The Impact of Teaching Data Communications and Networking in a Business Informatics Curriculum

Omran Al-Shamma[1], Haitham S. Hasan[2], Mohammad A. Fadhel[3]

[1] *(Department of Higher Studies, University of Information, Technology and Communications, Baghdad, Iraq)*

[2,3] *(Business Informatics College, University of Information, Technology and Communications, Baghdad, Iraq)*

ABSTRACT

Due to the vast growth of informatics and computer-related applications, most universities have offered a variety of education programs in Computer Science (CS), Information Technology (IT), and further newly Information Systems (IS) and Business Informatics (BI). With respect to its development, BI is still offspring. This paper expressed briefly, inside BI curriculum and outlined its characteristics, categories, and subject courses. It also focused on one of the significant courses called Data Communications and Networking. This core course is listed in BI, IT, and IS curricula. Teaching this course in BI curriculum will create better managers, better employees, and better computer users. The graduates having a solid foundation in computer networks will enable them to work efficiently and interactively with network installers, network designers, and network administrators.

Keywords: Business Informatics curriculum, Information Technology curriculum, Information Systems curriculum, Education.

I. INTRODUCTION

The quick growth in technology and computer-related fields develops the need for more continuous evaluating, revising, and moderating the current university curricula. Basically, the university has offered a variety of education programs in Computer Science (CS), Information Technology (IT), Software Engineering, Business, Management, Marketing, and further newly Information Management (IM), Information Systems (IS), and Business Informatics (BI). Although this growth of IT and IS related programs is expected to increase, there are some fears that the number of students enrolled in these programs could decline or go down. For example, Ref [1] showed the numbers of students studying IS in the UK. More instance, declares that IT is not extended as a source of planned benefit, has developed an increasing fear over the beating of technology-leaning careers [2]. On the other side, this will increase the accent on business-leaning IT careers [3]. Hence, the demand of topics

such as information management, application design and integration, business process management, and enterprise architecture will augment [4]. Also, the need for graduates that have ability to manage complex information and provide chain networks and project managers capable to supervise comprehensive IT projects is predictable to increase [5]. As a result of that, universities started to establish a strong analytical and critical thinking skills, a real world perspective with broad business, and core knowledge of information systems with the implementation of IT solutions that improve managerial performance [6] [7]. Accordingly, computing schools are offering a variety of IT courses [8], while business schools are developing variations of Management Information Systems (MIS) programs [9].

From the other point of view, one goal of BI is that there is a strong incorporation between research and teaching following the Humboldtian ideal [10]. The impending goals acquired in typical research projects grow up to be part of the curriculum very quickly due to the fact that most lecturers are researchers, simultaneously. As the pace of technological progress and scientific growth in BI is very speedy, the educated courses should always under enduring revision and reconsideration [11]. With respect to its development, BI is still offspring. Hence, considerable obstacles have to be conquered so as to additional establish its vision [12].

This paper expressed briefly, inside BI curriculum and outlined its characteristics, categories, and subject courses. It also focused on one of the significant courses called Data Communications and Networking. This core course is listed in BI, IT, and IS curricula. Its content starts with definition of data and signal (digital and analog), goes through transmission media, data multiplexing and compression, computer network categories (wire and wireless), security, and finally network management. Teaching this course in BI curriculum will create better managers, better employees, and better computer users. The graduates having a solid foundation in computer networks will enable them to work efficiently and interactively with network installers, network designers, and network administrators. Valuable textbooks demonstrate the subject very interesting as a business user's approaches as well as an engineering user's approach [13] [14] [15].

II. INSIDE BI CURRICULUM

Business Informatics has been established in the 1970s as a business course with technology orientated in German. Up to now, many universities, mainly in German-speaking countries, developed courses in BI with increasing numbers of graduates [16]. In general, business concerns management functions, informatics concentrate on information technology and communication systems, and BI focuses on the concept, implementation, utilization, and management of Business Information Systems (BIS) [7]. BI also concerns the connection between business functions, information, humans, and technology and communication systems [9]. Although BI seems to look like IS, indeed, BI is concentrated on the foundation of information technology solutions, while IS concentrates on applying empirical methodology. BI includes development of terms, patterns, and styles that are unambiguous and sharable. Hence, BI is an interdisciplinary science and it can be concluded as a socio-technological and business orientated subject with engineering penetration [7].

BI can be classified as [9]:

1. Practical discipline that studies real world occurrences.
2. Prescribed discipline that develops and employs formal description methodologies and patterns.
3. An engineering science that methodically plans and builds information and communication systems.

Helfert & Duncan create a framework for IS and BI curricula to explain the subjects of BI. BI curriculum seems to have a major emphasis on Logic, Mathematics, and Structural science [9] due to its emphasis on methodical construction and the use of practical fundamentals. This is almost defined as practicing for BI curricula [17]. For instance, mathematical fundamentals are identified as a vital so as to methodically build, develop, and examine patterns and structures of IS [18]. Therefore, BI often defined as IS architects (as an engineers' sense). ARIS-Architecture of Integrated Information Systems [19] is an example of the significant architectural framework for BI.

Helfert [20] analyzed the BI curricula and exposed that there are five individual sets of courses, which are: Business and Economics, Fundamentals of Informatics, Information Systems, Integration and Enterprise Engineering, and Domain-specific career electives. The most significant set, which is related to the scope of this article, is Information Systems set. This set can be classified to the following subset topics [21]:

a. Management of Data and Information.
b. Foundations of Information Systems.
c. Systems Analysis and Design.
d. Enterprise Architecture.
e. IS project Management.
f. IS Strategy.
g. Management.
h. Acquisition.
i. IT Infrastructure.

The first subset (Management of Data and Information) includes: Database types, Database approach, Fundamentals of file processing, File organization techniques, Physical data storage, Logical data model, Conceptual data model, Relational database design, Relations and relational structures, Normalization, Mapping conceptual schema to a relational schema, Physical data model, Data and database administration, Database languages, Transaction processing, Data security management, Data/Information architecture, Data quality management, and Business intelligence.

Foundations of Information Systems subset consist of: Information system components, Characteristics of the digital world, Information systems in organizations, Valuing information systems, Globalization, Information

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systems infrastructure, Development and acquisition, The internet and www, Enterprise-wide information systems, and Information systems ethics and crime.

The third subset (Systems Analysis and Design) includes: Business process management, Classification of opportunities for IT-permitted organizational modification, Investigation of business prerequisites, Project specification, Configerring of IT-founded chances into projects, Analysis of project feasibility, and Precedences of projects.

Enterprise Architecture subset consist the following topics: Enterprise architecture framework, Service oriented architecture, Enterprise resource software, Systems integration, Green computing, Risk management, software as a service, Business continuity, Enterprise data models, Content management, System administration, Emerging technologies, and IT control and management frameworks.

The fifth subset (IS Project Management) involves: Project management terminology, Introduction to project management, Managing teams, Project life-cycle, Project starts and preparation, Project quality management, Project resources administration, Project risk handling, project execution, and Project control and closure supervision.

IS Strategy, Management, and Acquisition subset incorporating topics such as: IS strategic alignment, The IS function, IS economics, Strategic use of information, IS planning, Managing the information systems function, IS risk management, Using IS/IT governance frameworks, and Acquiring information technology resources and capabilities.

The final subset (IT Infrastructure) includes: Core technical components of computer-based systems, Core computing system architecture concepts, Operating systems, Data centers, Networking, Scanning IT infrastructure, Organizing storage on organizational networks, Cloud computing, Grid computing, and System performance analysis and management.

III. DATA COMMUNICATIONS AND NETWORKING COURSE

In the 1970s, all business worlds were a paper-based system by using the mail letters to manage most of the functions of any business. With the development of computers and its related applications, different areas of the workplace have been updated by incorporating digital technologies such as business [22], management [23], marketing [24], industries [25], and even the research community [26] through the widespread usage of social media [27]. Nowadays, there is no business operates without using different kinds of data communications and computer networks. Although this discipline of science was originally designed for engineers and technicians, today, it employs business managers, programmers, end users, and anybody may use a computer, mobile, and even landline telephone. Due to the vast growth of informatics and computer-related applications, most universities update their study programs. Hence, data communications and networking becomes a must course

in any BI curriculum. As computer networks occupied in virtually every aspect of personal and business life, it is important that students need to understand the fundamentals, functions, features, precautions, and limitations of various kinds of computer networks. This knowledge will create better managers, better employees, and better computer users. The graduates having a solid foundation in computer networks will enable them to work efficiently with network installers, network designers, and network administrators. For example, a manager within a company asked a number of network specialists to give their recommendations to update the computer network of the company. If he had not any knowledge about the computer network, he must blindly accept their recommendations. In contrast, he can make intelligent decisions with respect to network resources if he had a basic knowledge in data communications and computer network. Another example, if someone has his own business and need to improve or support his work by optimizing the advantages of his computer network. Again, he must have a good knowledge in the fundamentals of computer networks. Also, to keep the BI graduate's job skills up-to-date and to remain a key player in the area of information technology, he/she must fully understanding of different types of computer networks, its advantages, its drawbacks, and its limitations. So, the question is what are the topics and concepts that the student of BI should learn in the data communications and networking? The answer is in the next section.

IV. TOPICS OF THE COURSE

The main topics that should be covered in the course are:

- Data and signal – analog and digital
- Transmission media – wire and wireless
- Interfacing
- Multiplexing and compression
- Error detection and correction techniques
- Network types – wire and wireless
- Security – computer and network
- Network management

The above topics start with an introduction to two important definitions: data and signals. Data means information to be transformed into a form of storage, transmission, and calculation. Signals are used to transmit the data. Hence, Data Communications is defined as the transmission of the data (analog or digital) using signals (analog or digital) over a medium (wire or wireless). Devices such as computers need to connect to another device or to a network which requires interfacing. To employ the transmission medium efficiently, most systems perform multiplexing, which means transmission of multiple signals on a single medium. Another technique used to maximize the amount of data transmitted is called compression. Data transmission between computers must be error-free; therefore, error detection and error correction techniques are two concepts should be covered, as well. Looking at the network side view, voice networks (transmit telephone signals) and data

networks (transmit computer data) are two types of networks must take into consideration. Merging these two types is an example of an important topic called convergence. Computer security, network security, and network management are essential topics in designing and improving network hardware or software.

V. CONCLUSION

As the pace of technological progress and scientific growth in BI is quite speedy, the taught courses should always under enduring revision and reconsideration. This paper demonstrated BI curriculum and outlined its characteristics, categories, and subject courses. It also focused on one of the essential courses called Data Communications and Networking. This core course is listed in BI, IT, and IS curricula. As computer networks occupied in virtually every aspect of personal and business life, it is important that students need to understand the fundamentals, functions, features, precautions, and limitations of various kinds of computer networks. This knowledge will create better managers, better employees, and better computer users.

REFERENCES

[1] HESA. [Online]. Available: http://www.hesa.ac.uk/holisdocs/pubinfo/stud.html.

[2] N. G. Carr, "IT Dosen't Matter," *Harvard Business Review, vol. 81, no. 5*, pp. 41-49, 2003.

[3] S. Benamati and R. Mahaney, "The future Job Market for Information System Graduates," New York, 2004.

[4] P. S. Traylor, "Outsourcing," *CFO, vol. 19, no. 15*, p. 24, 2003.

[5] C. Lower, "Der Methusalem-Effect," *Spiegel Special - Das Magazin zum Thema "Student 2005"*, no. 1, pp. 100-103, 2005.

[6] J. Gorgone, G. Davis, J. Valacich, H. Topi, D. Feinstein and H. Longenecker, "IS-2002: Model Curriculum and Guidelines for Undergraduate Degree Programs in Information Systems," Association for Information Systems, 2002.

[7] G. Disterer, F. Fels and A. Hausotter, *Taschenbuch der Wirtschaftsinformatik* (second ed., Munchen Wien: Carl Hanser Verlag, 2003).

[8] J. Laundry, J. H. Pardue, H. Longenecker and D. F. Feinstein, "A Common Theme for IT degree programs," *Communication of the ACM, vol. 46, no. 11*, pp. 117-120, 2003.

[9] M. Helfert and H. Duncan, "Business Informatics and Information Systems -Some Indications of Differences in Study Programmes-," Northumbria University, Newcastle upon Tyne, 2005.

[10] Wikipedia. [Online]. Available: https://en.wikipedia.org/wiki/Business_informatics.

[11] B. Ives, J. Valacich, R. Watson, R. Zmud and e. al, "What Every Business Student Needs to Know About Information Systems," *Communications of the Association for Information Systems, vol. 9, no. 1*, p. Article 30, 2002.

[12] K. Lyytinen, R. Baskerville, J. Livari and D. Te'eni, "Why the old world cannot publish? Overcoming challenges in publishing high-impact IS research," *European Journal of Information Systems (EJIS), vol. 16*, pp. 317-326, 2007.

[13] C. M. White, *Data Communications & Computer networks: A Business User's Approach* (8 ed., CENGAGE Learning, 2014).

[14] J. Fitzgerald, A. Dennis and A. Durcikova, *Business Data Communications and Networking* (11 ed., USA: John Wiley & Sons, Inc., 2012).

[15] B. A. Forouzan, *Data Communications and Networking* (5 ed., USA: McGraw Hill, 2012).

[16] P. Mertens and D. Barbian, "Zur Situation der Wirtschaftsinformatik im Lichte des studienfuhrers," *Wirtschaftsinformatik, vol. 44, no. 5*, pp. 502-505, 2002.

[17] S. Retzer, J. Fisher and J. Lamp, "Information Systems and Business Informatics: An Australian German Comparsion," 2003.

[18] P. Henderson, "Mathematical Reasoning inSoftware Engineering Education," *Communication of the ACM, vol. 46, no. 9*, pp. 45-50, 2003.

[19] A. W. Scheer, *Handbook on Architectures of Information Systems* (Springer, Berlin, 1998).

[20] M. Helfert, "Business Informatics: An Engineering Perspective on Information Systems," *Journal of Information Technology Education, vol. 7,* pp. 223-245, 2008.

[21] H. Topi, J. Valacich, R. Wright, K. Kaiser, J. F. N. Jr., J. Sipior and G.-J. d. Vreede, "IS 2010: Curriculum Guidelines for Undergraduate Degree Programs in Information Systems," Communications of the Association for Information Systems, 959-428, 2010.

[22] E. Brynojolfsson and A. McAfee, *The second Machine Age: Work, Progress, and Prosperity in a Time of Brilliant Technologies* (1 ed., W. W. Norton & Company, 2014).

[23] Y. Yoo, R. J. Boland, K. Lyytinen and A. Majchrzak, "Organizing for Innovation in the Digital World," *Organization Science, vol. 23, no. 5*, pp. 1398-1408, 2012.

[24] G. S. Day, "Closing the Marketing Capabilities Gap," *Journal of Marketing, vol. 75, no. 4*, pp. 183-195, 2011.

[25] R. J. Baxter and N. Berente, "The process of embedding new information technology artifacts into innovative design practices," *Information and Organization, vol. 20, no. 3-4,* pp. 133-155, 2010.

[26] S. Faraj, S. L. Jarvenpaa and A. Majchrzak, "Knowledge Collaboration in Online Communities," *Organization Science, vol. 22, no. 5*, pp. 1224-1239, 2011.

[27] M. Culnan and M. J. Patrick, "How Large U.S. Companies Can Use Twitter and Other Social Media to Gain Business Value," *MIS Quarterly Executive, vol. 9*, 2010.