

DEVELOPMENT STAGE AND RELATIONSHIP OF MIS AND TQM IN THE E-BUSINESS ERA

Chia-Chia Lin^{1,2}, Huan-Ming Chuang^{2*} and Dong-Her Shih²

¹*Department of Tourism and Leisure Management*

WuFeng University

Chiayi (621), Taiwan

²*Department of Information Management*

National Yunlin University of Science and Technology

Yunlin (640), Taiwan

ABSTRACT

This paper intends to investigate how corporations introduce and develop management information system (MIS) and total quality management (TQM) in facing the e-commerce era. Several 2009 national quality award winning firms will be used as individual cases for in-depth analysis. The development of a company's MIS and TQM will be analyzed. In this study, we discover the development of MIS and TQM for a company is closely related. Those award winning firms maintained a very high standard in the development of both MIS and TQM. Capability Maturity Model Integration (CMMI) models are collections of best practices that you can compare to your organization's best practices and guide improvement to your processes. A formal comparison of a CMMI model to your processes is called an appraisal. The Standard CMMI Appraisal Method for Process Improvement (SCAMPI) incorporates the best ideas of several process improvement appraisal methods. CMMI is not utilized in this study to assess the development stage and relationship of MIS and TQM. This study used evaluation criteria of the national quality award as the foundation to discuss the correlation and influence of MIS and TQM. Characteristics of development processes of MIS and TQM are analyzed. In addition, by separating MIS and TQM development stages among individual cases, we discover how the development of MIS and TQM is related to each other.

Keywords: Electronic Business, Management Information System, Total Quality Management, Capability Maturity Model Integration

1. INTRODUCTION

In many developed countries, national quality awards are established to promote the total quality management (TQM). For example, there are U.S. National Quality Award, Japan National Quality Award (also call Deming Award), and Taiwan National Quality Award. In these awards granted, the usage of information for project is included. Information clearly plays an important role in quality management.

Management information system (MIS) can reduce cost, improve productivity, promote support system and implement organizational change for organizations. As market competition intensifies, information system not only can help enterprises to enhance above-mentioned effectiveness, but also

strengthen enterprise's overall competitiveness. So, increasingly enterprises found that the information technology and information system are key success factors of quality management. Thus, through the implementation of management information system, enterprises should be able to better execute total quality management.

Taiwan National Quality Award (TNQA) is the top honor awarding to enterprises with overall business quality in Taiwan. In 1990, The Ministry of Economic Affairs established the TNQA to help enterprises upgrade overall business standard and improve international image. Initially the award was limited to manufacturers only in manufacturing industry, starting in 1995 the award was applicable to non-manufacturing industry. Based on the TNQA award category, this study will investigate those TNQA winning manufacturers in 2009 to further explore the following items:

1. The related impact of MIS on TQM.

*Corresponding author: chuanghm@yuntech.edu.tw

2. MIS development process related to the development process characteristics of TQM in various development stages.
3. According to the characteristics of each category of TNQA and by using specific case examples to distinguish the usage of MIS and the development stage of TQM and further identify the relevance of MIS and TQM development.

2. LITERATURE REVIEW

2.1 Electronic Business

The twenty-first century is a network economy era. Businesses, traditional or modern, face the challenge of moving forward to automation and electronic business. How can a business utilize information technology (IT) and electronic commerce (EC) technique to establish a complete adjustment process is very crucial? Electronic business (E-business) can initiate business process reengineering (BPR). It can help consolidate upstream and downstream suppliers vertically and horizontally. It can expand new distribution channel and market to enhance competitiveness of a business.

Electronic business is business process applications and organizational structure to integrate a wide range to enabling the Internet economy era to create a high-performance business model to transformation of the traditional company into a new e-company [13].

Electronic business refers to the coordination, sharing and cooperation within the enterprise via the Internet. In the process of the use of the technology and tools, including: enterprise intranet infrastructure, e-trading standards and environmental and others software like enterprise resource planning (ERP), customer relationship management (CRM), supply chain management (SCM) and longer business process reengineering (BPR), business intelligence (BI) and knowledge management (KM) supplemented, these tools and techniques had continued to develop. Therefore, the future of enterprise e-space and scope of operation is still very wide open [19].

Electronic business describes a company's relationship with its consumers, customers, allied firms, and suppliers [14]. It can identify the flow of primary product, information, and cash flow to help participants achieve benefits.

Electronic business is higher order utilization of information technology. It can automate a company's operational activities and work process, reduce service costs, enhance product quality, and improve the speed of delivering service. Consumers and management can acquire information immediately [17]. In other words, corporations can increase managerial efficiency through the use of computer, network, and mobile commerce

equipments. E-Business not only can reduce operational costs but increase overall competitiveness for a firm.

Electronic business not merely provides interactions between suppliers and manufacturers in E-Commerce, and between consumers and sales representatives [24]. It also includes a firm's internal operations such as manufacturing, development, fundamental structure, and product management. E-Business makes business transaction quickly but at the same time induces more severe competition.

2.2 Management Information System

The computer was invented in the late 1940s. The earliest use was limited to only help people solve problems in science, engineering, and highly complex issue of mathematical operations. By the early 1950s, computers were first applied to outside field of science and engineering to help solve the U.S. Census survey with large and complicated data processing and statistical work. Thereafter, computer began to be used in business, management, administrative and other fields. Computer has been integrated with business and the management area since then.

Later, as computer is more widely used in commercial and administrative processing people are finding new technology to cope with computer applications that would require knowledge far exceeding the original area of computer science. It involves many areas of knowledge and applications, as well as new issues related to business management. This development eventually grows into a new field : MIS.

The term "Management information system" has a considerable number of synonyms, but also a variety of confusing definitions. There is a widely accepted definition of such is defined by the first pioneer scholar in academia-Professor Davis (Dr. Gordon B. Davis - University of Minnesota School of Management professor):

MIS is an Integration System of Man and Machine. It provides information to support the organization's daily operations, management and decision-making. This type of system uses computer hardware, computer software, operating procedures, business issues patterns, and database and other technologies [8].

This definition of Gordon Davis essentially described a very wide range of types of computer system. Some people also defined it as a computer system that provides assistance for managers to make decisions (Narrow sense).

On the other hand, regarding to the application of IT, MIS is a term used to refer broadly to general organization. By adopting such a computerized system would involve many technical and managerial issues. These includes : system planning, system development, systems integration, systems

management and introduction, strategic systems, information human resources management, information society, ethical and legal issues, etc. (Generalized sense).

Management information system is a system of integrated, computer-based, man-machine interactive system. Its main purpose is to support the operations and decision-making of organizations in the middle and grass-roots level managers.

Management information system can extract transformed data information from the database, and stored in the database in order to meet the output requirements of a variety of ways as well as the needs of mid-range and grass-roots level managers. MIS provides information on three different timing occasions : 1. at the time when manager requested (on demand), 2. Routine (periodic), 3. when an extraordinary event occurs (for example : 5% of sales below expectations).

2.3 Total Quality Management

Many Americans will consider quality control as a Japanese-style management. It is because Japan is the first country to adopt this concept. Several experts of quality control in the United States such as Deming, Crosby, Juran, Feigenbaum derived the concept of quality control from measuring variations. They developed different systems to investigate quality control. To distinguish quality control management system between the United States and Japan, the U.S. created the term TQM [7].

TQM is defined as : based on the current situation and future development, using quantitative analysis and human resources to improve the provision of material and services for the organization, and improving the overall operation process of the organization, and enhancing satisfactory level of consumers need [21]. This definition mentioned quantitative analysis and human resources which is trying to reflect the integration of scientific management in total quality management as well the triangular relationship between organizations, groups and staff emphasized by human relation school.

Scientific management is an application of scientific methodology to investigate the work of its staff in order to increase productivity. It demands the staff to fit his/her work but was eventually criticized for teaching employees how to be "smart and capable" rather than to work hard. The "human relations school" has the opposite point of view with the scientific management. It focuses attention on "people", which is seeking to make work fit for employees.

Total quality management tries to integrate perspectives from scientific management of smart work with the human relations school's emphasis of organizations, groups, and staff. For example, a basic

principle of TQM is we can only truly understand the quality problem through scientific analysis [10, 12]. This axiom originated from the tradition of scientific management. TQM often referred to a concept-"zero-defects" [7]. Zero defects implies the ultimate goal of TQM is to reduce the defect of products and services that may arise in order to achieve fully the realm of no shortcomings.

2.4 Capability Maturity Model Integration

Capability Maturity Model Integration (CMMI) is a process improvement approach that provides organizations with the essential elements of effective processes that ultimately improve their performance. CMMI can be used to guide process improvement across a project, a division, or an entire organization. It helps integrate traditionally separate organizational functions, set process improvement goals and priorities, provide guidance for quality processes, and provide a point of reference for appraising current processes.

The benefits you can expect from using CMMI include the following:

- Your organization's activities are explicitly linked to your business objectives.
- Your visibility into the organization's activities is increased to help you ensure that your product or service meets the customer's expectations.
- You learn from new areas of best practice (e.g., measurement, risk)

CMMI is being adopted worldwide, including North America, Europe, Asia, Australia, South America, and Africa. This kind of response has substantiated the Software Engineering Institute's commitment to CMMI.

According to the Software Engineering Institute, CMMI helps "integrate traditionally separate organizational functions, set process improvement goals and priorities, provide guidance for quality processes, and provide a point of reference for appraising current processes" [5].

CMMI in software engineering and organizational development is a trademarked process improvement approach that provides organizations with the essential elements for effective process improvement. CMMI is not utilized in this study to assess the development stage and relationship of MIS and TQM.

3. THE DEVELOPMENT STAGE AND MODE OF MIS AND TQM

In response to the e-business era, information system (IS) can be integrated into the different business functions and improve the efficiency of various processes. Further, it can accumulate experience through information systems. The role of

IS had been promoted from traditional data processing to generating of strategic competitive advantage. The factors making the implementation of TQM successful include management capability of quality information, production rationalization, and automation. Whether IT or IS produces great impact on the organization. Both are covered by the broad range of MIS. This study intends to explore the relationship between MIS and TQM especially the objects included in MIS.

MIS theory was proposed by Nolan as early as 1979. This theory suggests that the organization using IT is through a series of growth process. This process can be divided into six stages where each stage has its own characteristics. The response to the growth of computer applications would reflect different degree of control at every stage. The basic premise is an organization must go through prior stage to enter the next stage. Therefore, this development model can be used to diagnose the current stage of an organization. We can project possible future conditions and thus provide planners suggestions for consideration.

In addition to the above six-stage theory, Venkatraman had also proposed a five-stage theory on the application and development of IT [25]. The initial stage begins with the easy part of implementation of computer-based functioning. The final stage ends when the entire enterprise is fully computerized across the board. The development

processes are cumulative growth and evolving level by level. In the beginning, an organization may not work efficiently. But if IT can provide a better solution, the original model should be abandoned. Switching to the new programming arrangements in an organization would cause a substantial adjustment in operating procedures. Further, the relationship between enterprises and enterprises (Extranet) also need to adapt their cooperation with the new IT advancement. This stage is called revolution level. Finally, the organization's scope of business will change with some expansion, some innovation, some disappearing. The potential benefits for an organization will increase along with a higher degree of corporate restructuring.

The six-stage theory tends to favor data processing level while the five-stage theory is taken into account the evolution effect of MIS on overall scope of business enterprise. Therefore, this study used the concept of phasing steps in five-stage theory to summarize the conceptual development of MIS as shown in Table 1:

In the context of development stage of TQM, Cortada studied award winners of the Japanese Deming Prize and the U.S. National Quality Award on their TQM development experiences and proposed a five-stage theory as shown in Table 2 [6]:

Table 1: A list of the development stages of MIS

Stage	Stage name	Development concept
I	Initiation using	Begin to apply the various stages of information systems and information technology, there is no specific plan, only introduced to some people.
II	System planning	Organizations have begun with systemic requirements, such as financial management systems, require planning systems.
III	System integration	More and more systems established within the organization, integrating various systems is necessary to mutually use the information. Establishment of the internal network to facilitate the integration of various system resources.
IV	Network connecting	Focus on the development of relationship between key members in the market such as the information link with upstream and downstream firms and branch offices. The external network systems, namely, cross-enterprise link.
V	Business Innovation	IS creates value-added services or information to enhance the traditional work and skills.

4. ANALYSIS OF THE RELATIONSHIP BETWEEN MIS AND TQM

This paper used the award category of TNQA to analyze and compare the basis of connecting development between MIS and TQM. The major concept is to apply the nine award categories of TNQA coupled with current implementation status of MIS

and TQM in enterprises to judge their development stage of MIS and TQM. For corporation had higher development stage of MIS, its TQM is supposed to have developed better than other companies. Some case studies were investigated accordingly. Based on the five-stage theory of MIS development model from Table 1 in Section 3 and further analysis of each developmental characteristics, corporate MIS development status can be judged and diagnosed.

Table 2: A list of five-stage theory development of TQM

Stage	The theoretical development of TQM concept
I	A cognitive beginning, there is no cross-organizational functional integration. Although some people try to apply quality management principles there is no improvement observed. Organization may not be expected to achieve customer or user satisfaction as traditional command and control are the management style.
II	The organization is getting more interested in quality management methods and willing to learn. Some executives have begun to support the idea while processes re-created and integrated in the structural design. The attitude of some staff has also been changed. Observe some successful results but are not sure whether the improvement caused by quality of work. Employees gained more authority due to increase in responsibility and decision-making power.
III	Organization engaged in improving effectiveness and the integrity of documents. Companies will make use of a systematic approach to take action. Enterprise value and culture experienced major change with only a small part unaffected. Employees are moving in the direction of doing things toward achieving the Quality Award.
IV	Enterprises to enter a golden age due to the quality improvements brought about increasing market share and enhance profitability. Processes are well integrated, tested and innovated. Organizational efficiency improved while customer service has also been affirmed. Suppliers provided positive feedbacks.
V	The success of quality management attracted not only publisher's attention but also received invitation to participate in a number of seminars and to share their successful experiences with other manufacturers. Became well known as the world-class. At this point, companies engaged in continuous improvement systematically.

According to Table 2 in Section 3, TQM can be divided into five stages of development. In this study, a five-stage development of TQM was used as the basis for analysis and comparison. The intention is to define the development of MIS in a business and how MIS is used to support their quality management operation and development characteristics of each stage. As shown in Table 3, according to those nine award categories in TNQA this study used stage wide developmental characteristics in each category between MIS and the TQM as the base for case analysis.

5. CASE ANALYSIS

This study selected the vendors from whom applied for 2009 TNQA and passed the first round judgment as the objects for case analysis. Among them, one award-winning company in manufacturing industry and one in service sectors; one non-winning company in manufacturing industry and one in service sectors too. Based on information provided, Table 4 summarized case analysis results :

In the process of conducting case analysis, the following points are found:

1. Regarding the theme on research and development and social responsibility, business has less planning in MIS application in this respect.
2. On the development of thematic scope of TQM, many achievements in the development is due to

the use of MIS. This implies that MIS affects the development of TQM.

3. In addition to the development of TQM, the Case 1 and Case 2 enterprises had more comprehensive MIS development than the other two companies. In fact, these two enterprises won TNQA in 2009.
4. The historical development of MIS and TQM for case 1 company matched very well with the theoretical perspective of MIS and TQM development stages. Manufacturers are pioneers to implement TQM and introduce MIS. It may be the reason causing this phenomenon.
5. In terms of customer service, case studies had shown that most companies still used traditional approach to provide service. When compare with different industries, information services industry are more skilled at using MIS to enhance customer service quality. Some examples are: use of remote detection, diagnose customer's problem on-line immediately, resolute incidents speedily rather than sending representative to the scene.

It can be seen from Table 4 that the overall development of a comprehensive assessment of the development stage. Companies reached the same development stage in TQM and MIS. The TNQA award winning companies are at the stage IV.

Table 3: Corresponding Development Stage of MIS and TQM

Stage	TQM	MIS
I	<ul style="list-style-type: none"> • Conceptual knowledge • Some advocates • Not a part of the culture • No results • Command and control management • Concentrated in the internal 	<ul style="list-style-type: none"> • Began accepting the concept of computer operation impact on the quality • Without planning • No network infrastructure, or quality of information was not placed on the web • Neither system planning nor considering the quality of work • Not take into account data security • Quality operation is not the company's emphasis • Managers did not participate in • The improvements of operation focus on the internal
II	<ul style="list-style-type: none"> • Application system growth • Began a systematic effort • Existed planning • Some success • Cultural change • Executives support • Began to authorize • Gradually customer-oriented 	<ul style="list-style-type: none"> • Gradually take into account the application system of quality • Began systematic efforts • With a planning action • Some results appearing • Starting to focus on the quality operations of computer internally • Executives began to support • Use computer data to provide support, start delegating authority • Stressed on customer service-related operational data to be computerized, provide service quickly
III	<ul style="list-style-type: none"> • Everyone becomes aware • Trends of integration • Inter-organizational expansion • Continuous results • Cultural change • Expand authorization and more wide spread • Continuous Improvement 	<ul style="list-style-type: none"> • Everyone understand the requirements of the company's quality information within the organization. • The trend of gradual integration on the quality information • Take advantage of networking with the outside world to gain information on the business environment • Further changes in culture • Further expand authorization • The current work continues to improve
IV	<ul style="list-style-type: none"> • Good integration • Effective processes through test • The overall culture • Continued good results • Good efficiency and good effectiveness • Market leader 	<ul style="list-style-type: none"> • Began cross-organizational development • Good integration on handling computerized processing of quality information • Effective processes from tested practices • Use information systems to track the source of problems • Cultural characteristics of organizational enterprises • Continued good results in all aspects of performance • Give full swing to the efficiency of computerization and high-quality work • Became the market leader
V	<ul style="list-style-type: none"> • Full Integration • Best practice • Entire organization • Become a corporate culture • There have been remarkable results constantly • A world-class • Continuously improve 	<ul style="list-style-type: none"> • Organizational operations use completely integrated, computerized information systems. Provide high-quality and efficient product / service • Use quality related information to help decision- making for companies • To be the best operator • All operations in the organization require to achieve quality standards • Fully integrated into the corporate culture • The outcome of continued outstanding performance • Begin to have a world-class reputation

6. SURVEY OF EXPERT OPINIONS

In addition to case studies, this study also examined the relationship between MIS and TQM from a questionnaire survey for expert opinions. Fifteen surveys were received. Among those fifteen experts, there are six professors from academia, five

executives from industry, and four government officials. The questionnaire included two broad categories:

1. First major category: Investigation on experts belief to what extent the use of MIS can enhance TQM benefit. A rubric score between 1 and 5 is summarized as shown in Table 5. In addition, an open suggestions column is provided to gather relevant recommendations from experts.

2. Second major category: Based on the nine evaluation categories of TNQA, inquire of the experts about the suitability of MIS being included in the TNQA evaluation and providing feedback for business. A rubric score between 1 and 5 is summarized in Table 6.

Table 4: Consolidated Results of Case Studies

Case status		TQM				MIS			
		Case1	Case2	Case3	Case4	Case1	Case2	Case3	Case4
The nine evaluation projects of TNQA	Business philosophy goals and strategies	IV	IV	III	III	IV	IV	II	II
	Organization and operation	IV	IV	II	III	IV	IV	II	II
	Human development and application	IV	IV	II	III	IV	IV	II	II
	IM and application	IV	IV	II	III	IV	V	III	III
	Research and development	IV	III	III	III	IV	III	II	III
	Quality guarantee	IV	IV	III	II	IV	IV	III	III
	Customer service	IV	IV	III	III	IV	V	III	II
	Social responsibility	IV	III	II	II	IV	III	II	II
	TQM performance	V	V	III	III	IV	V	III	III
Overall assessment of development stage		IV	IV	III	III	IV	IV	III	III
Receive award		yes	yes	no	no				

Table5: The Questionnaire of Using MIS to Enhance the Friendliness of TQM

Subject	Score				
	1	2	3	4	5
1. Whether the company's overall computerization will help enhance quality management	0	2	3	4	6
2. Company's computerization level will affect its quality management	0	1	3	5	6
3. The phase-in on MIS / TQM will benefit companies gradual implementation	0	1	4	4	6
4. If MIS is included as one of the nine award categories of TNQA, will it help to select the representative enterprise for TQM	0	2	4	4	5
5. Do you think the inclusion of MIS as an award category of TNQA to provide reference for vendors would benefit companies	0	2	3	5	5

Note: The following indicate the meaning of each score:

"1" : No benefit (impact) 、 "2" : Benefit (impact) is a little 、 "3" : Helpful (impact)

"4" : Have benefit (impact) 、 "5" : Benefit (effect) significantly

7. CONCLUSIONS AND FUTURE RESEARCH DIRECTIONS

7.1 Conclusion

The Development of MIS caused many impacts on businesses. The impact level is almost comprehensive. This paper explored the impact of MIS on the TQM through looking into the characteristics in development stages of MIS and TQM. The following conclusions are found:

1. MIS can help the development of process-oriented activities. Using MIS can integrate operation processes and information in an organization. MIS can help achieve TQM objectives in TQM related activities.

2. This paper proposed the phase-in development model that can be used to diagnose a company's development of MIS and TQM. Companies can use this as a planning framework to consider assistance of MIS in TQM operation.
3. Overall speaking, MIS can improve TQM effectiveness. MIS planning should be in accordance with industry to cope with the nature of an overall consideration of the development of enterprises.
4. In the case studies we found that manufacturers best fit the MIS / TQM operation characteristics in development stage proclaimed in this article.

5. Corresponding to MIS as one of TNQA evaluation categories, experts had divergent views on whether to provide award referees with MIS information and TQM execution in enterprises. Possible causes are: ① the provided information about MIS is incomplete, ② operations as a whole vs. sub-sector can generate different effects.
6. The statistical results from the cases analysis can be seen in the overall assessment of the development stage. The industry's development of both TQM and MIS is at the same stage for the award winning companies.

Table 6: The Questionnaire of the Nine Award Categories of TNQA and Consideration of MIS

Subject	Score	1	2	3	4	5
	1.1 Is it adequate to consider MIS in business operation philosophy, goals, and strategies for award review?	0	0	4	5	6
1.2 Is it adequate to provide enterprises with business philosophy, goals, and strategies for evaluation consideration?	0	0	4	5	6	
2.1 Is it adequate to include MIS as part of review on business organization and operation?	0	0	3	6	6	
2.2 Is it adequate to provide enterprises with organization and operation for evaluation consideration?	0	0	3	6	6	
3.1 Is it adequate to consider MIS in human development and application for award review?	0	0	3	7	5	
3.2 Is it adequate to provide enterprises with human development and application for evaluation consideration?	0	0	3	7	5	
4.1 Is it adequate to consider MIS in information management (IM) and application for award review?	0	0	2	6	7	
4.2 Is it adequate to provide enterprises with IM and application for evaluation consideration?	0	0	2	6	7	
5.1 Is it adequate to consider MIS in research and development for award review?	0	0	4	5	6	
5.2 Is it adequate to provide enterprises with research and development for evaluation consideration?	0	0	4	5	6	
6.1 Is it adequate to consider MIS in quality guarantee for award review?	0	0	4	6	5	
6.2 Is it adequate to provide enterprises with research and development for evaluation consideration?	0	0	4	6	5	
7.1 Is it adequate to consider MIS in customer satisfaction for award review?	0	0	3	6	6	
7.2 Is it adequate to provide enterprises with customer satisfaction for evaluation consideration?	0	0	3	6	6	
8.1 Is it adequate to consider MIS in social responsibility for award review?	0	1	3	5	6	
8.2 Is it adequate to provide enterprises with social responsibility for evaluation consideration?	0	1	3	5	6	
9.1 Is it adequate to consider MIS in TQM performance for award review?	0	0	2	6	7	
9.2 Is it adequate to provide enterprises with TQM performance for evaluation consideration?	0	0	2	6	7	

Note: The following indicate the meaning of each score:

"1" : Not fit Completely 、 "2" : Not fit 、 "3" : Fit 、 "4" : Very fit 、 "5" : Fit completely

7.2 Suggestions and Future Research Directions

1. This paper listed the corresponding development stage of TQM and MIS based on the ideas of stage wide development and functional classification. It also followed those nine awarding categories of TNQA related to MIS Future studies can continue more in-depth and circumspect consideration regarding MIS related items.
2. This paper used case study approach to analyze TQM and MIS matching development items and actual application status of its operations. Case Analysis was limited to the difficulty of obtaining data, therefore, future studies can

expand research objects of study in order to achieve more precise results.

3. Future studies can further explore if the development of TQM did not go hand in hand with the MIS of the company, would it cause differences in the company's overall efficiency? For example, a company reached the fourth stage in TQM but developed to the second stage in MIS.

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ABOUT THE AUTHORS

Chia-Chia Lin is a Ph.D graduate student of Information Management at National Yunlin University of Science and Technology (NYUST), Taiwan R.O.C. He is also Lecturer at the Department of Tourism and Leisure Management, WuFeng University. His research interests include general management, information management and leisure

management. He has a special focus on tourism industry operational strategy and electronic commerce. He was awarded IPMA Level D Certificate of Project Management Associate by International Project Management Association on Oct. 01, 2007.

Huan-Ming Chuang is a Associate Professor in the Department of Information Management at National Yunlin University of Science and Technology (NYUST), Taiwan R.O.C. He received the BS and MBA degrees from National Cheng Kung University and National Chengchi University, Taiwan, in 1979 and 1983, respectively. He received the PhD degree in Management Sciences from the University of Iowa in 1993. His current research interests include strategic information systems, marketing information systems, knowledge management, and business intelligence.

Dong-Her Shih is a Professor in the Department of Information Management at National Yunlin University of Science and Technology (NYUST), Taiwan R.O.C. He received his Ph.D. degree in Electrical Engineering at National Cheng Kung University in 1985. His current research and teaching interests are Addiction behavior, Auction theory, Mobile Commerce, Information Security, Computer Forensics, Wireless sensor Network Management. In particular, He is a Asian Editor, International Journal of Mobile Communications (IJMC).

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電子企業化時代 MIS 及 TQM 發展階段相關性之研究

林嘉洽^{1,2}、莊煥銘^{2*}、施東河²

¹吳鳳科技大學觀光休閒管理系
嘉義縣民雄鄉建國路二段 117 號

²國立雲林科技大學資訊管理所
雲林縣斗六市大學路 3 段 123 號

摘要

本文旨在探討企業面臨電子商務時代，如何導入和發展管理資訊系統 (MIS) 及全面優質管理 (TQM)；並以2009年我國國家品質獎之若干申請廠商作為個案對象深入研究，探討MIS與TQM之發展關係。在本研究中，我們發現公司MIS和TQM的發展極為密切相關。這些獲獎的企業在MIS和TQM的發展方面維持了很高的標準。因能力成熟度模型整合 (CMMI) 收集了最佳做法，故可以比較組織的最佳實務和引導改善工作流程。使用CMMI模型比較公司的工作流程通稱為評價方法，CMMI標準評價方法則採用最好的幾個工作流程，做為改善評價的方法。本研究並未運用CMMI以評估MIS和TQM發展階段的關係。本研究採用國家品質獎為基礎的評估標準，探討MIS和TQM的相關性和影響力，以及分析MIS和TQM發展進程特色。此外，通過MIS和TQM各個發展階段中之個別情況，我們發現MIS和TQM的發展是相互關聯的。

關鍵詞：企業電子化、管理資訊系統、全面優質管理、成熟度模型整合

(*聯絡人：chuanghm@yuntech.edu.tw)

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