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EXPLORING THE FACTORS THAT AFFECT THE EFFICIENT UTILIZATION OF IT IN CONSULTING OFFICES

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ABSTRACT

The design and construction industry has suffered during the last decade from the low quality information produced and exchanged between design and construction professionals involved in the design processes. Research shows that the information deficiencies were found to center around data sharing between these professionals and the coordination of project information in construction documents. The development of information technology (IT) offers the potential for significant improvements in the efficiency of communication and data exchange in the production process, if effectively employed. Despite this fact, and although IT has been extensively used in the architecture design industry, the literature shows that the way this technology has been used has not improved the quality of information or facilitated the coordination and information exchange process to the ultimate potential of the technology. This study investigates the potential factors that may lead the inefficient utilization of IT in architectural consulting offices

Keywords: *Office Automation, CAD, IT effectiveness, IT in Construction.*

الملخص

عانت صناعة التصميم والبناء خلال العقدين الماضين من رداءة معلومات المشاريع المتداولة بين فريقي التصميم والتشييد. تشير الأبحاث إلى أن اسباب هذه القصور تتمحور حول إجراءات انتاج و تبادل المعلومات بين المستفيدين منها في هذا المجال. وبالرغم من استخدام تقنية المعلومات في إنتاج وإدارة معلومات المشاريع في هذه الصناعة، لم تساهم هذه التقنية إلى حد ما في تحسين الوضع مقارنة بالصناعة الآخرى. تناقش هذه الورقة مسببات عدم الإستفادة من الإمكانات المتاحة في تقنية المعلومات في تحسين الجودة إنتاج وتداول وإدارة معلومات المشاريع في المكاتب الإستشارية.

1. INTRODUCTION

Information Technology (IT) has been successfully employed in many industries, such as engineering manufacturing, automobile and aircraft design production, to integrate various operations that in return improve the use, flow, and quality of engineering information [Stark, 1989], [Kalpakjian, 1989]. In particular, it has improved the productivity and quality of manufacturing production in many ways, including on-line control of processes, welding, painting, and assembling by robots, computer aided process planning, computer aided design and drafting, and quality control systems.

In contrast, the building design and construction industry has been very slow in adapting strategies, methodologies and techniques that help to manage and handle its information [Aouad et al, 1993]. Nevertheless, the last two decades have witnessed a remarkable development in the usage of IT in the design and constructions process.

Although most of today's architectural offices have acquired reasonable automation resources that could enable them to efficiently automate the production process, and despite the huge investments by offices in this area, CAD productivity remains disappointing. [Al-Rugaib, 1996], [Bohorai, 1996].

A study made by the author in 1995 and 1998 that compares the level of automation in consulting offices in Saudi Arabia and the quality of the information that they produced showed that although some statistical tests detected a slight improvement in the quality of project information produced by those offices who scored highly on automation levels, this improvement was not high enough to be statistically significant. At the same time, the level of improvement did not project the various capabilities of IT to improve the situation. Thus, this improvement was far from satisfactory [Al-Rugaib, 1996] .

2. FACTORS THAT AFFECT THE EFFICIENT UTILIZATION OF IT IN THE ARCHITECTURAL DESIGN PROCESS.

This paper aims to identify the potential factors that may contribute to the inefficient utilization of IT in the architectural design process, by exploring the literature on IT effectiveness and analyzing the way consulting offices use IT.

2.1. Absence of Strategic Planning

Strategic planning of automating office activities reduces the risk of IT failure. Research shows that proper planning facilitates the implementation stage in any automation project, and it increases the utilization of the capability of the system. Impartial evidence suggests that a lack of planned IT strategy is a major impediment to IT effectiveness [Jain, 1994].

2.2. Misconception Of The Difference Between IT And IS

A misconception of the difference between Information Systems (IS) and Information technology (IT) was found to be one of the major reasons why the often-considerable investment in both IS and IT is wasted. Decision-makers in some design offices think that these two terms are synonymous, and that the provision of one of them is a substitute for the other, which is wrong. IS is directed towards the design of an optimal information framework within the management facility in order to maximize its effectiveness and efficiency, while IT facilitates and supports the operation of IS. So the first one is the method and the second is the tool and the interaction between the two leads to a sustainable performance advantage within the office [Barett, 1995].

It was found that most architectural design offices use IT as a tool only but not as a method [Kanungo and Chouthoy, 1998] which means that they are using a new technology based on an old manual method. This reduces the effectiveness of the technology.

2.3. Lack of System Knowledge

In order to get the intended results of any system, the user has to acquire the needed knowledge about the system application. A lack of this knowledge leads to inefficient utilization of the system. Users sometimes are not aware of the extent of technology available within the application. This is often due to weak training programs and the bad habit of using the application before reading the system manuals.

2.4. Lack of Experience

Lack of computer experience reduces the chance of utilizing the full capability of the computer system available in any organization. System experience was found to be one of the factors that contribute to quality in the various activities along the design and production process and have a strong correlation with computer usage [Igbaria, M et al, 1994]. This highlight providing educational opportunities to architects and engineers for better utilization of the available systems.

2.5. System Utilization

There is a general consensus that one of major indicators of computing effectiveness is system utilization. System utilization represents the behavioral indices of user acceptance of the application system. Guimaraes and Igbaria [Guimaraes and Igbaria, 1997] examined two dimensions of system utilization reflecting intensiveness and extensiveness of use. These are system usage and utilization categories. System usage refers to the time spent in use of the system, whereas utilization categories refer to the number of areas for which the system is used. It was found that these factors have a significant direct effect on system effectiveness.

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Most of the architectural design offices were found not to be utilizing the available technology to its ultimate potential [Al-Rugaib, 2001], [Bohorai and John, 1996]. The offices were not using the CAD communication tools that enable designers to exchange and communicate project information, although these tools were available in most of the CAD systems used. This could be due to inefficient training or inappropriate system installation, which failed to utilize system manuals as a part of the implementation stage.

2.6. Lack of Management Support

Organizational and top management support is one of the facilitators of IT usage in offices. The provision of technology and associated support should not be limited to system installation but should extend to the post implementation stage. Experience shows that top management withdraw after system installation, resulting in weak maintenance and poor upgrade follow-up. According to Kanungo and Ghouthoy [Kanungo and Chouthoy, 1998], top management must lead by example by not only using IT but also by taking an active interest in issues associated with IT use and planning. This will develop and encourage the use of IT across the organization, which will result a better utilization of the technology.

2.7. Lack of Technical Support

Technical support is divided into two categories (1) application development support which should exist within the office to assist users in the development and customization of the system and (2) the general support which includes allocation of resources, MIS staff support and top managements. Technical support during the implementation and on an on-going basis is very important to system success. Coe [1998] and Kanungo and Ghouthoy [1998] confirmed that lack of technical support was one of the major inhibitors of IT usage in organizations.

2.8. Lack of Communication Infrastructure

The factors influencing the value of information include its availability and accessibility rather than its content [Court et al. 1997]. In consulting offices research shows that most of the conflict between design professionals can be minimized by effective coordination of information through the design process [Arditi. et al, 1998], [Chapman, 1998]. As discussed earlier, during the last two decades, IT has become the thrust behind the improvement of information flow and data transfer between project teams. Despite this fact, the findings of the author in previous research [Al-Rugaib, 1996] show that even when design offices acquire good computing resources, coordination and information exchange methods still depend on traditional communication tools such as face-to-face communication, memos, and telephone calls. The merits of IT can be reduced or lost if the coordination method does not fully utilize the capability of the communication system.

2.9. Lack of Funds

Budgetary constraints were ranked as one of the first two inhibitors of IT use in organizations [Kanungo and Chouthoy, 1998]. Due to the lack of funds, lots of offices face difficulties in providing the needed computing resources, support and training.

2.10. User Satisfaction

User satisfaction refers to the affective reaction of individual towards a specific computer system application [Guimaraes and Igbaria 1997]. When user satisfaction is ignored there is a greater risk of introducing systems that do not support the user in the accomplishment of their tasks. Carrying and Sandis [1998]., Woodroof & Kasper [1998] indicated that information systems should be designed to enhance the user's process and outcome satisfaction in order to be considered effective and therefore successful.

2.11. Lack of Proper Training

The absence of adequate training was found to be a key reason why users reject and resist the implementation of new systems. Guimaracs and Igbaria [1997] reported that user training was found to be an important element in producing a favorable user attitude toward end-user computing and in promoting increased system usage. This was supported by Coe [1998] who pointed out that ensuring that users are effectively trained is critical to effective system delivery. He also added that hands-on training was found more effective than straight lecture based instructions. In addition self-training was also found to have a strong correlation with computer usage, suggesting that offices need to provide educational opportunities to their staff. Unfortunately, research shows that design offices were found to be reluctant to invest as much in training their employees as they do in acquiring hardware and software [Port, 1989].

The above finding highlights the importance of training in the development of user skills, which in turn enhance effective utilization of system capabilities.

2.12. Absence of Procedural Guidance

Procedural guidance, also known as the quality and procedure manual, clearly defines procedures and methods. It contains information regarding the organizational objectives, the quality policy statement, the extent of application of the quality management program document, and the organizational objectives and responsibilities. It also addresses the organizational procedures regarding quality [Bubshait, 1999].

Coe [1998] thinks that a detailed procedure, which explains exactly how a user is to use a system based on required function, is not effective. According to him, a better approach is the conceptual model, in which users are presented with how the systems are organized and how they work. This manual becomes like a real map where the system is presented in addition to

basic procedural commands. With a conceptual knowledge of the system, the user is able to perform more complex task in involving all the steps needed to perform a task. This empowers users to solve problems on their own and dramatically improves user proficiency and satisfaction with the system.

Unfortunately, most of the consulting offices in Saudi Arabia do not use such a document [Al-Rugaib, 1996]. According to Kanungo and Ghouthoy [1998] the absence of such a tool seriously affects computer effectiveness.

2.13. Language Barrier

Most applications are developed in western countries and are usually written in English. In other countries, where the native language is not English, users may find it difficult to comprehend all the information needed to efficiently operate the application.

3. CONCLUSION AND FUTURE RESEARCH

This study highlights the potential factors that can contribute to effective utilization of IT in the design and production process in consulting offices. Most of these factors are related to the absence of strategic planning and the way IT is implemented in this process. The nature of these factors suggests the offices are using IT as a tool but not as a method, which may reduce the effectiveness of this technology. In addition, automation integration is a common issue in most of these factors. There is, therefore, a need to investigate the importance of each factor that contributes to successful utilization of IT in these offices.

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REFERENCES

1. Al-Rugaib, T 2001, "Exchanging Project Information in Architectural and Engineering Office in Saudi Arabia," The International Journal of Housing Science and its Applications. USA.
2. Al-Rugaib, T. 1996, "Project information, Office Automation, and Quality in the Building Production Process in Saudi Arabia," Ph.D. Thesis. Cardiff, UK.
3. Aouad, G; Kirkham, J; Brandon, P; Brown, T; Cooper, G; Ford, S; Oxman, R; Sarshar, M; Young, B., 1993, "Information modeling in the construction industry: information engineering approach." Construction Management and Economics 11, pp. 384-397.
4. Arditi, D., 1998, "Factors that Affect Process Quality in The Life Cycle of Building Projects." Journal of Construction Engineering and Management. May-June.
5. Barett, P., 1995, "Facility Management: Towards best Practice," Blackwell Science, USA.
6. Bohorai, S; John, B, 1996, "Exploring the Unrealized Potential of Computer-Aided Drafting," http:/www.cs.cmu.edu/afs/cs.cmu.edu/user/suresh/www/chi-96/chi-96.html pp. 1-12.
7. Bubshait, M., 1999, "Quality Practice in Design Organization" Construction Management and Economic. London 17, pp. 799-809.
8. Carrying, E; Sanders, G., 1998, "Dimensions of Information systems Success. Information System Success Measurement". Idea Group Publishing, Hershey, PA, USA.
9. Chapman, R., 1998. "The role of system dynamics in understanding the impact of changes to key project personal on design production within construction project," International Journal of Information Management. Vol 16 No. 4 pp. 235-247.
10. Coe, L., 1998, "Five Small Secrets to System Success," Information System Success Measurement. Idea Group Publishing, Hershey, PA, USA.
11. Court, A., 1997, "The Influence of IT in New Product Development Observations of an Empirical Study of the Access of Engineering Design Information," International Journal of Information Management, pp 359 - 375.
12. Guimaraes, T; Igbaria, M., 1997, "Assessing User Computing Effectiveness: An Integrated Model. Journal of End User Computing". Vol 9, No 2, pp. 3-14.
13. Igbaria, M., 1998, "Analysis of Information Technology Success in Firms in New Zealand" International Journal of Information Management, pp. 103-119.
14. Jain, V. 1994, "A Comparison of Information Systems Strategies and Usage of Private and Public Sector Banks", Working Paper. Department of Management Studies, India Institute of Technology, New Delhi.
15. Kalpakjian, S., 1989, "Manufacturing Engineering and Technology." Addison-Wesley, New York.
16. Kanungo, A; Chouthoy, M (1998): It planning in India: implications for IT effectiveness. Information Technology for Development 8, pp. 71-87.
17. Port, S., 1989, "The Management of CAD for Construction," BSP Professional Books, Oxford.

18. Stark, J., 1989, "Managing CAD/CAM," McGraw-Hill, London.
19. Woodroof, J; Kasper, G., 1998, "A Conceptual Development of Process and Outcome User Satisfaction," Information System Success Measurement. Idea Group Publishing, Hershey, PA, USA.