

Speed of Adaption of Information Systems: Correlation between Business Enterprises and Universities

Dr. Atif Hassan¹, Dr. Premkumar Rajagopal², Dr. Farooq-E-Azam Cheema³

Abstract

This research addresses the issue of the gap between the curriculum and industry practices in the area of management information systems. At first stage this research evaluates the business administration curriculum being taught at Pakistani business schools. At second stage, this research evaluates the performance of business graduates in the industry. The findings of the study are stated as the following; Information systems curriculum in institutions imparting business education is alarming and creates a gap between educational and industrial environments, as business organizations are shifting to the paradigm of e-business. In this research, it is concluded that the relevance of the business curriculum of information systems courses with that of industry requirements is a desirable goal and that it is required to take necessary steps to minimize the increasing gap between theory and practice. First, we need to better comprehend the extent of the problem. Next, we need to better bridge “theory” and “practice.” This research also recommends the steps we can take to shrink the widening gap between theory and practice and identify where the business and management technology is heading and what technological skills are expected from our business graduates.

Key Words: Management Information Systems, Information Technology in Business, Information Systems Practices. Information Systems Curriculum for Business

1. Introduction

We are living in the “exponential times” and we have no other choice but to keep abreast of the changing world. The rapid development of modern technology has provided all the latest tools and resources including computing, information and multimedia technologies to meet the diversified needs of the twenty first century edutainment and consumer services. This exponential thrust of innovation facilitates the utilization and growth of our collective global knowledge at a rate not enjoyed previously by the industrial revolution.

The internet has transformed into a comprehensive resource of information and knowledge creation tool, easily accessible to any individual who has basic information gathering and access to the World Wide Web. Internet enables the searchers and researchers to retrieve the information on desired topic.

Now users of internet are experiencing entirely different networking experiences, beside the regional connectivity options internet is a truly global resource. Understanding these facts and combining them with the latest knowledge for internet resources brings the latest and greatest information available today.

In developed countries, Information systems/Technologies have become a part of the basic service basket such as education, health, business and employment opportunity, and provide new means to access basic social needs and provide opportunities for income generation.

Information systems are evolving at a rapid pace. One challenge in the field of information systems is that technologies are becoming obsolete after every two or three years. Students of information systems need to keep their IS knowledge up to date periodically, to stay current. Same Challenge applies to the curriculum of information systems. Curriculum of information systems must be updated periodically to meet the industry requirements (Hassan, 2009).

Computer and information technology tools and concepts are very important to teach specially for the graduates of business and management; actually business graduates have to use the information products of the twenty first century as a tool for doing business in every aspect of their job. An ultimate assessment must demonstrate that the business students are able to make use of their technological skills in advanced business decision making scenarios. Business students should be capable to demonstrate a better understanding of information systems and computers Technology as students have to step forward during each year of their business education career.

¹ Chairman, Department of Management, School of Business & Economics, University of Management & Technology, Lahore, Pakistan atif.hassan@umt.edu.pk

² President, Malaysia University of Science & Technology (MUST), Malaysia, prem0908@gmail.com

³ Dean, Management & Social Sciences, Bahria University Pakistan dr.cheema@live.com

Many institutes of business administration, in reaction to the demand and pressures exerted from key players like students, faculty and future managers, identifying a need to bring the necessary modifications in the business curriculum to better prepare the business learners with a new skillset especially technological skills in information systems.

Business curriculum is a broad, combination of various subject areas that provides students with meaningful instruction for and about business. Instruction in Business Education encompasses business skills and techniques, an understanding of basic economics, and business attitudes essential to participate in the global marketplace as productive workers and consumers.

The swift acceptance of internet based technologies giving rise to the integrated functional areas of business management and electronic commerce. For example, accounting has been evolved into accounting information systems, similarly finance has become financial information system, HR has become human resource information system, marketing into marketing information systems, production into production management system and operations into operations support system. Information technology penetration rates differ distinctly between developed and developing countries and across developing countries. A profound analysis of the expansion patterns and contributions of information technology in a number of countries like China, India, Malaysia, Taiwan, Philippines, Singapore, and South Korea, reveals that rapid socio-economic progress in these economies significantly accelerated due to proficient and cost effective access to information.

The computers came to Pakistan in mid sixty's when second-generation computer was installed in an organization at Karachi. Presently, almost all private and public sector organizations have the sophisticated computers. The growth in the number of computer systems in Pakistan during the last ten years was over 50%. This has been possible due the government's policies and awareness of the public and reduction/removal of duties over computers and related equipment. Analyst predicts that the growth in computer systems will further multiply next three years.

2. Literature Review

The main focus of this research study was to observe the industry requirements and curriculum of management information systems in business administration education. The investigator has prepared a wide prospect of study for the literature on the problem domain. Literature was widely available on the topic but there was a lack of research studies on the topic with reference to Pakistan.

Hoplin (2003) provides an interesting thought by noting that "the rapid proliferation of emerging information system technologies drives home the point that IS cannot run in place without losing ground.

Owens (2003) has identified various important areas necessary for the computer literacy, he included productivity application software for example word processing, spread sheets and presentation graphics in the list as well as various internet based tools, basic computing concept including telecommunications and database management systems literacy.

Tanya McGill (2003) the integration of information technology has transformed our society into global society, but it has to face tremendous challenges and will get opportunities for people as we help shape the next generation of information innovators. In the times of strict budget reductions, organizational challenges are increasing, and the success become more critical factor. Recent challenges in IT education concentrate on the continuing focus of teaching quality in the center of implementing learning technologies and cross disciplinary issues.

Hoffman & Blake (2003) the fundamental meanings of technological studies is very little concerned with programming languages and more focus is upon the application of the computer based technologies when the most of people own one or more personal computers either it is a tablet, desktop, personal computer, a laptop p personal computer or a tablet. Various groups of individuals may be organizational employee, students and faculty members have different concepts about the meaning of computer literacy. Half a century ago when the size of a computer system was nearly equals to a large room, the meanings of computer learning was being able to program a computer. Actually, these fundamental concepts of computer literacy have changed with the passage of time as technology improved and society became more dependent on computers.

Eisenberg & Johnson (2002) suggested incorporation of computer technology into operational disciplines he stated that the meaning of the computer literacy is not that how to use a computer system

but it means to use the modern technology as a tool for organizational problem solving research and communications.³

Litecky & Arnett (2001) the educational industry delivers all the essential competencies for education sector to progress and to gain edge over the competitors but the responsibility is lying with the Information Technology sector to acquire knowledge workers and to train existing staff and provide opportunities for the new job seekers. They have conducted an in depth analysis of thousands of job advertisements that appeared in newspapers and the Internet over a year from nine major metropolitan areas across the country. They also developed a list of thirty eight core competencies that were required by the employers for a typical IT trained personal.

Watson & Straub (2001) stated that “with the integration of the Internet and other networks (e.g., cell phone, cable TV, satellite downlinks and uplinks), systems that have been the historic emphasis of Information Systems research are being rapidly transformed”.

Doke & Williams (1999) during a research study about various Information Systems job categorization established that interpersonal skills and systems development were common in different categories but programming related competencies were found essential for starting level Information Systems vacancies.

Watts (1999) who believes that technology is not simply a curriculum content area, but rather an approach to learning and the application of knowledge. Watts also discussed the definition of technology put forward by the Australian Education Council. This definition includes creating products and processes via a purposeful application of knowledge, experience and resources to meet the needs of users.

Lightfoot (1999) implies that this is the responsibility education system to prepare Information Systems professionals for the 21st century. Teaching modern technological skills help students obtain their first jobs while teaching essentials of technology help them secure subsequent jobs. Most of the institutions seem to be in a state of conflict due to class size, limited course offerings imposed by the requirements of the degree programs, and the rapid changes in the land scape of Information Systems.

Westfall (1998) stated that “Information systems learning necessarily include (but are not limited to):

- a) Understanding and analysis of economic dynamics and tendencies that will be required for modern information technologies.
- b) A consideration of the association between the choice of career and required information technologies.
- c) Practical and proactive knowledge, education and practicing modern information technology related products.
- d) An acceptance of the comparison of the various information technologies and ability to identify which technologies more important than others.
- e) Knowledge about IS that includes the coverage of the technology at the current point in time.

Gonzenbach (1998) has mentioned that most importance should be given to the teaching of business communications, networking, operating systems, systems analysis and design and telecommunications. Most of the managers think that for potential employees to keep comprehensive knowledge in the domain of information technology, programming is an essential skill.

Horton & Leitheiser (1994) to best equip students for the dramatic technology changes in the IS/IT field, a standardized IS course curriculum becomes a necessity. Numerous attempts have been made to overcome this issue.

Kaplan (2007), In an ongoing effort to adapt to technological change, almost all business schools have integrated personal computers into their study programs. Many institutions will expect employees to have their own laptop now days. Organization’s requirement of using computer will vary from program to program and work needs, but employees must have at least a minimum understanding level with word processing, spreadsheets, and databases before starting professional education. Employees can contact their institutions, before starting the program about the software and hardware requirements.

Hoffman, Blake, McKeon, Leone, & Schorr (2005) found that the major gap between confidence and practice of our business graduates and computer skill expectations of productivity software to resolve the business domain related issues. Institutions must update the business curriculum according to need of the industry and must introduced the packages like spreadsheet. They also pointed out that most of the students already know the basic concepts of the applications such as internet, word processing and e-mail that is why, need not as much of practice in these applications. In order to develop a long-standing objective of modifications in the business curriculum, a more detailed information technology contents need to be developed as compared to the previously taught.

Noll & Wilkins (2002) The requirements for information systems (IS) skilled employees is increasing day by day, but the identification of the specific skills required for the variety of IS positions is not as clear. Information technology (IT) managers are challenged to find competent workers for their open positions. Computer security, data growth, data management, and the expansion of network technology also pose increasingly sophisticated challenges for IT managers. These challenges are enhanced by the constant change in information systems.

Tierman (2002) explains that problems with majority of student access to technology, often translated to as the digital divide or the inequality in access to computers across socioeconomic, regional, or cultural lines-is a rising concern universally, as computers gain even more importance in business and education.

Hamilton et al. (2000) established that the businesses were using twenties of different methods to cross functional integration of core skills in the business administration curriculum. These methods could be assembled into two key groups, including Applicative education and lecture room education. Many business institutions, in reaction to various forces exerted by important stakeholders like, students, faculty and future employers, are considering a desire to redesign the business administration curriculum to train their students with a modern package of competencies including information and communication technologies.

Wrycza et al. (1999) has identified that the Information Systems profession is evolving to the most modern destination as required by the organizations and industry. He also stated that the Information Systems profession is being pulled in opposite directions, one being the technical skills and other human orientation.

Ashley & Padgett (1997) have shown that regardless of the requirements from Information Systems proprietors for more business related required skills in exiting Information Systems study curriculum.

Analysis of the available literature examines the curriculum of information technology in business administration education. Extensive study for the literature on the problem under study has been done. A lot of related literature was available on the topic. Literature provide following significant deductions:

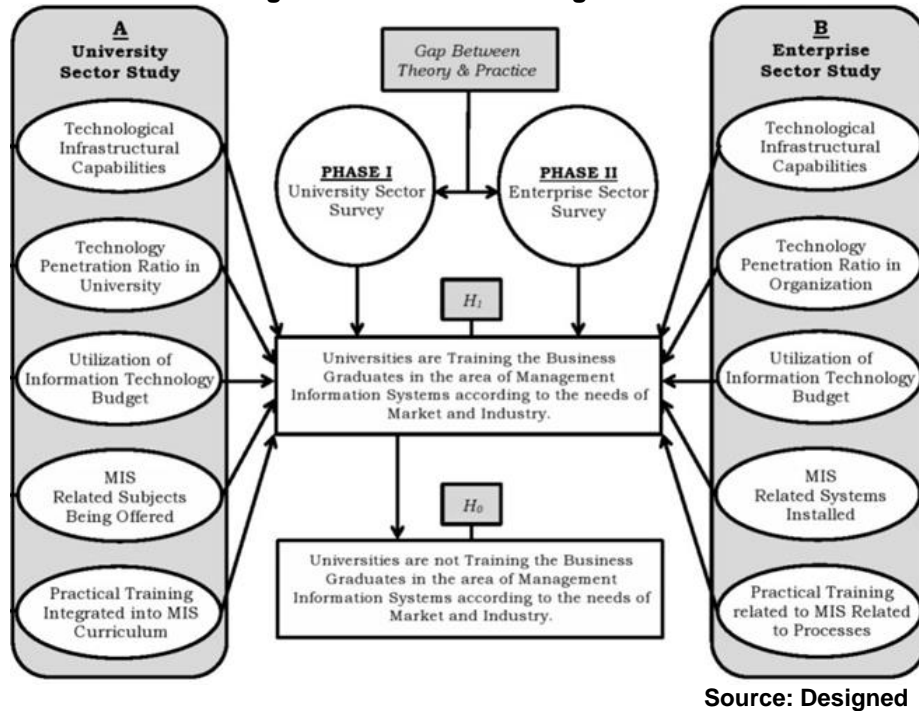
Information Technology Literacy is in demand in the twenty first century in every walk of life and especially Information Technology being integrated in the field of Business Administration. Researchers, all over the world found gap between Industry Expectations from Business graduates and IT skills in Job Outlook and Trends.

In light of the aforementioned literature, this research has designed a paradigm to further evaluate the research questions empirically.

3. Research Paradigm

Research paradigm has been developed for a unified comprehensive view of this research study. Five independent variables of the University sector study has been placed on the left hand side of the figure and five independent variables of enterprise sector study has been placed on right hand side of the figure. All the independent variables contribute to the major hypothesis of the research. Sub hypothesis has been developed from each independent variable of the research study.

Figure 1: Research Paradigm



4. Research Methodology

This research involves a multi-dimensional sampling design the description is shown in figure. The reason for using the multi-dimensional research design is that this study analyzes the information technology curriculum in business education, which involves the deep study of the curriculum of information technology in business education on the other hand it is also required to study the information technology skills of business graduates working in industry.

There are multiple phases or dimensions of research design of this study:

Phase I (Sample from Universities/Institutions): The data related to the information technology curriculum in the business education will be gathered from the HEC recognized universities and institutions of higher education.

Phase II (Sample from Industry / Market): It is very necessary to know the standards and requirements of the real business environment in which the graduates of our universities and institutions will go for their jobs.

4.1 Sample Design for Phase I (University Sector)

Sampling is intended to gain information about a population. A population is the entire collection of people or things you are interested in, as phase I of my research deals with the curriculum analysis of all the Pakistani business institutes/Universities so all the recognized Universities/Institutions of higher education will be the target population for my research.

The sampling frame usually is a list of population members used to obtain a sample. That's why the list of HEC (Higher Education Commission) recognized universities/institutions will be the sampling frame for the 1st phase of this research study.

The sampling procedure selected for this phase of the study is quota Sampling. This sampling method is used when the researcher knows that the population has sub-groups that are of interest.

This study collects the sample from all over the Pakistan and for this population is divided into quotas, so that the researcher could guarantee the inputs from universities from all over the country to make the study more comprehensive and useful.

If researcher selects a simple random sample of 10 Universities, I might not get any from the Khyber Pakhtoon Khawa, Azad Jammu Kashmir, or Islamabad. To make sure that researcher get universities from each group, researcher has divided the universities into groups, and then selected the

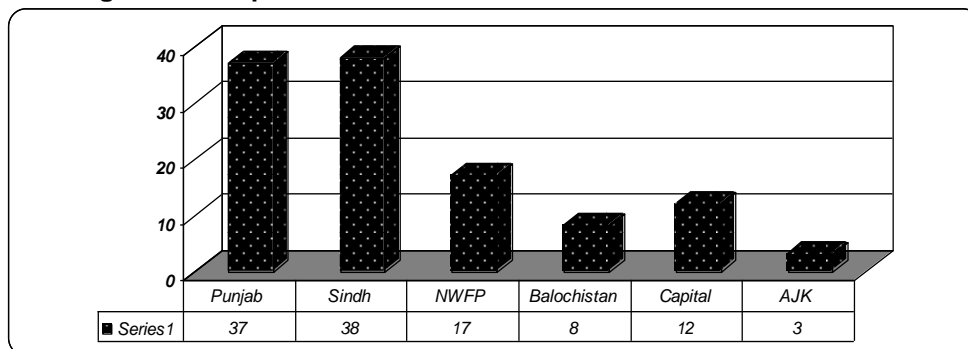
proportion of universities from each group. This is proportional quota sampling. However, researcher has applied weights to the findings for each sub-group, proportional to its presence in the all universities of Pakistan.

4.2 Determine the Relevant Sample Size

Slovin's formula has been used to calculate the size of the sample at phase I (University Sector Survey). So, as per Solovin's formula I need to study 13 educational Institutions among the total population of the Institutions Offering business education in Pakistan.

Additionally, I have applied weights to the findings for each sub-group, proportional to its presence in the all universities of Pakistan. Below are some statistics related to HEC recognized Universities / Institutions. We can get the ratio of universities in all provinces of Pakistan, and then get the number of sample on the basis of weights. As shown in the following table.

Figure 2: Sample Size Determinations



Source: Computed

Table 1: Sample Size Determinations

S#	Province	No. of Universities	Percentage of the Population	No. of Sample Selected
1	Punjab	37	32%	3.2 => 4*
2	Sindh	38	33%	3.3 => 4*
3	KPK	17	15%	1.5 => 2*
4	Balochistan	8	7%	0.7 => 1*
5	Capital	12	10%	1.0 => 1*
6	AJK	3	3%	0.3 => 1*
Total		115	Total No. of Universities selected for Sample = 13**	
*Values rounded up				
**Calculated as per Slovin's formula				

Source: Computed

4.3 Sample Design for Phase II (Organizations)

Sampling is intended to gain information about a particular population. A population is the entire collection of people or objects you are interested in, as phase II of my research deals with the application of Information systems/technology in the organizations of Pakistan so all the public/ private enterprises will be the target population for this phase of my research.

Sampling procedure for this phase of research is purposive sampling. Purposive sampling represents a group of different non-probability sampling techniques. Also known as judgmental, selective or subjective sampling, purposive sampling relies on the judgment of the researcher when it comes to selecting the units. The reason for choosing purposive sampling in this phase of research is avoiding non-responsive situations, because in non-random sampling we choose organizations from which the information could be gathered expediently.

The size of the sample selected for this module of the research has been calculated by the help of the following sample calculation table calculated by Stroker in Strydom & De Vos (1998). According to the lists of companies and public /private organizations of Pakistan, the size of population is around 10000. Therefore, Four hundred and Fifty business organizations were approached and responded for this phase of the study.

Table 2: Sample Size (Stoker, Strydom and De Vos (1998))

Population	Percentage Suggested (%)	No. of Respondents
23	100	20
30	80	24
50	64	32
100	45	45
200	32	64
500	20	100
1000	14	140
10000	4.5	450
100000	2	2000
200000	1	2000

5. Result and Analysis

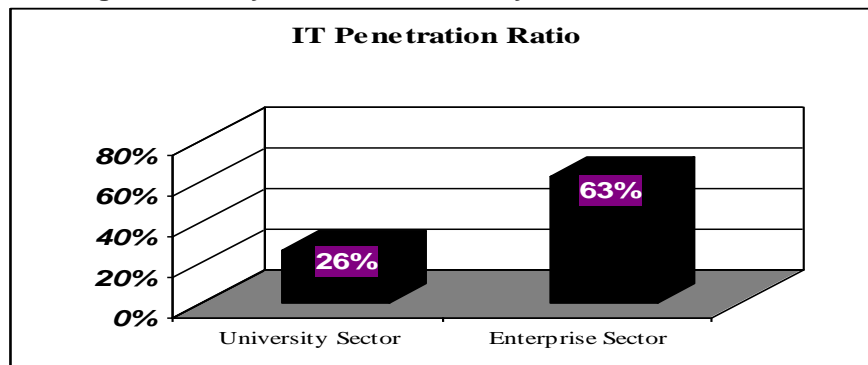
5.1 Comparative Analysis of Information System Penetration

This research study compares the information system penetration ratio of university and enterprise sectors in Pakistan. Information system penetration of university sector is 26%, while information technology penetration ratio of enterprise sector is around 63%. This trend shows that enterprise sector of Pakistan is much more technologically equipped as compare to university sector of Pakistan. Our business students have less opportunity for accessing the information system products and services at their teaching institutions and when they go to various business organizations for jobs they find more advanced technological environment.

Table 3: Analysis of Information System Penetration Ratio

Information System Penetration Ratio	
University Sector	26%
Enterprise Sector	63%

Source: Computed

Figure 3: Analysis of Information System Penetration Ratio

Source: Computed

5.2 Information System Penetration Ratio at Universities

Information system penetration ratio could be calculated by dividing total number of computers connected to university information system with total number of students enrolled. As mentioned in Table 3 average IS penetration ratio of universities is 26 percent indicating. Information system penetration ratio is guiding about the integration of the information technologies in institution or university which is very low at the moment. An overall analysis of the responses received from sampled universities indicates that there is a big gap in integration of information technology in the university sector in Pakistan. This penetration ratio is not only very low but growing at a very small rate as compared to growth of IS penetration in industry sector. As the world is moving towards latest trends like paperless environment and mobile office, there is a dire need to up lift IS penetration ratio in universities offering business administration to remain competitive globally.

5.3 Information System Penetration Ratio at Business Enterprises

Information System penetration ratio could be calculated by dividing total number of computers connected to the enterprise's information system with total number of employees working in that business enterprise including clerks, middle and higher management positions. Technology penetration ratio communicates that how many employees are using one computer in the organization. The data received in response to this question summarized in Table 1 shows that enterprises have 63 percent IT penetration. It means that 63 percent people in enterprise sector are the users of the information systems and the rest are either doing manual work or using shared computers. Information system penetration ratio guides us about the rapid integration of the information technology in the enterprise sector of Pakistan. An overall analysis of the responses received from sampled enterprises studied for the research tells enterprise sector of Pakistan is rapidly moving towards 100 percent IS integration in office tasks at managerial levels specially. Therefore this can be compared with IS skills taught at universities in Pakistan to evaluate the extent of preparation of business graduates to face the challenge of working in fully automated enterprises.

5.4 Correlation between Functional Information Systems

Functional information systems may be related to various business functions with integration of information technology. For example an accounting information system may be very helpful for enterprise in performance of accounting related business assignments. Similarly an enterprise may have other information systems to perform business functions like financial information system, marketing information system, human resource information system and production information system.

Table 4: Percentage of Presence of Various Information Systems

	Accounting Information System	Financial Information System	Marketing Information System	Human Resource Information System	Production Management system
Business Enterprises	81%	63%	41%	59%	48%
University Sector	19%	11%	13%	9%	7%

Source: Computed

Table 4 summarizes the responses of sampled enterprises showing that 81 percent of sampled enterprises are having accounting information system to perform accounting functions. 63 percent enterprises are performing finance functions using financial information system. 41 percent of the enterprises are using marketing information system to do marketing related tasks. 59 percent enterprises also perform human resource functions using human resource information system. Whereas there are 48 percent enterprises that are using production information systems to do productions related function in the organization. These responses are also shown graphically in Figure 3.19 emphasizing the enterprise sector is fast moving towards IT integration and penetration in performance of organizational tasks.

Accounting information system may be very helpful for a business graduate specialized in accounting in the enterprises operating with integration of information system to do the job assignments. The responses summarized in Table 4 tells that only 19 percent sampled Universities are offering accounting information system course. Similarly other courses which are based on business functions integrating information system are very important to teach to business graduates like financial information system, which 11% of the sampled business institute/University is offering. Also another important business function with integration of IT is marketing information system, which is also offered by very few sampled universities i.e 13 percent. Human resource information system and production management system are two e-business courses which are also not offered by many of the sampled business institutes/universities. To make business graduates able to work in modern organization Universities should integrate these courses in the business curriculum.

5.5 Pearson Correlation Coefficient Between Business Enterprises & Universities

5.5.1 Result Details & Calculation:

X Values

$$\sum = 292$$

$$\text{Mean} = 58.4$$

$$\sum(X - M_x)^2 = SS_x = 943.2$$

Y Values
 $\sum = 59$
 Mean = 11.8
 $\sum(Y - M_y)^2 = SS_y = 84.8$

X and Y Combined
 $N = 5$
 $\sum(X - M_x)(Y - M_y) = 186.4$

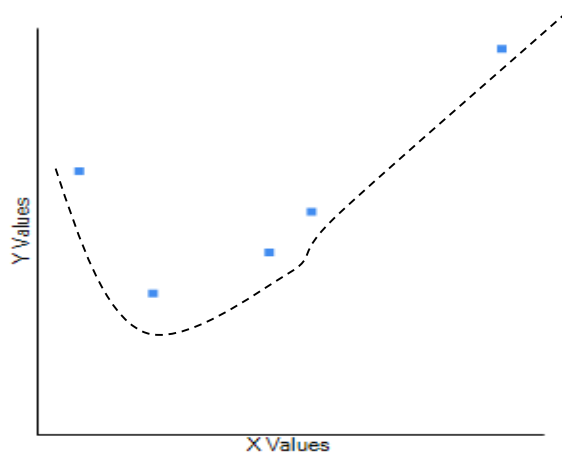
R Calculation
 $r = \frac{\sum(X - M_x)(Y - M_y)}{\sqrt{(SS_x)(SS_y)}}$
 $r = 186.4 / \sqrt{(943.2)(84.8)} = 0.6591$

Meta Numerics (cross-check)
 $r = 0.6591$

Key
 X: X Values
 Y: Y Values
 M_x : Mean of X Values
 M_y : Mean of Y Values
 $X - M_x$ & $Y - M_y$: Deviation scores
 $(X - M_x)^2$ & $(Y - M_y)^2$: Deviation Squared
 $(X - M_x)(Y - M_y)$: Product of Deviation Scores

The value of R is 0.6591. This is a moderate positive correlation, which means there is a tendency for high X variable scores go with high Y variable scores (and vice versa).

Figure 4: Pearson Correlation Coefficient (X => Enterprises, Y=> Universities)



Source: Computed

5.6 Hypothesis Testing

H_1 = Universities are offering the information system subjects according to the needs of business enterprises.

H_0 = Universities are not offering the information system subjects according to the needs of business enterprises.

5.6.1 Chi Square Testing

Chi square test is applied on nominal scale hypothesis testing. One sample chi square test is probably the most widely used nonparametric test of significance. In this study chi square test is applied on data received in response to question regarding number of employees getting training in the

organization, because this is a good indicator of the success or failure of the institution. The formula by which chi square test is calculated is

O_i = Number of observed employees getting information technology training

E_i = Number of expected employees getting training under H_0

k = Number of categories

5.6.2 Chi-Square Test Results

P value and statistical significance

Chi squared equals 83.232 with 1 degrees of freedom.

The two-tailed P value is less than 0.0001

By conventional criteria; this difference is considered to be extremely statistically significant.

TABLE 5: REVIEW OF HYPOTHETICAL DATA

Row #	Category	Observed	Expected #	Expected
1	Offered	352	250	50.000%
2	Not Offered	148	250	50.000%

Source: Computed

Therefore, the research hypothesis H_0 is TRUE. After the careful data analysis and testing of hypothesis we may formally declare the following.

(H₀) Pakistani universities are not training the business graduates in the area of Management Information Systems according to the needs of market and industry.	Accepted
(H₁) Pakistani universities are training the business graduates in the area of Management Information Systems according to the needs of market and industry.	Rejected

6. Conclusion

Pakistani business institutions are offering very initial level information technology courses, while the industry practices involves high tech electronic business functions.

Information technology curriculum in business administration education needs to be up-to-date according to the needs of industry and international standards.

Business schools should assess information technology curriculum issues in business administration education and also identify a number of IT skills that students and faculty would like to learn for their own professional development.

As information technology is a rapidly changing segment, therefore the curriculum of information technology needs to be updated periodically to meet the challenges of the modern requirements and developments.

Therefore, this could be hypothetically concluded that, Pakistani universities are not training the business graduates according to the needs of market and industry.

7. Recommendations

On the basis of the aforementioned study the researcher has developed some recommendations for the students, educational institutions and the industry by large.

So information technology curriculum in business administration education needs to be up-to-date according to the needs of industry and international standards.

Business schools should assess information technology curriculum issues in business administration education and also identify a number of IT skills that students and faculty would like to learn for their own professional development.

Participation of Information Technology courses in Pakistani business institutions is alarming and creating a gap between educational and industrial environments, as business organizations are shifting towards the e-business. Therefore, there is a dire need to align the business administration courses according to the requirements of the current technological arena. So information technology curriculum in business administration education needs to be up-to-date according to the needs of industry and international standards.

Business schools should assess information technology curriculum issues in business administration education and also identify a number of IT skills that students and faculty would like to learn for their own professional development.

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