diploma programs. Due to the re-routing of the lower performers to the associate diploma programs at the end of the first BSc year in the new two-track system, the numbers of students dismissed from BSc programs are usually small. For a similar reason, in the old single-track associate diploma-BSc system the associate diploma graduates with a GPA of 2.5 or more were allowed to join the BSc. This resulted in relatively low dismissal rates.

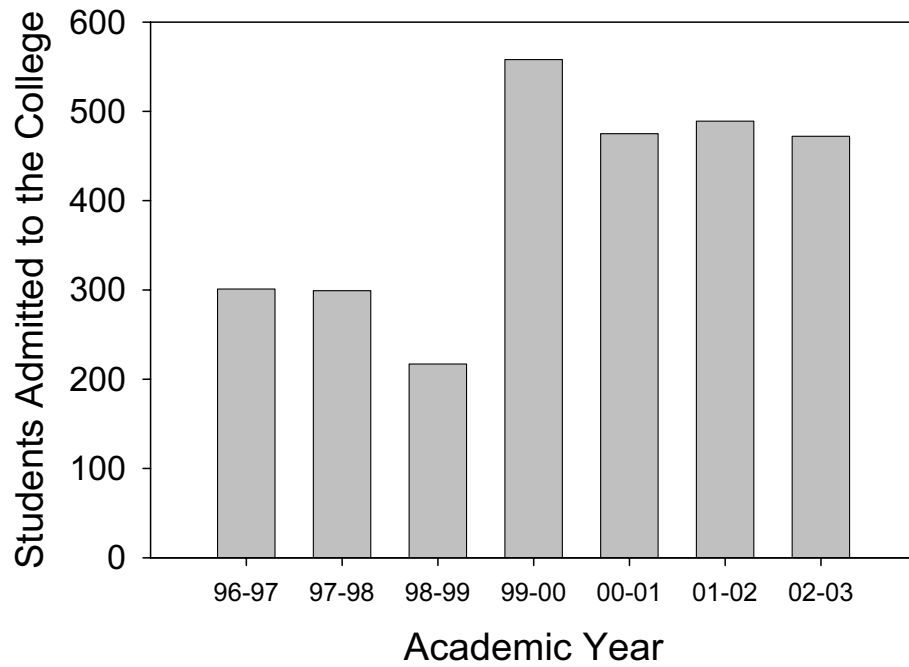


Fig. 2. Numbers of students accepted in the college of engineering.

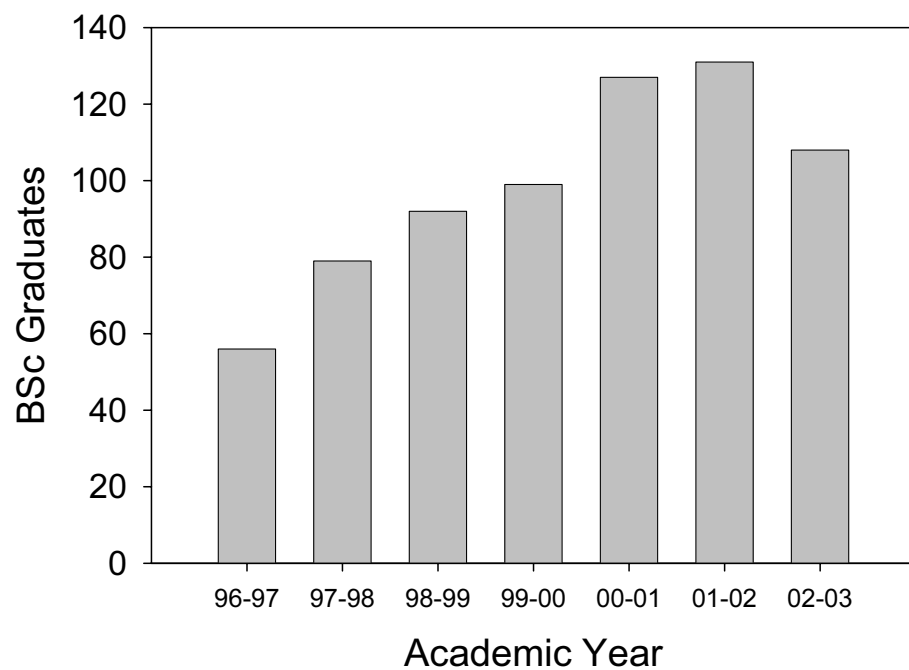


Fig. 3. Numbers of BSc graduates from the college of engineering in various years.

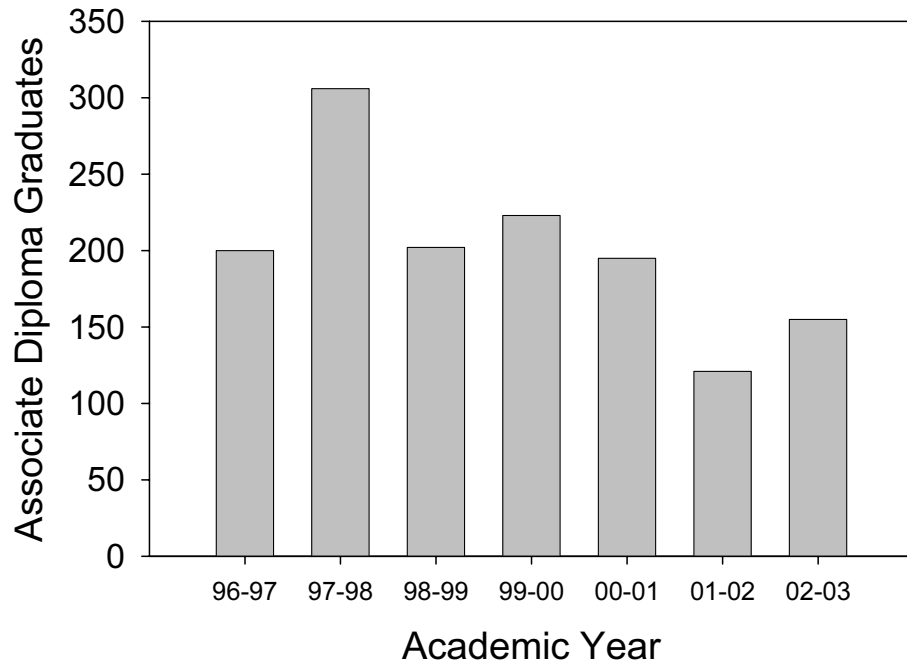


Fig.4. Numbers of students graduated from the associate diploma programs.

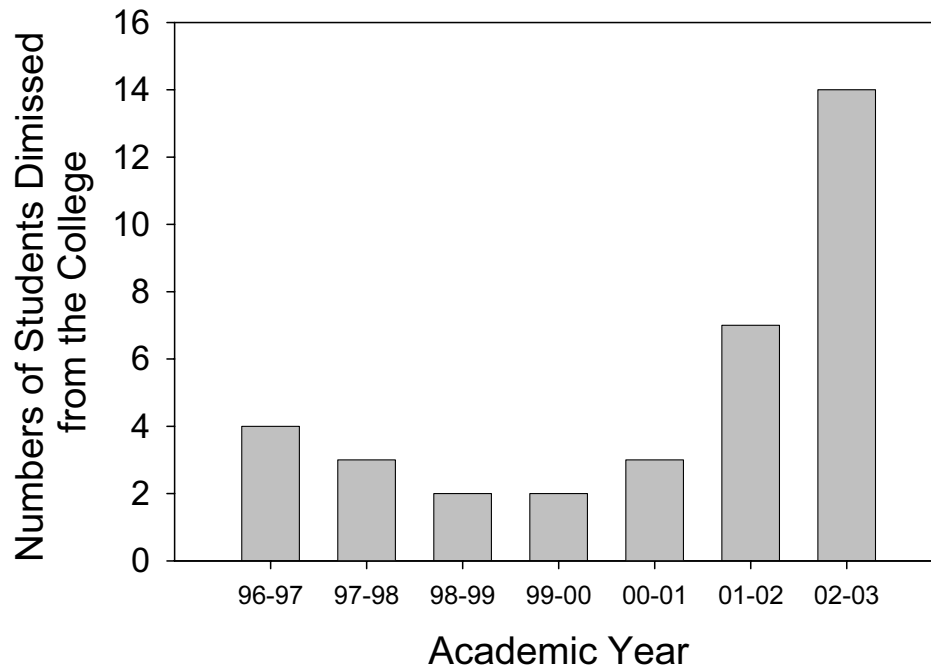


Fig. 5. Numbers of students dismissed from the BSc program in the college of engineering

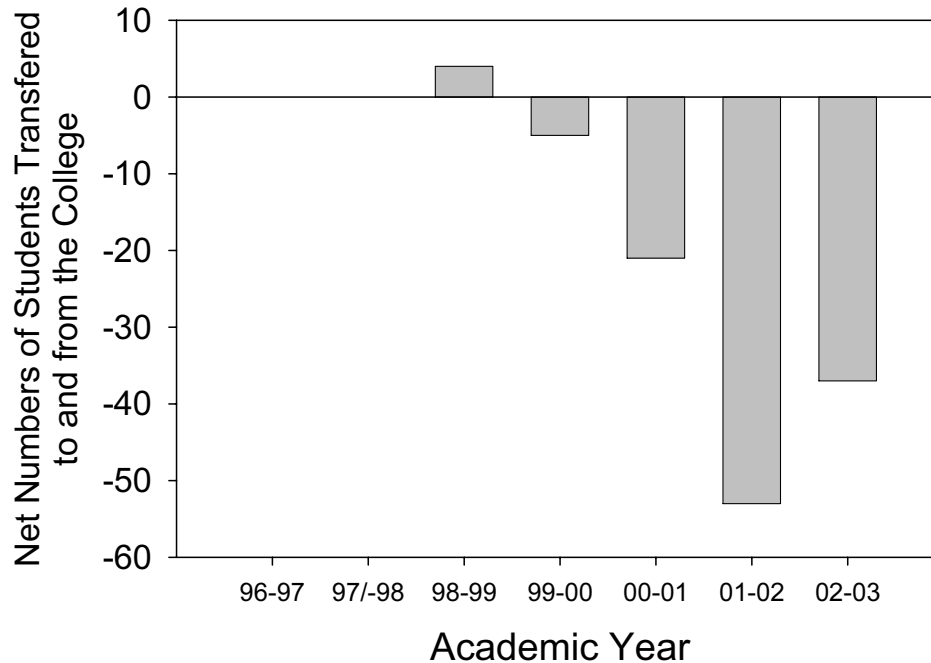


Fig. 6. Net numbers of students transferred to/from the BSc program in the college of engineering to other colleges.

#### 4. Response Of Job Market

So far, the response of the job market with respect to the new system has been favorable. The shorter period required for graduating students with BSc degrees has allowed the college to supply the industry with the required numbers of graduates at more frequent pace. Moreover, the more practical nature of the associate diploma programs appears to be preferred by the industries. However, it has been suggested that a longer industrial (coop) training period is needed compared to the two months training conducted during the summer session.

#### 5. Conclusions

The provision of associate diploma in the college of engineering serves several purposes, particularly the supply of the job market with technicians and operators. Moreover, the availability of a non-degree program provides a substitute for students who are not able to cope with the requirements of a BSc program. The implementation of the single-track system, which continued for more than fifteen years, resulted in a coupling between the associate diploma and BSc programs. This situation resulted in several disadvantages, particularly, a longer period to complete the BSc program (typically 4 1/2 to 5 years) and diploma courses which are more theoretical to prepare

students to join a BSc program. The two-track system adopted recently has decoupled the diploma and BSc programs. This has lead to a shorter graduation period for the BSc (four years after the orientation) and resulted in a clearer definition of the objectives and contents for the courses in each program.

## تجربة كلية الهندسة بجامعة البحرين في الربط بين مساري البكالوريوس و الدبلوم المشترك

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**المستخلص:** قامت كلية الهندسة بجامعة البحرين منذ تأسيسها في بداية الثمانينات بتقديم برنامجي البكالوريوس و الدبلوم المشترك معا ، و قد كان السبب في ذلك هو حاجة سوق العمل للمهندسين وكذلك للفنيين ، و قد اتبعت كلية الهندسة نظاما خاصا في الربط بين البرنامجين استمر إلى حوالي عام ٢٠٠٠ ، و هذا النظام كان يسمى بنظام المسار الواحد ، حيث كان جميع الطلبة يقبلون في برنامج الدبلوم المشترك و الذي كان يتطلب سنتين من الدراسة ، و بعد تخرج أي طالب من برنامج الدبلوم يسمح له بالتقدم بطلب القبول في برنامج البكالوريوس ، و كان شرط القبول في برنامج البكالوريوس هو حصول الطالب على معدل ٢,٥ من ٤ في برنامج الدبلوم ، و قد تم تغيير هذا النظام منذ العام الدراسي ٢٠٠٠/١٩٩٩ إلى نظام جديد يقبل فيه الطالب الجديد مباشرة في برنامج البكالوريوس و لا يقبل أي طالب في برنامج الدبلوم ، و بعد عام دراسي واحد يقيم الطالب و يسمح له بالموافاة في برنامج البكالوريوس إذا استوفى مجموعة من الشروط ، و الطلبة الذين لا يستوفون هذه الشروط ينقلون إلى برنامج الدبلوم المشترك ، و تهدف هذه الورقة إلى عرض تجربة كلية الهندسة بجامعة البحرين في استخدام هذين النظامين.

## **An Entrepreneurship Program as a Paradigm Shift**

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**ABSTRACT.** The Faculty of Engineering has started the development of the first Entrepreneurship program in Saudi Kingdom. The primary objective of the program is to make a paradigm shift in the mentality of some of our graduates to become job providers instead of being job seekers. As it became the tradition in the last two centuries that the engineers led their societies in the developed countries (1st world), we are willing to do the same in our society. The program provides the students with the necessary tools to start Small to Medium Enterprises (SMEs). Knowing that SMEs represent almost 60% of the economical force in some countries, the Faculty of Engineering took the lead and believed that the program should start as soon as possible for the benefit of our society and economy. For example, SMEs have been a primary factor in the astonishing industrial development in India. In our region, some countries (e.g., Bahrain) have implemented similar Entrepreneurship programs. In our program, students are taught using active-learning techniques. In this paper, the authors will share the Faculty of Engineering experience developing the entrepreneurship program focusing on the link between the society and industrial needs and the academic activities.

### **Introduction**

Unemployment and professional redundancy have been two major problems in many countries for several years now (Srivastava, 2004). Thousands of young people, armed with all kinds of degrees and diplomas get pushed into the market every year. Every year, young professionals from all areas across the country flood all major industrial and commercial sectors and government offices looking for jobs. Unfortunately, not everybody succeeds. Even among those who manage to find a job, several remain badly unemployed, doing something, which otherwise they might not have preferred to do.

Globally, the unemployment problem also has its links to the phenomenon of downsizing or what the reformists prefer to call 'right sizing'. Over the last few years, almost all the big companies have been laying off people or forcing them to early retirement to cut costs. The question is: Can there be any practical solution to this long

stranding and ever growing problem of unemployment? A possible answer could be suggested in self-employment and entrepreneurship (Dollinger 2003).

### **What is Entrepreneurship?**

The dictionary says, 'Establishing and running a commercial venture to create wealth. The word entrepreneur and subsequently entrepreneurship has been derived from the word enterprise, which can be defined in five different ways:

- a. An aggressive readiness to undertake taxing efforts
- b. The wish, power and ability to begin and follow through with a plan or risk
- c. Something undertaken, especially something requiring extensive planning and work
- d. An exciting often hazardous undertaking
- e. A commercial organization

Similarly the term entrepreneurship has more meanings attached to it than just what gets understood through the dictionary definition (Khanka 2004). In reality, entrepreneurship refers to a way of life. It is about something different and innovative and this innovation could be in any way of life. It might sound amazing to some but it is true, that every businessman is not an entrepreneur and every entrepreneur is not a businessman.

Entrepreneurship is about learning; learning from experience; learning from circumstances and from surroundings. No entrepreneur knows all the answers at the time of setting out on the journey. Yet they move out armed with just one weapon, called faith. They hold their faith in their ability to learn, which in turn keeps them steering ahead. In other words, entrepreneurship is largely a game about learning, imbibing and implementing to achieve tangible results.

Entrepreneurship is about networking. It is about developing systems to accomplish tasks. It is about bringing together necessary resources (men, machine and money) to achieve the desired objectives. Entrepreneurship is about leading, networking and consolidating the available resources to make best of the given opportunity (Litt 1974). In summary, entrepreneurship is:

- An individual's resolution to keep working in obscurity and amidst uncertainty to see a dream come true
- An individual's quest to acquire the mindset that allows him/her to grow even amidst chaos
- An individual's capability to bring together diverse resources and create something valuable

The four D's that form the dignity of an entrepreneur are desire, discipline, determination, and dedication, as outlined in the *Handbook for New Entrepreneurs* (1986).

### **Can Entrepreneurship be Nurtured?**

Entrepreneurship is a career, which not only requires a specific kind of aptitude,

but also a very different kind of mindset. Several questions arise. Can people acquire the necessary skills and the mindset needed for the job? In other words, can entrepreneurship, one of the highest manifestations of leadership in action, be nurtured? The answer is 'YES'. Entrepreneurship can be nurtured and that is what this course is all about. Someone once asked Lee Kuan Yew, the Senior Minister of Singapore, the same old question: "Are leaders born or made?" Lee Kuan answered, "Leaders can be made, provided they are born!" The same holds true for entrepreneurs (Srivastava 2004). They also can be made, provided they are born. Incidentally, most of us have the potential to be an entrepreneur. But only very few of us attempt to utilize this hidden potential.

### **Soft Skills and Hard Skills**

Engineers learn hard skills through their academic study. Hard skills are taught in basic sciences such as math, chemistry and physics and applied sciences such as civil engineering and mechanical engineering. Soft skills are typically acquired through training after graduation. Soft skills such as communication, management and teamwork skills are essential to success in any business whether the engineer will be employer or employee.

The most recent global trend is to teach the students the soft skills before graduation. This completes the mentality development and open new horizons for them. It also increases their chances finding a job or more importantly creating their own business. After graduation, students are called engineers. After engineers work for few years (averaging 5 years), they usually can build their soft skills and understand factors affecting most of engineering projects such as environmental and social effects. They become professional engineers. One of the primary objectives of this course is to teach the students some essential soft skills, which increases their opportunities creating their own businesses or even enhances their chances finding a job.

### **Why Entrepreneurship?**

The Faculty of Engineering used self evaluation techniques and external evaluators to assess its academic program and management performance, as follows:

Self Evaluation using:

- Strength, Weakness, Opportunities and Threats (SWOT) analysis
- Strategic plan

External Evaluation thru:

- ABET
- Industrial advisory committee
- Peer reviewers

Based on the above evaluation results and evaluator recommendations, the Faculty of Engineering took Initiative I to prepare its graduates to become professional engineers who possess both *hard skills* and *soft skills* required by the industry.

However, there were still more threats facing our graduates, society and economy. These threats are summarized herein:

- Additional 4 million graduates will be seeking jobs in the next 10 years
- Only one out of three graduates may find a suitable job
- Non-oil based industry contributes about 6% to the Gross Domestic Product (GDP)
- Most of the consumer needs are satisfied by imports

Therefore the Faculty of Engineering realizes that its graduates are still lacking some skills required by/for the industry. There are also opportunities and encouragement, as summarized below:

#### Opportunities

- Government supports new entrepreneurs
- Some businessmen offered mentor and financial support for entrepreneurs
- Industrial advisory committee realizes the importance of entrepreneurship

#### Encouragement

- Small and medium enterprises (SMEs) represents nearly 60% of the economy in some developed and developing countries
- The United Nations Industrial Development Organization (UNIDO) introduced a global comprehensive entrepreneurship program
- For instance, India based most of its recent technological development on SMEs using the UNIDO entrepreneurship program
- There is a global trend among some very well-known universities where they introduce an entrepreneurship program to their students

Based on the above assessment, the Faculty of Engineering decided to take Initiative II and prepare a comprehensive entrepreneurship program. The program provides the students with the necessary training, and necessary links to the industry, financial institutions and incubations.

### **Entrepreneurship Training Program**

The Faculty of Engineering started the first comprehensive entrepreneurship program in the Kingdom in the spring semester of the academic year 2003/2004 (1424/1425H). The objectives of the program are summarized herein:

Prepare future engineers who are job creators (entrepreneurs) not only job seekers

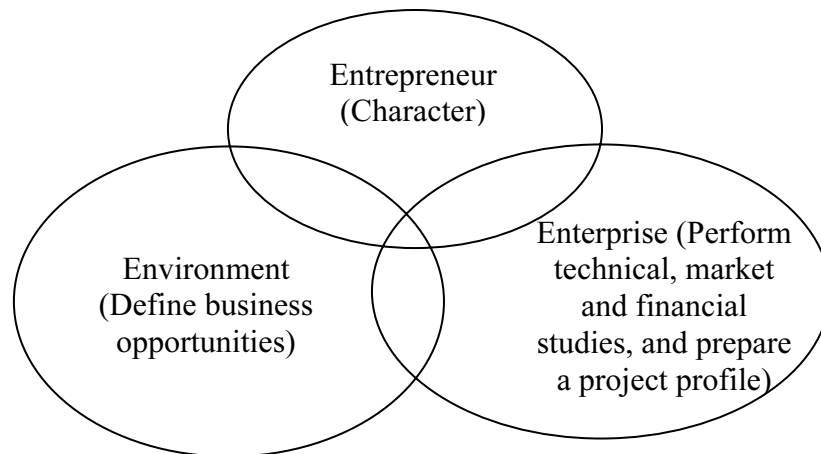
- Graduates will have necessary soft skills required by the industry
- Improve the industry contribution to the GDP
- Reduce imports

The academic plan has been implemented according to the following schedule:

- An awareness short course of 12 hours – spring 2004
- A training program of 160 hours – summer 2004
- A full fledge special topic course – fall 2004
- A full fledge elective course – spring 2005

- A core course – fall 2005

The Faculty of Engineering is currently training and recruiting selected instructors to fulfill our ambitious plan. The three primary components of entrepreneurship are the entrepreneur, environment, and enterprise, as shown below.



In our program and through an active-learning environment, the students practice the following primary subjects:

- Who is an entrepreneur?
- Entrepreneur competencies
- Identification and selection of business opportunities
- Planning a small scale enterprise
- How to perform a technical study?
- Introduction to marketing analysis
- Introduction to financial analysis
- Preparation of a business profile

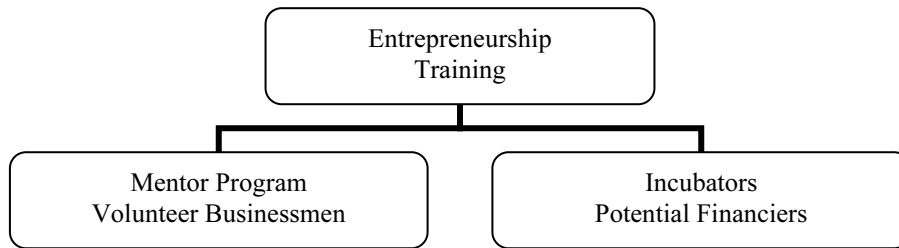
The students learn the necessary tools to explore themselves and know their abilities, weaknesses and strengths. They also practice systematic procedures to identify, select and create potential opportunities. They are trained to perform technical, market and financial studies of an enterprise and prepare a business profile. Students work in teams and participate in class activities through open relevant discussions, brain storming, presentations and other active learning techniques.

#### ***Link To Capstone Design Project***

The other element of our chain process is the capstone design project. Currently, we are encouraging some of our outstanding students to use their gained engineering knowledge and apply it to modify existing technological ideas or invent new ones. Knowing the concepts of entrepreneurship will make much easier for them to direct their innovative ideas in a business way of thinking. They are also able to perform the preliminary financial analysis of their proposed product and predict its feasibility.

### **Entrepreneurship-Industry Link Program**

The Faculty of Engineering realized the need of providing continuous support to its trained students (potential entrepreneurs) by establishing the necessary links with the industry, financial institutions and incubators, as shown below.



#### ***Mentoring Program***

As part of the entrepreneurship-industry link program, the Faculty of Engineering created a mentoring program to the students. We invited successful businessmen, to the classroom to share the journey of their success with the students. Also, entrepreneurship experts and bankers were invited and lectured our students. The students were highly excited and encouraged seeing life examples of successful new comers in the market and high caliber businessmen. We have also scheduled regular meetings between selected industry investors and our promising senior students. The students prepare pre-feasibility studies of their ideas and share them with the businessmen who in return give them an advice, edit and modify the business plan until it becomes ready to implement. Some of these meetings are held monthly and others are held quarterly. Some businessmen even offered partnership to some of our students.

#### ***Incubators***

The Faculty of Engineering has initiated contacts with the Chamber of Commerce in Jeddah and other businessmen to establish incubators where our graduates can implement some of their promising projects and establish their entrepreneurial enterprises. This work is still in progress and we believe that establishing such incubators will give unprecedented chance to our graduates to implement their ideas to become real projects using the tools they acquired in the training program.

### **Conclusions**

The Faculty of Engineering has evaluated its academic program using self evaluation techniques and thru external national and international evaluators. These

evaluations resulted in recognizing the strength, weakness, threats and opportunities available to the Faculty of Engineering. Based on the above evaluations, the Faculty of Engineering decided to initiate and implement the first comprehensive entrepreneurship program in the Saudi Kingdom. The program provides a paradigm shift in the mentality of our graduates who are trained to become job creators not job seekers. Also, the program provides the students with the necessary tools to explore themselves, find and create opportunities, perform technical, market and financial studies and create a project profile. The program directly links the academic activities and innovations to the industry. The Faculty of Engineering believes that the entrepreneurship program will help create new jobs, enhance the local industry, improve the economy and reduce imports.

### **Acknowledgements**

The Faculty of Engineering appreciates the continuous support and encouragement of King Abdulaziz University Council and Rector. The Faculty of Engineering also thanks the businessmen who volunteer their valuable time to mentor our students and share their priceless experiences with them.

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## برنامج العصاميون كتحول نوعي

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**المستخلص:** أنشأت كلية الهندسة أول برنامج للعصاميين بالمملكة. والهدف الرئيسي من البرنامج هو عمل تغيير جذري في عقلية خريجي كلية الهندسة ليجدوا فرص عمل لهم ولغيرهم بدلاً من أن يكونوا باحثين عن عمل. وكما قاد المهندسون مجتمعاتهم في بلدان العالم الأول نحو التقدم في القرنين الماضيين ، فنحن لدينا النية والعزم أن نجعل مهندسينا يقومون بنفس الدور في مجتمعنا حتى نصل للتقدم والازدهار. هذا ويقدم برنامج العصاميين للطلاب الأدوات اللازمة لكي يبدأوا منشأة صغيرة أو متوسطة. وبالنظر في المجتمعات المحيطة بنا سواء في الدول المتقدمة أو النامية نجد أن المنشآت الصغيرة والمتوسطة تمثل نحو ٦٠% من القوة الاقتصادية لهذه البلدان. ولهذا قررت كلية الهندسة أن تبدأ برنامج العصاميين على وجه السرعة من أجل خير مجتمعنا واقتصادنا. فعلى سبيل المثال كانت المنشآت الصغيرة والمتوسطة هي السبب الرئيسي في النهضة الصناعية الحديثة بالهند. وفي منطقتنا بعض الدول كالبحرين، على سبيل المثال، قد تبنت برامج مشابهة للعصاميين. ونقوم بتعليم طلابنا في هذا البرنامج بطريقة التعليم التفاعلي، وفي هذه الورقة يشارك الباحثون بخبرة كلية الهندسة في إنشاء وتطوير برنامج العصاميين مركزين على الربط بين حاجة المجتمع والصناعة والنشاط الأكاديمي بالكلية.

## **A need for Restructuring of Engineering Education**

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**ABSTRACT.** Among the major challenges facing higher education, and engineering education in particular world wide are the growing cost of education; the declining quality of high-school graduates; the growing need for "professional" engineers; and the weak link between academia and industry. Bearing this in mind, current practices of engineering education at UOB are evaluated by presently enrolled students, academicians, graduates and employers. As a result deficiencies facing the enhancement of engineering education are identified and analyzed. It is noticed that these deficiencies are similar to those reported by engineering educators world-wide. The results of the evaluation of the current engineering education system call for revision of curriculum, teaching methods and styles, and quality assurance. Other issues that to be considered during the revision process include alternatives to traditional engineering programs, education of engineers for international practice, university-industry interaction, and social status of engineers. The paper outlines a framework for a structured revision process of engineering education that identifies the industry and society needs and complements it with the basic needs of standard engineering programs.

### **1. Introduction**

Engineering education, as other university education in both developed and underdeveloped countries is accused for poor teaching, low productivity, decaying infrastructure, out dated curricula, and lacks management. Furthermore, education is exposed to economical, technological, and social pressures manifested in increased cost, and paradoxically increased competition, rapidly evolving applications of information-related technologies, increasing pace of technological change, and need for relevant and life-long learning programs.

Baum *et al* <sup>[1]</sup> reported on a joint project by the Engineering Deans Council and the Corporate Round table of the American Society for Engineering Education. The report calls for engineering programs of relevance to the lives and careers of students;

attractive to highly talented students; and connected to the community needs. It calls more specifically for individual missions for engineering colleges based on the constituencies served; re-examining faculty rewards; reshaping the curriculum to incorporate team skills, collaborative learning, communication skills, and leadership; life-long learning; personnel exchanges among and between engineering colleges, government and industry; research /resource sharing.

Pister *et al* <sup>[2]</sup> reported that engineering educators are still adhering to a set of engineering education principles which seem to be unchanged for the last few decades, namely, the need for strong background in mathematics, physics, and engineering sciences; the importance of design and laboratory experimentation; more attention to the development of communication and social skills; the need for integration of social and economic studies into the curriculum; the importance of good teaching and attention to curriculum development; and the need to prepare students for career-long learning. These central themes have remained constant, but their emphases among engineering educators have changed over the past few decades. Pister *et al.* recommended all academic institutions to conduct institutional self assessment, to improve teaching methods and practices, and to ensure that the curriculum supports the institution's strategic plan.

Tien <sup>[3]</sup> advocated a broad engineering education that meets current challenges, such as emerging of new inter-disciplines, increasing number of jobs in service sector than in all other sectors, accelerating advances in technology, continuing education for long-life learning, dominance of virtual universities in engineering education.

The major challenges facing higher education, and engineering education in particular worldwide are the growing cost of education; the declining quality of high-school graduates; the growing need for "professional" engineers; and the weak link between academia and industry.

Jones <sup>[4]</sup> mentioned that for the last two decades, budgets for higher education have been exceptionally tight all around the world. Colleges and universities have been forced to adopt strategies for increasing revenues and decreasing costs. Among those strategies are raising tuition, decreasing research funding, finding efficiencies in traditional operations, and developing new for-profit business ventures. The current environment has also been hospitable to the growth and expansion of new educational organizations around the world, both for-profit and not-for-profit.

The strong growth of private and for-profit institutions of higher education around the world has attracted great attention. The tradition of a single publicly funded higher education institution, which outstrips national resources, has given way in the face of increasing demand for it. Governments have admitted candidly that they cannot provide places for all the qualified students in their countries who want to attend college, and thus have created legislation and policies which invite, encourage, and support the entrance of private investment into their countries for building new universities.

Inadequate mathematics and science preparation limits the quality, quantity and diversity of incoming students to engineering programs. As a consequence, engineering instructors have begun to see bimodality in their course grade distributions; there has

been an increased need for remedial or compensatory courses; and engineering programs have shown an increased degradation rate. Reforming pre-college mathematics, science, and English education in both curricula and methods is a must in order to ensure a sufficient pipeline of students who are ready, able and eager to study engineering.

Most employers of engineers, specially large organizations, call and press for professional engineers who have full exposure to: topics in business, humanities, and social science; skills in leadership, interpersonal communications, teamwork, problem formulation, system synthesis, critical thinking, problem solving, and life-long learning; and knowledge of ethics, quality and safety. No way for the traditional four and half-year engineering curriculum to cover these issues in addition to the basic engineering and disciplinary-focused subjects. The problem is further aggravated by the poor preparation in mathematics, science, and English of the high-school graduates.

Large Bahraini companies like BAPCO, ALBA, and GPIC currently satisfy their needs of professional engineers by exposing their new university graduates employee to lengthy in-house training programs that extends for a minimum period of 2 years up to 5 years.

The fast pace of technology experienced nowadays require that faculty become involved with research in order to keep themselves, their courses and their students relevant and aware of the changing technology. Quality of undergraduate engineering programs results from constant infusion of new knowledge that comes from advanced research. That is why efforts to constantly improve the quality and relevance of undergraduate education must continue to be complemented by an aggressive program of graduate education and research. Thus, as the pace of technological change increases, there is a growing need to link research and engineering education. Vest <sup>[5]</sup> values this link in his statement: "dollars for university research do double duty; they support the conduct of research and they educate the next generation". Consequently, research is an investment in both education and discovery.

## **2. Current Assessment of Engineering Education at UOB**

As part of a scheme for reassessment of its academic programs, curriculum, and teaching practices, the College of Engineering of UOB carried out different surveys to seek feedback from enrolled students, graduates, faculty as well as industry and the profession. The data gathered showed the strengths and weaknesses of the current engineering education system.

Students' feedback reflects in general the non-negligible level of non-satisfaction with some survey's items such as encouragement to use computers, absence of active learning and teaching enthusiasm, traditional faculties teaching methods, stimulation in course. Furthermore, the results show inadequacy of practical laboratory sessions, and insufficient industrial training.

The analysis of the faculty survey's results is more disappointing with the students' background in mathematics, basic science and English language. This is

basically due to the low standard of the intake to the College of Engineering from secondary schools.

Feedback from both alumni and industry agree with the faculty worry about the English language and communication skills of UOB engineering graduates. Also, the results show that engineering students are short in: practical engineering knowledge and hands-on-experience, information technology and computer usage, management skills and environment and safety awareness.

The results of the evaluation of the engineering programs were presented and debated in the Symposium on: Development and Enhancement of Engineering Education (24-25<sup>th</sup> February 2004) and attended by a widespread background of faculty, invited speakers from USA, neighbouring Gulf states universities, industrial partners, alumni, and students. The symposium concluded that there are pressing needs for revision of the curriculum as well as the other components of the engineering education system, namely, teaching methods and style, and quality assurance, in order to ensure its capability to satisfy the community needs. In the following sections, a structured revision process of the engineering education process is presented.

### **3. Degree Structure**

To meet the challenges discussed above and to overcome the weaknesses of the current practices of engineering education, an integrated six-year program leading to M. Eng. Would be desirable to respond to the growing need for professional engineers.

The six-year program is to be partitioned into three components: a two-year pre-engineering component taught by community colleges, followed by a three-year engineering component Leading to B. Eng., and finally one-year professional engineering component leading to M. Eng. The engineering and professional engineering components are taught by engineering colleges.

#### **3.1 Pre-engineering component**

The pre-engineering program is intended to provide better qualified and mature juniors to enter a professional engineering program. It is equivalent, to some extent, to the A-level of the British system. To curb the growing costs challenge this component is run by community colleges under the umbrella of the universities or independently. The two years are primarily devoted to fundamental courses in mathematics, science (Physics & Chemistry), computing, English communication capabilities, as well as basic courses in design and analysis that are core to all engineering disciplines. Furthermore, during the pre-engineering study, the students are introduced to humanitarian and social sciences that are related to engineering studies.

The goal of the pre-engineering program is to prepare the high school graduates for a professional engineering program in terms of knowledge, skills and attitudes, as well as for self-directed learning and problem solving. Furthermore, the program is designed to improve the students' ability to write, read, and understand English, which is usually the medium of instruction, and to understand the principles of communication skills, creative thinking and analytical analysis.

For cost effectiveness, Learning during the pre-engineering period is mainly acquired through information transfer by direct lecturing in a class, or indirect lecturing by video or through web. Another, low cost learning approach that can be used for this stage is the tutorial learning with computers where the computer plays the role of the tutor.

### **3.2 Engineering component**

The engineering component represents the core component of the proposed engineering education structure. To meet the growing need for professional engineers and to overcome the weaknesses of the current engineering education system, a careful thought should be given to the major constituents of the current system, namely, specialty structure, curriculum structure, course structure, and learning methodology and style.

#### *3.2.1 Specialty structure*

Since early seventieth engineering education in Bahrain, as well as in the gulf region, was focusing on graduating and training of engineering personnel of general specialties within specific disciplines. Gulf Polytechnique and thereafter University of Bahrain use to enroll and assign students to programs that designed to satisfy that pattern. Although such pattern of education has many advantages, but with the prevailing situation nowadays it becomes less attractive for some obvious drawbacks such as an overemphasis on disciplines, too elaborate division of specialties with too narrow range of coverage, and the lack of elasticity in the curriculum. Under current situation, this pattern can hardly meet the needs of the rapid development of science and technology, the constant changes in social demands and the acceleration of the flow of qualified personnel. Attention should be paid to the adjustment of specialty structure according to market demands and development of disciplines. This is achieved by discarding, merging and reforming some old specialties that do not meet the social needs, and/or adding new specialties urgently needed by society.

There is a growing need for renewing or reforming old specialties and programs to meet these new challenges. Rather than the current traditional engineering programs in mechanical, electrical, electronic, chemical, and civil engineering, programs that are directed to fulfill the needs of specific sectors in industry and society are proposed, namely, programs to qualify engineering graduates in the following areas:

- Power generation & transmission
- Water production
- Aluminium and steel processing
- Petroleum & petrochemicals
- Communications & electronics
- Roads and transportation
- Buildings, construction and refrigeration
- Sewage water treatment

Each of the above areas is a multi-disciplinary area requiring resources from different engineering departments. In other words, the structure of these programs resembles a cellular structure of a production system in engineering management terminology. Other areas of interest to community can be added to the above list, or alternatively some of the traditional programs may run in parallel with the proposed programs.

### 3.2.2 Curriculum structure

The engineering component is divided into three phases: first year for engineering science and design phase; second year for industry exposure phase; and third year for professional skills phase. A modular structure is recommended for this three years sandwich program. Each year is composed of 15 modules and each module is three weeks length. The modules of the first year (Engineering science and design modules) address, in addition to differential equations and numerical analysis (one to two modules), the concepts and principles of engineering science and practice related to the subject program in an integrated manner.

The engineering science and design phase aims at developing a foundation in engineering sciences that will allow students to pursue a degree in engineering, furthering the students' critical thinking abilities, and developing students' integrative skills in analysis, synthesis and contextual understanding of engineering problems.

The subjects of the engineering science and design modules are taught within a problem-based and collaborative learning and reasoning environment. Any engineering profession aims to satisfy a need that can be exemplified by production of a product and/or provision of a service. Satisfaction of such a need evolves through an integrated multi-stage process involving design, production, operation and maintenance. Based on this, the modules of the first phase may be allocated along the following scheme:

- a) Statistics, differential mathematics & numerical methods group: 1 to 2 modules
- b) Basic engineering group: 4 to 5 modules
- c) Design group: 3 modules
- d) Production group: 3 modules
- e) Operation and maintenance group 3 modules.

Each module includes three problems with duration of one week per problem. Ultimately the number of modules per group taken by a student depends on the focus of the specific professional engineering program and the intended degree of specialization.

Industrial collaboration is vital for the formation of engineers who, by repeated exposure not only to new technology, but also to problems encountered in the field, will begin their careers with an increased awareness of industrial aspects. The inclusion of the industry exposure modules into the proposed curriculum is driven by a number of specific difficulties that engineering education faces nowadays. The classroom environment where engineering students are prepared is organized and structured in a very different way from that of industry. Furthermore, courses in engineering present information structured in terms of single disciplines while industry problems are usually

solved with cross-disciplinary techniques. As a result of this set-up, students often find difficulty in relating various data and techniques that do not fit into that particular set-up.

Exposure to industry aims at bridging the gap between the abstract and concrete knowledge; furthering the student integrative skills in analysis, synthesis and cross-discipline connections; and preparing students for team working. Thus, industry is given the chance to take a really positive and an influential role in student development. By giving industry greater responsibility and involvement, the students get to work on a real-life project that has true industrial relevance and adds to their experience a divergent knowledge dimension.

In this phase of the undergraduate curriculum, students undergo supervised industrial training periods in related industries. The goal is to prepare the students to acquire knowledge, skills and attitudes that will enable them to identify, analyse and manage engineering problems in order to provide efficient and cost effective products and services to the community. The industry exposure phase is designed to cover three groups of modules of different emphasis with an average of five modules each:

- a) design focused projects.
- b) production focused projects.
- c) operation and maintenance focused projects.

The success of the whole program depends on its totality on sponsorships that to be provided by industry to accommodate the engineering students during the exposure to industry component.

Professional skills phase is a continuation of engineering science and design phase where nine of its fifteen modules are assigned to more specialized subjects in the areas needed for the program, and to subjects that develop soft skills, environment and safety awareness of students with an international perspective. The remaining six modules of this phase are allocated for a graduation project that integrates the different concepts and skills acquired through the different stages of the study program.

Throughout this part of the curriculum PBL is the main learning method coupled with computer aided learning lessons and virtual Laboratory sessions that can be worked at the students' individual pace, in their own time and without the supervision needed for regular laboratory classes.

### *3.2.3 Course structure*

To meet the ever changing community and social needs, adjustment of undergraduate course structure is as important as the adjustment of the curriculum structure. In view of the sharp paradox between the ever increasing course content and the relatively fixed teaching time, the following measures should be taken.

- Reforming course contents by discarding or merging old courses and adding new topics. The focal point of the construction of courses should shift from the reform of single courses to the development and construction of a series of course modules.
- Provision of multi-level modules for some core courses, i.e. basic modules,

expansive modules, and improving modules. Students can choose a certain module or all modules of the three levels.

- Strengthening the internal links between courses to enable students to transfer to other programs.
- Expanding module-based structure to include major-minor system, allowing students with surplus energy to take another specialty as minor so that they can become compound personnel.

The plan for the course modules should help the students to grasp and to employ the technical means to solve practical engineering problems, and help them to acquire the ability to learn new techniques. Emphasis is laid on the application of theories rather than the deduction of theories.

### **3.3 Professional Engineering Component**

The final stage of the integrated 2-3-1 engineering education program is the professional engineering component in which 10 - to 12 modules are offered, and each module is four weeks length. The modules include selected advanced topics that encourage and guide the students to adjust their knowledge structure according to the demands of the market. During this stage students receive training in scientific experimentation and engineering practice so as to improve their ability in researching and solving practical problems. Furthermore, soft skills and management courses of advanced contents are offered.

These offerings in addition to the prevalence of a learning environment that encourages students' to apply their natural learning tendencies result in the development of soft skills that help the learners to adapt to the continual changes experienced in life and to rely more on their individual learning assets.

## **4. Concluding Remark**

Though the current curriculum of the College of Engineering of UOB conforms to international standards, nevertheless reform of the engineering education system is needed, as in other engineering colleges worldwide, to prepare graduates to enter the profession of engineering which has been transformed by massive technological developments and by globalization of all aspects of concern to engineers. The results of the evaluation of the current engineering education system call for revision of curriculum, teaching methods and styles, and quality assurance. Other issues that to be considered, during the revision process, include: alternatives to traditional engineering programs, education of engineers for international practice, university-industry interaction, and social status of engineers. The paper outlines a framework for a structured revision process of engineering education that identifies the industry and society needs and complements it with the basic needs of standard engineering programs.

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## الحاجة إلى إعادة هيكلة التعليم الهندسي

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**المستخلص:** من بين التحديات الأساسية التي تواجه التعليم العالي على وجه العموم والتعليم الهندسي على وجه الخصوص الارتفاع المتزايد في تكلفة التعليم، انخفاض مستوى التعليم العام، الحاجة المتنامية للمهندسين المحترفين، والفجوة الناجمة من ضعف الاتصال بين مؤسسات التعليم العالي والصناعة. مع إدراك هذه التحديات، قامت كلية الهندسة بجامعة البحرين بإجراء دراسة لتقويم العملية التعليمية فيها وذلك باستطلاع آراء الطلاب والأساتذة والخريجين والشركات الخدمية للخريجين. أدت هذه الدراسة إلى التعرف على نقاط الضعف والمعوقات الواجب التغلب عليها لتطوير التعليم الهندسي. وقد لوحظ أن نقاط الضعف والمعوقات مشابهة لتلك التي وردت في كثير من تقارير المشتغلين بالتعليم الهندسي. خلصت تلك الدراسة إلى الحاجة إلى مراجعة شاملة للمنهج وطرق وأساليب التدريس وضمان جودته. وأيضاً من بين المواضيع التي يجب دراستها عند المراجعة البدائل المتاحة للبرامج الدراسية التقليدية، التعليم الهندسي للممارسة في مختلف أنحاء العالم، العلاقة بين الجامعة والصناعة، والوضع الاجتماعي للمهندسين. تعرض هذه الورقة إطاراً لمراجعة وإعادة هيكلة التعليم الهندسي بحيث يستجيب لمتطلبات الصناعة المحلية مع الاحتفاظ بالأساسيات الواجب توفرها في البرامج القياسية لدراسة الهندسة.