

## **Assessing Skills and Knowledge of IT Professionals in Saudi Arabia**

**Ibrahim M. Al-Jabri**

King Fahd University of Petroleum and Minerals, Saudi Arabia  
Phone: 0096638602821 Fax: 0096638603489  
Email: imjabri@kfupm.edu.sa

**Haidar M. Fraihat,**

King Fahd University of Petroleum and Minerals, Saudi Arabia  
Phone: 0096638604217 Fax: 0096638603489  
Email: haidarfr@kfupm.edu.sa

### **ABSTRACT**

*This research paper assesses current and future skills and knowledge of IT professionals working in selected Saudi Organizations through ranking the importance of selected IT, management, database, and programming skills and knowledge gained by IT university graduates. The study depicted moderate dynamism and change in the importance of several IT skills and knowledge after 3 years compared with the present time. It was concluded that IT curricula, especially MIS, have to be alter to the changes in the demand for knowledge and skills in computer programming languages, database systems, IT and management knowledge/skills and reflect that in their educational programs. The study provided several recommendations for corporate executives who oversee the organizational strategy, the human resource managers who are involved with hiring and maintaining IT personnel, the developers of academic programs who are eager to provide better education in this highly demanded field of education, as well as government strategy makers who formulate IT national plans and would like to see maximum levels of synergy between the various stakeholders.*

Key Words: MIS, IT skills, IT knowledge, IT labor market, Saudi Arabia .

### **INTRODUCTION**

It is widely agreed that a perception gap exists between IT skills/knowledge offered by academic institutions and IT skills/knowledge demanded by business corporations, Lee, et. al, (2002); Todd, et. al, (1995). Such gap has been looked at by researchers from different angles since the variables considered in assessing the gap pertain to a certain time-frame or work environment. Acknowledging that the IT profession is highly volatile and driven by the advancement in technology, it may be wise to look at the subject from a new perspective.

Driven by the advancements in technology, IT academic curricula are changing by leaps and bounds. Market needs for IT professionals is changing as well dictated by the rapid change in IT. Undoubtedly, these changes have impacted the way business is conducted. The widespread use of e-trade, e-commerce, e-business, e-money, e-economy, and so on, are only signals that modern-day business managers and IT professionals have to be on alert to make their professions fruitful.

The synergic linkage between IT academic programs and IT professions is undeniably clear because many IT professionals are coming from colleges and universities teaching IT. At the same time research depicted a serious perception gap between the way academics and professional look at the various IT professions, Todd, et. al, (1995); Roepke, et. al, (2000); Lee, et. al, (1995).

Furthermore, recent development in the various IT professions has been unfolding. The old profession path of programmer, analyst, project manager, IT manager, etc., is fading and is being replaced by career path which is multi-directional, Lee, et. al, (1995). The new path is being described as entry level positions with self-guided approach for career promotion, Lee, et. al, (2002). Even within the same career path, an individual in IT profession is required to shape his career in accordance with the organizational requirements and the dictations of the volatile IT environment.

To bridge this perception gap between IT skills/knowledge needed by the business organizations and those offered by academic programs, both IT professionals and university professors teaching IT programs have to take bold steps within their jurisdictions in order to build professional synergy among themselves with the objective of gearing the IT academic programs to furnish more relevant IT professionals.

Unless such gap is mitigated, IT graduates will continue to be equipped with skills that may not be relevant to the marketplace; and corporations will be forced to pay salaries to employees in exchange of skills they are not utilizing. This unpleasant situation undermines the quality of academic programs and incurs waste of resources for beneficiary organizations. Neither academic institutions nor corporations can afford such a waste.

This study aims at conducting an investigation into the nature of the gap between academia and industry in regards to IT professions. The objective is to assess such gap and propose modalities with which both parties can better understand the constraints facing each other and to effectively vocalize the management requirements of IT professional skills generated by academic programs.

It is becoming evident that a boom is taking place in Saudi Arabia with regards to IT use in organizations. Such boom necessitates performing skill analysis for the various IT professions in the country. This study is interested in the IT jobs in Saudi Arabia (Saudi IT academic programs and Saudi corporations).

The study is expected to provide valuable insights to stakeholders on corporate Saudi Arabia due to the sweeping utilization of IT in the various business activities that the country is experiencing; and due to the increasing number of academic programs offering IT graduates fueled by the spread of private education. Furthermore, the results of this study come handy for the academic institutions offering IT programs in Saudi Arabia and perhaps the region.

The scope of the study will be limited to IT-related professions only and will be conducted on selected corporations in the Eastern Province of Saudi Arabia. Therefore, an extra benefit of the study is to assess academic programs offered by Saudi universities, and find out whether such perception gap exists among Saudi executives. This can be achieved by comparing the findings of this research with the finding of other research conducted elsewhere.

## **LITERATURE REVIEW**

Tod, McKeen, and Gallupe (1995) traced the evolution of information systems (IS) job skills based on job advertisements. Specifically they monitored changes in the knowledge and skill requirements of IS positions by analyzing the content of job advertisements over a 20-year period. They limited their study to three IS professions: programmers, system analysts, and IS managers. Their analysis was based on calculating the frequency of IS job phrases appearing in commercial advertisements. They concluded that demand for technical job skills remained high throughout the study period. On the contrary business knowledge/skill requirements remained low during the study period. Little change occurred over the study period for the two skill types. The study raised questions regarding the implicit understanding (perception) by IS academics and practitioners of the need for business knowledge on part of some IT professions such as systems analysts.

In an exploratory study, Lee, et. al, (2002) studied the gap between IS academics and IS professionals. They acknowledged the gap but went into a step further: they ranked IT skills according to their importance as perceived by IT managers. It was pointed out that IS technology is changing fast to the point that it is hard to catch up with the pace of change.

IS academics are facing a hard time in coping with these changes and satisfying the demand of the IS industry. They indicated that many researchers reported a moderate to high, but persistent, gap between knowledge/skills taught in academia and those demanded by the IS industry, Lee, et. al. They also found out that different IS practitioners such as IS managers, user managers, and IS consultants rate the importance of the various IS skills and knowledge differently. It is worth mentioning that they conducted their study on two types of respondents: the academicians and professionals.

Nelson and Hall (1987) studied the deficiencies of both IS and end-user personnel were studied. To collect data, 275 questionnaires were distributed to employees from 8 different organizations. The study divided the respondents into IS specialists and end-users. The areas of knowledge and skills were also divided into six categories: Organizational overview, organizational skills, Target organizational units, General IS knowledge, Technical skills, and IS product. Among the six different knowledge and skill areas, they found that both IS and end-users are deficient in general

knowledge and skills. End users, on the other hand, seem to require more IS-related skills. The study suggested finding ways to improve education and training programs in the area of IT.

A study by Reopke, Agrawal, and Ferratt (2000) investigated the transformation of IT human resources at 3M and the alignment of IT human resources with business vision. They indicated that business leaders would like IT to play the role of a business partner and a strategic enabler. Insightful IT leaders recognize that the greatest impediments to success are often related to people rather than to information, technology or systems. They concluded that the transformation of IT from a back-office support role to a strategic business partner requires new roles and competencies for IT leaders and professionals.

In an exploratory study about the evolution of IS professionals' competency, Lee and Havelka (2001) build on prior studies regarding IS skills in the workplace. They distributed questionnaires to firms that recruit IS graduates. They concluded that the IS professionals perform different activities during their career path and are required to acquire different skills at the various levels of their career development. They concluded that a great deal of learning takes place without any connection to formal training or educational programs. Furthermore, their research pointed out that IS professionals are required to have higher levels of technical skills at the beginning of their careers, and higher levels of non-technical skills at the later stages of their career development.

In studying the critical skills and knowledge requirements of IS professionals, Lee, Trauth, and Farwell (1995) conducted a joint academic/industry investigation. They investigated the anticipated changes in the IS profession and the impact of these changes on skill and knowledge requirements to the academic preparation of future IS professionals. Using questionnaire as the main research instrument, they found that the industry will demand a cadre of IS professionals with knowledge and skills in technology, business operations, management, and interpersonal skills. They discovered that the lower-level IS jobs are rapidly disappearing and that there is a shift in emphasis from a traditional and centralized IS organization toward a more decentralized one with focus on end-user operations. They concluded that IS curricula are often ill-matched with business needs and therefore, the realignment of IS activities in organizations will require corresponding re-structuring of IS curricula at universities. They argued that the concept of a generic curriculum to meet the educational needs of all future IS professionals are obsolete.

Career-driven IS programs will require the adoption of multi-disciplinary approaches and educational innovation. Finally they indicated that the sources of pressure to change the IS profession is coming from the technology, the business environment, the role of IS in organizations, and the changes in educational curricula

The influence of IT management practice on IT use in large organizations was studied by Boynton, Zmud, and Jacobs (1994). They tackled the issues of the IT-management climate, the managerial IT knowledge, the IT-management process effectiveness, and the IT use. They found that IT knowledge is a dominant factor in explaining high levels of IT use and that both managerial IT knowledge and IT-management process effectiveness are influenced by IT management climate.

Nelson and Cheney (1987) found out that computer-related training is positively related to computer-related abilities; and computer-related ability is positively related to use of computer resources. Since the 1960's, IS departments started to establish themselves as vital departments within organizations. Henceforth, the need for IS personnel to have knowledge in organizational and managerial issues has increased. They are obliged to familiarize themselves with operational and managerial issues of the organizations. IS professionals such as system analysts, system and administrators need to know about the work of their colleagues in the finance, accounting, marketing, operations departments.

In this research project, previous studies are utilized to compile a list of skills, as shown in Table 1, and knowledge and assess their needs by the industry.

## **RESEARCH OBJECTIVES**

The objectives of this research are manifold. The following are the main ones:

1. Survey IT knowledge and skills needed/required by IT professional and managers in corporate Saudi Arabia
2. Scrutinize/ categorize / classify / cluster / the prominent skills, knowledge, and expertise supplied to the labor market by graduates of academic and training institutions.
3. Depict the skills and knowledge provided by IT academic programs which are of less importance to the various IT professions in the labor market

4. Assess the need for dialogue forums and other information interchange mechanisms between the various stakeholders and provide suggestions in this matter.
5. Provide recommendations on how to gear IT academic programs to better service the various IT professions and the labor market.
6. Pinpoint future trends related to IT professions.

## METHODOLOGY

This empirical research is indulged itself in many courses of action. Firstly, previous literature was surveyed to determine the skills/knowledge that should be possessed by IT professionals. The resultant list of variables was classified into groups that satisfy the project objectives. The classified list of skills/knowledge was used to build a questionnaire tool that was distributed to a sample of IT professionals and managers working in prominent Saudi corporations. Respondents were asked to provide their perception of the importance of such skills in supporting the computing needs of their organization in two time frames, at the present time, and after 3 years from now. The objective here is to gage for the trend in the perception of the importance of these skills and knowledge.

Recommendations of this research are based on the changes in importance of IT knowledge and skills detected when comparing the present time situation with the expectation after 3 years. The solicited data was analyzed using the proper statistical methods. It is the intent of the project to prioritize respondents' perceptions of such skills/knowledge.

Knowledge/skill category	Knowledge/Skill Item	
General IS knowledge	IS policies and plans	Fit between IS and organization
	Existing IS applications	IS/IT potential
	IS/IT and competitive advantage	Privacy issues (databases)
Technical skills	Programming	Use of software packages
	Model building	Model application
	Data communication	Database development
IS Technologies	Packaged software	System development methods
	Application programming	Operations and maintenance
	Programming languages	IS technological trends
	IS/IT competitive advantage	Network technologies
	Operating systems	Hardware
IS products	<i>Database technologies</i>	
	Use of specific application system	Use of office automation systems
	Use of operating systems	Preparation of documentation
Organization and society	Use of documentation	IS evaluation and maintenance
	Knowledge of specific functional area	Knowledge of specific organizations
Organizational knowledge	General environment	
	Organizational goals & objectives	Primary organizational functions
	Critical success factors	Environmental constraints
	Organization mission	Work unit objectives
Organizational skills	Links with other work units	Work unit problems
	Interpersonal communication	Interpersonal behavior
Interpersonal skills	Group dynamics	Project management
	Communication skills	Behavioral skills
Personal traits	Teaching and training skills	Interpersonal skills
	Critical thinking	Creative thinking
Managerial skills	Ability to work independently	Motivation to work
	General management	Leadership skills
	Organizational skills	Project skills
	Planning	Monitoring and control
Business skill	Problem solving skills	Creative and innovation skills
	Accounting	Finance`
	Economics	Marketing
	Management	Business law
	Management science	

Table 1: Classifications of IT and management skills/knowledge.

### *Instrument Development*

A questionnaire was developed as an instrument for data collection. The first part is dedicated for collecting demographic data, such as age, education, nationality, position, etc. The second part is for measuring the importance of selected programming languages in supporting the computing needs now and after three years. The third part is for measuring the importance of IT knowledge and skills in supporting the computing needs now and after three years. The fourth part is for measuring the importance of management knowledge and skills in supporting the computing needs now and after three years, and the fifth part is for measuring the importance of selected databases in supporting the computing needs now and after three years.

Data were collected using a five-point scale, where 1 is “not important” and 5 is “very important”. The respondents were asked to indicate their degree of perceived importance for each programming language, IT skill/knowledge, management skill/knowledge, and database in supporting the computing needs of their organizations now and after three years.

It is worth mentioning that this research combined the skill and knowledge domains in one data collection tool. This is due to the fact that most academic programs merge teach skills with knowledge in the curricula they teach and hence it would be unwise to separate those two domains conceptually. Furthermore, this was the case with most of the surveyed literature.

### *Sampling*

Questionnaires were then distributed to prominent organizations in Saudi Arabia. The researchers either visited these organizations to supervise filling the questionnaires or contacted a trusted agency in these organizations to supervise collecting the data. In either of the cases, the researchers made sure that the quality of the collected data will be at its best.

Only those who have IT educational background or working in IT department were solicited, provided that they are willing to participate in this research. Volunteered participants were given questionnaires with cover letter explaining the purpose of this study and assuring confidentiality of their responses. In total, 110 questionnaires were filled out successfully. Data was then coded, entered into a computer file, and then analyzed using the Statistical Package for Social Sciences (SPSS) software.

## **RESULTS AND DISCUSSION**

### *Sample Characteristics*

The profile of the sample revealed the following characteristics:

1. The jobs and titles of respondents were quite diverse among the IT job spectrum. About 33% of them were system analysts and designers, and about 30% were managers. About 15% were consultants, and belong to other IT titles including CEO's, CIO's, database administrators, programmers, network administrators, or other jobs.
2. Fifty three percent of respondents were 36 years or older, and about 63% were 30 years or older. About 93% of respondents were more than 25 years of age which is an indication that only few respondents (less than 7%) are fresh graduates or newly employed. This sample attribute gave comfort to the researchers in a sense that most respondents have enough experience and robust judgment to answer the research questions especially those questions related to the business skills which require respondents to have accumulated an extensive experience in their organizations.
3. Similarly, about 93% of respondents have either a Bachelor degree, a Master's degree, or a Ph.D. degree, indicating that the respondents answers carries satisfactory level of objectivity and sound judgment. Furthermore, about three quarters of respondents were Saudi Nationals. This indicates that the research findings are mostly applicable to the Saudi IT marketplace.

4. The IT departments of respondents are mostly veterans in the field. About 74% of them were established more than 10 years ago, and 83% were established more than 5 years ago. In other words, these departments are well established and the work environment holds a historical memory extension of the various research questions.
5. With respect to the IT departments' size, it was found that 64% of these departments employ more than 100 employees, and 73% of them employee more than 50 employees. Again, this gives an indication of the size of these departments and that their judgments about the research questions stem from numerous experiences with different IT people employed. The relatively large size of the surveyed IT departments and their long stand in their organizations gave more confidence in the quality of data and hence the findings of this research.

The surveyed organizations were found to be sizable as well. About 71% of respondents judged the size of their organizations to be very large. Only 5% of respondents indicated that their organizations are small or very small. Organizations surveyed include Saudi Aramco Corporation, a multinational giant in oil production, and SABIC (Saudi Basic Industries Corporation) which is a large organization as well. Very few of the surveyed organizations belong to the category of Small and Medium Sized organizations (SME's). Sample characteristics are summarized in Table 2.

*Programming Languages*

The prominent programming languages used in the market were taken from previous literature with updates from the researchers experience in the field. These languages vary across the spectrum from third to fourth to fifth generation languages. They also vary across the deployed computing platforms. The empirical work focused on asking respondents about their perception of the importance of possessing these computer languages by their current and prospective employees, who are basically university graduates. Such perceptions are of high importance because, for better or worse, they come from people who call the shots in the IT labor market, as they make the hiring and firing of IT personnel.

<b>Age</b>	Year	< 25	26-30	31-35	36-40	>40
	%	<b>7.27</b>	<b>30.20</b>	<b>10.45</b>	<b>24.35</b>	<b>28.10</b>
<b>Education</b>	Level	Diploma or less	College	Graduate		
	%	<b>6.55</b>	<b>68.00</b>	<b>25.45</b>		
<b>Nationality</b>	Type	Saudi	Non-Saudi			
	%	<b>76.3</b>	<b>23.7</b>			
<b>Job</b>	Title	CEO, CIO, VP, DG	Manager	DBA	Analyst	
	%	<b>.9</b>	<b>30.1</b>	<b>3.6</b>	<b>33.6</b>	
	Title	Consultant	Network Admin.	Programmer	Other	
	%	<b>13.6</b>	<b>2.7</b>	<b>2.7</b>	<b>11.8</b>	
<b>Company size</b>	Reported size	Very Large	Large	Medium	Small	
	%	<b>71.9</b>	<b>21.8</b>	<b>4.5</b>	<b>1.8</b>	
<b>IT Dept. Established</b>	Year	<1	1-5	6-10	>10	
	%	<b>6.36</b>	<b>8.18</b>	<b>74.54</b>	<b>8.18</b>	
<b>IT Professionals in IT Dept</b>	#	<5	5-10	11-20	21-50	
	%	<b>7.27</b>	<b>3.63</b>	<b>6.36</b>	<b>4.54</b>	
	#	51-100	>100			
	%	<b>8.18</b>	<b>64.45</b>			

Table 2: Sample Characteristics.

As can be seen from Table 3, the modern web-based languages (i.e. HTML, XML, Java, VB, ASP, JSP) that operate in the Internet platform ranked top in the list, while the fourth generation languages (i.e. C++, C#, Visual C, C) rank the lowest in importance. This finding is logical as most organization are migrating their computing platforms to become Internet-based platforms. For example, Aramco Corporation and many other industry leaders are upgrading its ordinary SAP/R3 to the Internet-based SAP/R3.

Third Generation languages (3GLs) measure low priority in the future, with C, COBOL, FORTRAN, and PASCAL to be in the bottom of the list. This is another alarming signal to academic programs in CS. C# rose up from rank 7 now to rank 6 after 3 years, swapping its place with C++.

This simple finding about migrating to web-based languages is very important. Many academic institutions have not yet realized this fact and they continue to spend much of their teaching resources on teaching non-Internet languages, which in some cases, represent a waste of resources. Students are graduating with skills and knowledge that is no longer a top requirement by the IT labor market. Notice that data was collected from a spectrum of IT professionals and was not specific to MIS professionals. The fact that they cast low importance to veteran languages such as C, COBOL, FORTRAN, PASCAL, indicate that the IT labor market may not be as eager as it used to be in employing graduates with degrees in computer science. Modern CS programs which teach Internet-based languages would be an exception.

Computer Language	At Present			After 3 years		
	Mean	Rank	N	Mean	Rank	N
HTML/XML	3.60	1	99	3.80	1	94
Java	3.56	2	97	3.78	2	95
Visual Basic	3.20	3	98	3.07	5	92
ASP	3.01	4	90	3.21	3	89
JSP	2.72	5	86	3.10	4	84
C++	2.27	6	90	2.20	7	84
C#	2.12	7	85	2.24	6	78
Visual C	2.09	8	90	1.95	8	83
C	1.76	9	86	1.61	9	78
COBOL	1.72	10	94	1.38	12	86
FORTRAN	1.55	11	91	1.58	10	85
Pascal	1.34	12	86	1.46	11	81

Table 3: Importance and Rank of programming languages now and after 3 years.

To assess the changes in importance between now and the future, the study asked respondents about their perception of the importance of the various computer languages after 3 years from now. As can be seen from the Table 3 and Figure 1, the first 2 languages will continue to rank top important after 3 years from now. Three years in the IT timeline is considered to be a long period of time, taking into considerations the outstanding leaps and pounds of progress in IT advancement.

By looking at the rank of importance, Figure 1 clearly show an increase in the perception of importance of the Internet-based languages: HTML/XML, JAVA, ASP, JASP, and Visual Basic. (1 indicate lowest importance).

### Database Systems

This section illustrates the perceived importance of the various databases to the IT professionals. Oracle product ranked the highest among the databases with 4.02 out of 5, followed by SQL server and MS Access, both products of Microsoft Corporation. Oracle scored 4.02 with a significant marginal difference from the next competitor, SQL Server. On the other hand, DB2, MySQL, and Sybase ranked the lowest with Sybase scored the lowest among the entire group. Most university professors, in the region and elsewhere, use MS Access as the primary database tool for teaching their students. Many of the graduated students will have to go the extra mile of learning more advanced platforms such as Oracle and SQL Server after graduation, either by short courses administered by their employers or taken by initiatives from the employee himself to increase his career advances.

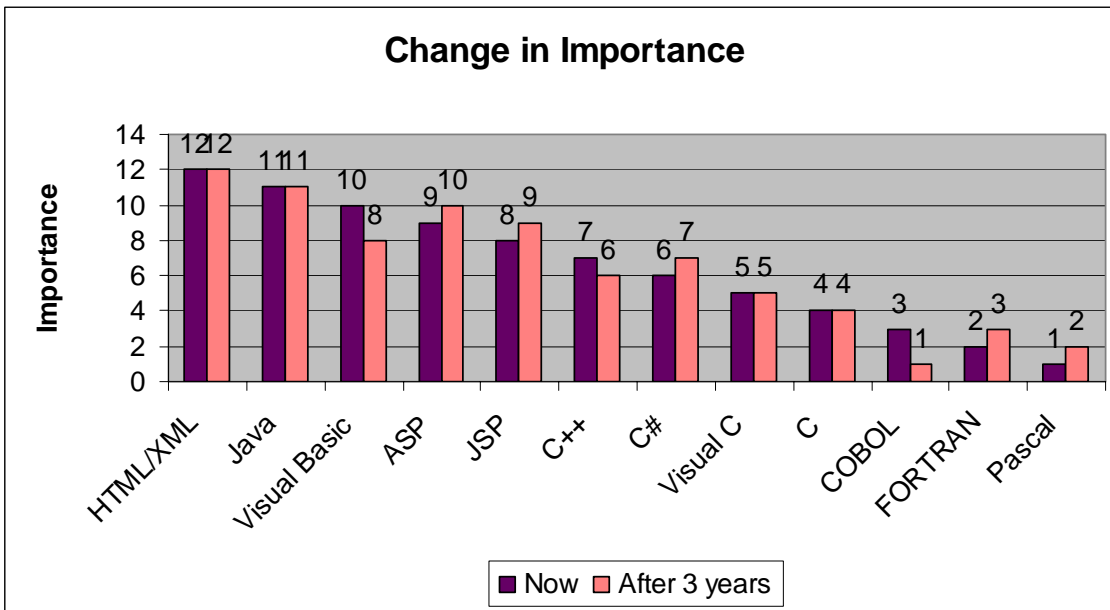


Figure 1: Change in Importance of Programming Languages.

5.3.2 The Future Trends

Unlike skills and knowledge in programming languages, the change in the perception of importance of skills and knowledge in databases showed little change over time. The first three database platforms, namely Oracle, SQL Server, and Access, each maintained their rank over the three-year interval of the study. Sybase maintained its lowest rank while MySQL and DB2 swapped their 4<sup>th</sup> and fifth positions (Table 4). Figure 2 provides a graphical presentation of the movement in the importance of database solutions over time.

Databases	At Present			After 3 years		
	Mean	Rank	N	Mean	Rank	N
Oracle	4.02	1	101	4.20	1	95
SQL Server	3.42	2	97	3.74	2	89
Access	3.17	3	95	3.07	3	91
DB2	2.40	4	88	2.02	5	82
MySQL	2.07	5	82	2.24	4	79
Sybase	1.82	6	86	1.85	6	82

Table 4: Importance and Rank of knowledge and skills in databases.



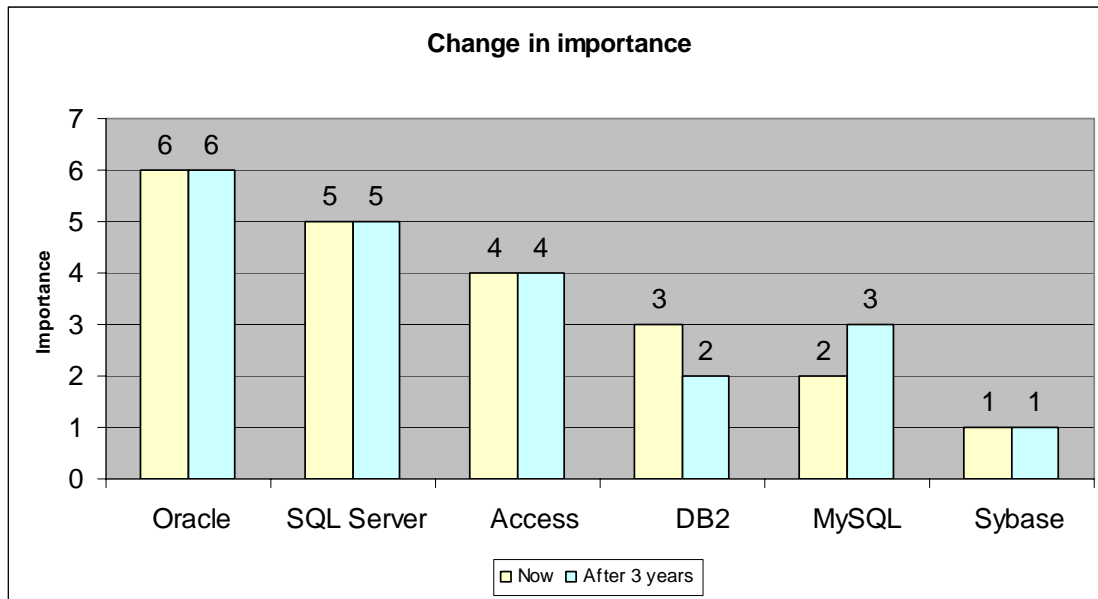


Figure 2: Change in Importance of Databases.

*IT Knowledge/Skills*

This category of technical knowledge/skills assumed in an employee with educational background in MIS. The previous two categories, computer programming languages and databases, both gage for a wider spectrum of skills that is also expected by other IT graduate including those majoring in computer science, information science, and computer & software engineering, etc. On the other hand this category is assumed by the researchers to be highly related to MIS graduates.

The relation with the management of IT in organization represents denominator between these skills and knowledge. As can be seen in Table 5, they range from knowledge and skills in operating systems, system development, networking, system maintenance, and enterprise systems.

System security scored the highest in importance among the list of 17 items followed by Windows operating system, system gathering techniques, and system development life cycle skills. Knowledge/skills in Unix, electronic commerce, expert systems and Linux scored the lowest. Linux scored the very lowest rank. This may be attributed to ignorance of this new open source operating system among the respondents. Importance of skills and knowledge of website development, GUI, and enterprise systems scored in the middle of the spectrum.

The story is different when analyzing the change in importance for the next 3 years. While the first knowledge/skill (system security) maintained its top rank, the rank of the second, third, and fourth variables (see Figure 3) slipped to the 7<sup>th</sup>, 6<sup>th</sup>, and 8<sup>th</sup> positions respectively.

Technical IT knowledge/ skills	At Present			After 3 years		
	Mean	Rank	N	Mean	Rank	N
System security	4.16	1	105	4.36	1	96
Windows OS	4.05	2	103	4.04	7	97
System requirement gathering techniques	4.03	3	104	4.10	6	97
SDLC	4.01	4	102	4.00	8	95
Network concepts	3.98	5	103	4.15	4	99
Data communication	3.89	6	101	4.21	2	95
Enterprise systems	3.88	7	95	4.14	5	90
Website development	3.83	8	102	4.20	3	95
Structured query language (SQL)	3.78	9	98	3.84	10	93

Data modeling (ERD)	3.59	10	95	3.75	12	91
GUI design	3.54	11	97	3.83	11	92
DSS modeling	3.48	12	98	3.98	9	94
Process modeling (DFD)	3.32	13	100	3.40	15	93
UNIX OS	3.22	14	104	3.30	16	97
Electronic commerce	3.03	15	97	3.61	14	93
Expert systems	3.01	16	99	3.74	13	91
LINUX OS	2.49	17	96	2.82	17	92

Table 5: Importance and Rank of the Technical IT knowledge /skills.

Similarly, the last five knowledge/skills in the list maintained their low ranks with little insignificant variations. The most noticed change between the present situation and after 3 years is in the area of data communication, website development, and decision support systems. The importance of the skills and knowledge in these subjects improved from the ranks 6, 8, and 12 respectively to the ranks 2, 3, 9 respectively. This is not surprising as the backbone of organizational computing is shifting to networking, and internet-based decision taken in what is becoming famous as the network-enhanced organizations (NEO's). Figure (3) depicts these trends.

*Management Knowledge/Skills*

This category of knowledge/skills pertains to the ability of IT graduate to perform managerial tasks based on the assumption that the IT professional will eventually pursue a career path in management. Therefore, he will need such skills at progressive stages in his career. Accordingly, these skills do not usually come to surface during the hiring process of new IT recruits, but will gain importance as time in employment passes by.

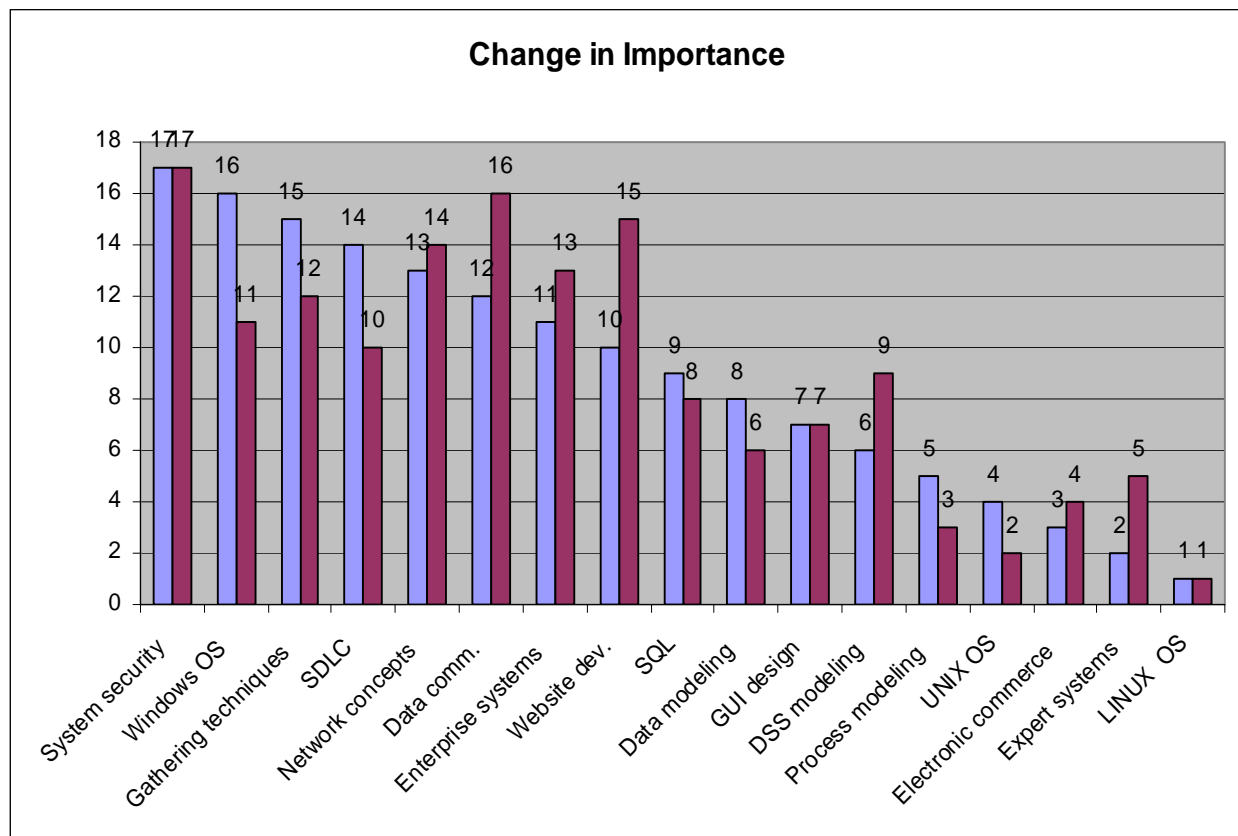


Figure 3: Change in Importance of IT skills.

By scanning literature, this research was able to pinpoint the prominent 19 administrative knowledge and managerial skills appreciated by a modern organization. Some of these categories can be classified as personal skills while

others are group dynamics skills. On the other hand, some of these skills are purely managerial while others require knowledge and skill aspects from other disciplines such as psychology, sociology, communication, and even technology.

As can be seen from Table 6, “accomplish assignments” ranked number 1 in importance and “working closely with customers/users and maintain good relationships” ranked number 2. Ability to “learn new technologies” ranked 4, and “plan and execute work in a collaborative environment” ranked 5. At the lower end of the importance spectrum are the “ability to teach others” and the “ability to train others” ranked the lowest from among the 19 factors. It was surprising to see “Apply IT knowledge to solve business problems” ranking number 8. The researchers expected this particular skill to have had more importance.

Management knowledge/skills	At Present			After 3 years		
	Mean	Rank	N	Mean	Rank	N
accomplish assignments	4.62	1	109	4.75	1	103
work closely with customers/users and maintain good relationships	4.55	2	109	4.71	2	102
work cooperatively on a one-on-one and project team environment	4.45	3	109	4.61	4	103
learn new technologies	4.38	4	109	4.59	5	103
plan and execute work in a collaborative environment	4.36	5	109	4.68	3	103
be self-directed and proactive	4.28	6	109	4.56	6	104
focus on technology as means not ends	4.25	7	108	4.49	8	104
apply IT knowledge to business problems	4.23	8	108	4.54	7	104
resolve conflict professionally	4.21	9	108	4.48	9	103
learn about business functions	4.19	10	107	4.37	13	101
write effective and correct memos and reports	4.17	12	109	4.44	10	105
interpret business problems	4.17	13	107	4.38	14	103
organize, and lead projects	4.16	13	108	4.52	11	104
make effective presentations	4.11	14	107	4.40	16	103
understand technology trends	4.10	15	108	4.34	12	103
work under pressure	4.07	16	108	4.24	15	104
deal with ambiguity	4.04	17	105	4.22	17	101
Ability to train others	4.01	18	103	4.32	18	101
Ability to teach others	3.96	19	109	4.15	19	105

Table 6: Importance and Rank of Management knowledge and skills.

### 5.5.2 The Future Trends

Some knowledge/skills witnessed significant shift of importance between the present time and after 3 years, while others maintained their current rank. Some of these shifts were in the form of improvement while the other was a decline in importance. The most noted shift upward (more importance) were for the variables (5, 8, 11, 13, 15). For example there was a sizable increase in importance in the knowledge/skills like “understand technology trends”, “apply IT knowledge to solve business problems”, “organize and lead projects”, “write effective and correct memos and reports”, and “plan and execute work in a collaborative environment”. Such skills are usually covered in management-related courses of MIS curricula. Figure 4 depicts these movements.

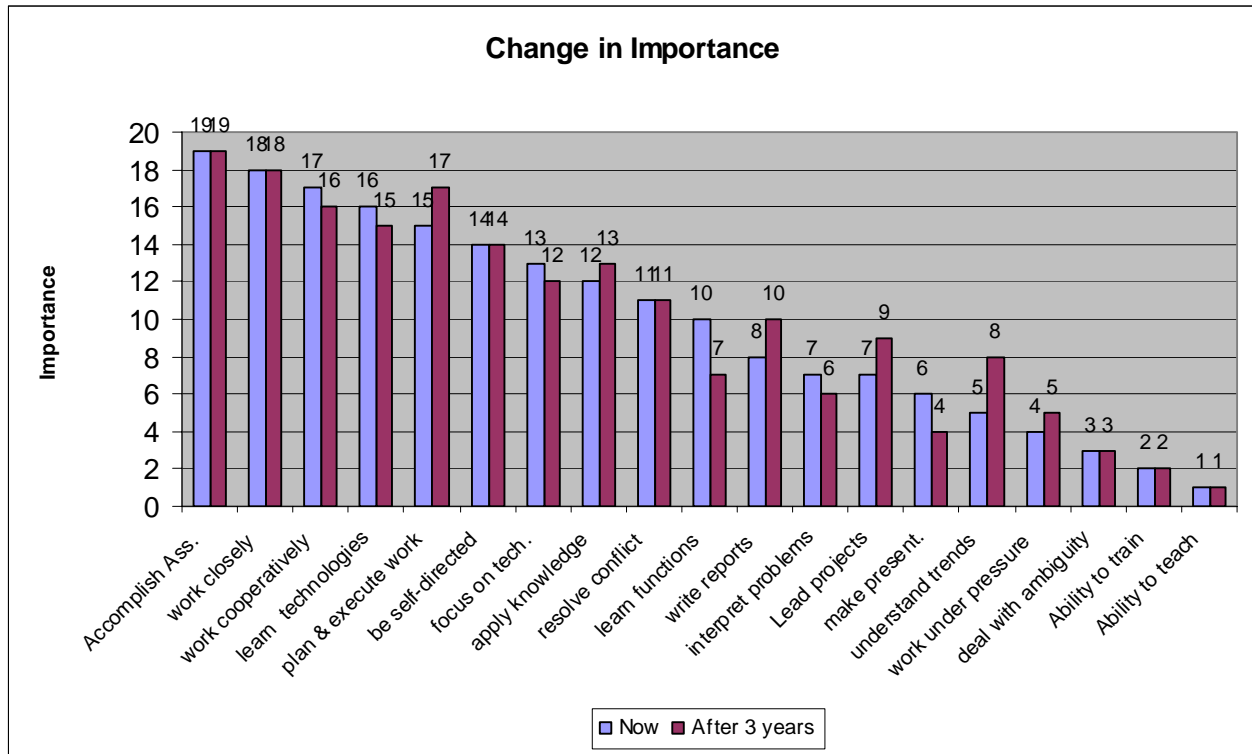


Figure 4: Change in Importance of managerial skills.

On the downturn trend, the following variables will loose some of their importance over time: “learn new technologies”, “focus on technology as means not ends”, “learn about the business functions”, and “make effective presentations”.

### CONCLUSIONS AND IMPLICATIONS

The findings of this research are valuable to many stakeholders, namely management, supervisors of academic programs, government, and researchers:

1. The findings will help corporate executives to better formulate the organizational strategy with regards to their IT activities.
2. It will help human resource management in their hiring and maintenance of IT personnel, as well as in designing their training program.
3. Developers of academic programs who are eager to provide better education and training will be able to calibrate their program components.
4. Government strategy makers might use the findings in formulating the IT national plans with the objective of maximizing synergy between the various stakeholders.

In addition, the research findings sheds light on the nature of IT labor market in Saudi Arabia. It will answer the question whether the Saudi IT labor market has unique features or it resembles the IT labor markets in the rest of the world. In fact, it can be concluded that the Saudi IT labor market has similar characteristics of other IT labor markets elsewhere. So the study does not suggest that the Saudi IT labor market is distinct from other countries, on the contrary, as this paper will suggest later, IT labor markets exhibit resemblance around the world.

The researchers suggest that the findings of this research are valuable to many stakeholders. On top of the list are corporate executives who oversee the organizational strategy, the human resource management who are involved with hiring and maintaining IT personnel, the developers of academic programs who are eager to provide better education in this highly demanded field of education, as well as government strategy makers who would like to see maximum levels of synergy in the labor market for IT professionals.

## FUTURE RESEARCH

This paper provided a comparison of IT skills and knowledge between the present time and after 3 years. One future research idea is to compare the current situation among different countries rather than over time. Another future research stemming from this one is to provide more statistical insights into the research provided by this research such as the utilization of factor and discriminant analysis. This would pave the way to find new grouping of IT skills and knowledge based on new criteria.

Another suggested future research stemming from this one is to assess academic programs offered by Saudi universities, and find out whether such perception gap exists among Saudi executives.

## REFERENCES

- Boynton, Andrew; Zmud, Robert; Jacobs, Gerry (1994). The influence of IT management practice on IT use in large organizations. *MIS Quarterly*, 18(3), 299-318
- Freeman, L. A.; Jarvenpaa, S. L.; Wheeler, B. C. (2000). The supply and demand of information systems doctorates: Past, present, and future. *MIS Quarterly*, 24(3), 355-380.
- Lee, Denis; Trauth, Eileen; Farwell, Douglas (1995). Critical skills and knowledge requirements of IS professionals: A joint academic/industry investigation. *MIS Quarterly*, 19(3), 313-340
- Lee, S.; Koh, S.; Yen, D.; Tang, H. (2002). Perception gaps between IS academics and IS practitioners: an exploratory study. *Information and Management*, 40(1), 51-61
- Lee, S.; Yen, D.; Havelka, D.; Koh, S. (2001). Evolution of IS professionals' competency: An exploratory study. *Journal of Computer Information Systems*, Summer, 21-30
- Nelson, R. R. (1991). Educational needs as perceived by IS and end-user personnel: A survey of knowledge and skill requirements. *MIS Quarterly*, 15(4), 503-525
- Nelson, R. R.; Cheney, P. H. (1987). Training end-users: An exploratory study. *MIS Quarterly*, 11(4), 547-559
- Nord, Dary; Nord, Jeretta (1997). Information systems project development: Knowledge and domain requirements for the system analyst. *Industrial Management Data Systems*, (97:1), 17-24
- Roepke, R.; Agrawal, R.; Ferrat, T. (2000). Aligning the IT human resources with business vision: The leadership initiative at 3M. *MIS Quarterly*, 24(2), 327-353
- Todd, P.; McKeen, J.; Gallupe, B. (1995). The evolution of IS job skills: A content analysis of IS job advertisements from 1970 to 1990. *MIS Quarterly*, 19(1), 1-28
- Yen, D.; Lee, S.; Koh, S. (2001). Critical knowledge/skill sets required by industries: An empirical analysis. *Industrial management and data systems*, 101(8), 432-442
- Zack, M. H. (1998). An MIS course integrating information technology and organizational issues. *The Database for Advances in Information Systems*, (29:2), Spring 73-87