



The ERP system impact on the role of accountants

ERP system
impact on
accountants

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Abstract

Purpose – The purpose of this paper is to discuss the impact of an Enterprise Resources Planning (ERP) system on the role of accountants, to provide job qualifications for their reference.

Design/methodology/approach – This research adopts the case study method, using on-the-spot interviews and a questionnaire to find out the effects of an ERP system on the role of accountants.

Findings – The role of accountants is mainly to be transaction data handlers and financial report providers. Clearly, accountants must have certain degree of knowledge in the realm of traditional finance accounting. In addition, accounting supervisors think implementing an ERP system changes the role of accountants.

Research limitations/implications – The data collected by the authors are mainly from the Shanghai Financial Center and regional businesses in Shanghai, Beijing and Taiwan. The authors are only able to study the impact of ERP systems on the role of accountants in the short-term rather than in the long-term.

Originality/value – It is widely accepted that an ERP system is more than just an accounting information system, so implementing an ERP system will not necessarily promote the positions of the accounting department and accountants on the subjective cognition of accountants. Accountants need to have knowledge of financial accounting, IT and management after ERP implementation.

Keywords Republic of China, People's Republic of China, Accountants, Resource management, Enterprise resources planning, Shanghai Financial Service Center

Paper type Case study

1. Introduction

In today's competitive environment, enterprises need to be reformed to get competitive advantages. The fastest and most effective way to achieve this goal is to introduce a new information system (IS) to carry out the reform. One of the systems is enterprise resources planning (ERP), which ensures all operational systems of the company are fully integrated (Maguire *et al.*, 2010). By providing real-time access to operational and financial data, ERP system allows companies to streamline their management structure and create more flexible, more democratic and flatter organizations (Davenport, 1998).

In the last two decades, ERP system has been one of the best technological solutions for the effective and efficient information management (Françoise *et al.*, 2009).



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Noudoostbeni *et al.* (2010) point out ERP is one of the main businesses that help organizations to manage their resources in the effective way. Under the circumstances, ERP system has become the necessary tool in application of information technology (IT). The main function of ERP system is to combine all operational information needed for every process from different departments into one database and information is imported to the accounting department (Kale, 2000). It shows the importance of ERP system in accounting field. However, ERP system also brings great impact on the role of accountants. It has replaced or consolidated many works of accountants. This may change the nature of their job. They have to face the new environment with a positive attitude.

The purpose of this research is to explore the impact of ERP system on accountants. Desormeaux (1998) agrees that ERP implementation raises the role and position of the accounting department and accountants because accountants are considered information providers and analysts for other departments after ERP implementation. In contrast, vendors of ERP system in Taiwan think accountants are financial guardians. Therefore, it is important for us to explore how ERP system affects the role of accountants. Through this research, we want to understand the impact of ERP system on accountants more to help them adapt to the new role.

The research subjects are the Shanghai Financial Service Center and accounting departments of R company in region businesses of mainland and Taiwan. R company is a representative transnational chemical company in the USA and its sales volume and market share are large and high. This research uses case study approach to find out the impact of ERP system on accountants in R company and discusses the role and job qualifications of accountants after ERP implementation.

2. Literature review and study

ERP system

ERP system has become important because it uses IT to integrate information of all operations of an entire company. Ketikidis *et al.* (2008) conclude that ERP system improves the competitive advantage of a company. The major operations are combined in a single software module (Kalakota and Robinson, 1999; Bingi *et al.*, 1999). Matolcsy *et al.* (2005) show that it is important to follow and control logistics to reduce unnecessary costs when the process is transparent enough. Davenport (1998) recommends ERP system can help the management control operations to raise the competitive advantage of a company. The operational performance of a company using ERP system outshines that of a company without it (Hunton *et al.*, 2003).

Wailgum (2009) in Forrester Research survey data of nearly 400 North American and European enterprise software decision-makers shows that two-thirds of companies actively invest in ERP application. ERP system is so popular because it improves operational efficiency and business (Ke and Wei, 2008; Liang *et al.*, 2007). ERP system integrates business processes and provides the instant access to integrated data across the entire enterprise to improve operational efficiency (Chou and Chang, 2008). Benefits that ERP implementation brings to a company include the combination of internal resources, a solution to the inadequate and outdated system (Oliver, 1999) and improvement in productivity and financial cycle (Gargeya and Brady, 2005).

Impact of ERP system on accountants

The emergence of ERP system brings changes to certain operations of a company and the nature of the job of accountants. Cheng (2001) expresses accountants are evaluators in the evaluation stage before ERP implementation. During ERP implementation, accountants are communicators and coordinators of front-end departments. After ERP implementation, accountants work in internal operations of a company instead of data input and collation. Therefore, accountants are integrators during ERP implementation (Ke, 2003; Sangster *et al.*, 2009).

Desormeaux (1998) expresses that, after ERP implementation, accountants become makers of financial statements from data recorders. They provide the analysis of management information for the company to make decisions so the management is able to get integrated information in a short time. Scapens (1998) points out relevant management information can be gained directly by ERP system. Accountants are the interpreter and analyst of such information. Vemuri and Palvia (2006) think accountants should actively provide the management with up-to-date information to help them make decisions under ERP environment. Grabski *et al.* (2009) show ERP implementation changes the job of managerial accountants by providing better operations such as inventory control, overall quality of data and participating in management decision making.

Under computerized operational environment, computer auditing has replaced traditional auditing (Hung *et al.*, 2004). Auditors are familiar with operations of a company because they usually have “finance or accounting” background. However, they face much difficulty because of their inadequate knowledge in IT. Computer auditing is the urgent demand for them under ERP system. It is important to improve the work efficiency of auditors and create organizational value. Glover *et al.* (1999) mention the reengineering of operations may change demands of the company after ERP implementation. Internal auditors can use their understanding of risks of implementing ERP system to help a company implement ERP system. ERP system affects internal auditors’ ability to identify and manage these risks (Saharia *et al.*, 2008).

From past literature, we summarize operations for which accountants may be responsible under ERP environment are data input, general accounting transactions, data compilation and filing, data adjustment and amendment (Cheng, 2001), financial analysis (Desormeaux, 1998), risk management, enterprise risk assessment (Glover *et al.*, 1999; Saharia *et al.*, 2008), ERP system maintenance, ERP system evaluation (Desormeaux, 1998), communication and coordination among departments (Cheng, 2001), integration of cost data related to operation (Ke, 2003; Sangster *et al.*, 2009), participating in management decision making (Vemuri and Palvia, 2006; Grabski *et al.*, 2009), computer auditing (Hung *et al.*, 2004), education and training (Cheng, 2001).

3. Research design

Few papers discussing the impact of ERP system on accountants focus on the changes of operations and roles before and after ERP implementation to find out the impact of ERP implementation on accountants. Most of them are descriptions of the concept and case study. However, the case study is criticized since there are various explanations for results of the case study and they cannot be generalized (Yin, 1989). Case study research is suggested as an effective method in testing theory within IS research and combination of qualitative and quantitative approaches such as interviews

and questionnaires, proven valuable in assisting IS researchers to avoid potential analytical errors and omissions (Longinidis and Gotzamani, 2009). Therefore, this paper outlined operations accountants may perform in literature review. Besides, an interview, we conducted a survey and designed a questionnaire to improve the persuasion of evidence collection and data analysis.

R company, a transnational corporation, specializes in research, development and the manufacture of fine chemicals. Production of acrylate is over 400,000 tons each year, which accounts for 20 percent of the world market while production of polymer only accounts for one-third of the world market. R company is one of main suppliers of acrylate monomer and polymer. The company is in the top two in world's fine chemical industry. R company owns over 100 factories, research institutions, and over 18,000 employees around the world. Its products are sold in over a hundred countries. The sales volume each year is around six billion in US dollars. In March 2003, R company ranked in second in the most admired chemical company in the USA according to the magazine "FORTUNE".

R company implemented SAP ERP system in 2004. It is a leading and indicative company in the Greater China area because of its scale, number of employees and the volume of sales. Most of past papers focus on companies in the USA. However, R company stresses Asia-Pacific and the Greater China areas. Therefore, it is representative to take R company as the subject of the research to compare the differences of the impact of ERP system on accountants between Taiwan and the Greater China areas after ERP implementation.

4. Research results and analysis

Interview

This paper takes the Shanghai Financial Center (SFC) and region businesses in mainland China and Taiwan areas as study objects. The goal of ERP implementation in R company was to help employees improve work performance by using ERP system effectively. Because most of customers of R company chose SAP system, R company decided to implement SAP system after considering the connection, data integration and logistics with their customers.

There were some adjustments in the structure and operations of departments and branches after the establishment of SFC. In this new environment, accountants in region businesses had to perform only certain operations instead of all operations in accounting process and the accounting supervisor in region businesses was responsible for SFC. The accounting supervisor in region businesses took more responsibilities on management than before. Financial supervisors of different sales departments had to take responsibility for the center. SFC focuses on information integration and financial analysis so accounting departments in region businesses concentrate on routine operations.

During the implementation, accountants need to learn the operational processes of ERP module. Because of their understanding of internal processes, they provide suggestions and revisions for the implementation of ERP system. Under ERP environment, information from front-end operation units flows into accounting department. The input on front-end affects output on back end. Therefore, accountants have to communicate with other co-workers across departments and review the front-end data mapping for integration of information and further analysis. Besides,

the supervisor of accounting department needs to be responsible for education and training. Accountants are required to provide financial statements so they have to make sure that numbers on financial statements are correct. ERP implementation increases the competitiveness of each department and provides immediate information of each department for the management.

Operations and roles of accountants change significantly after ERP implementation. The workload of traditional data input, data compilation, filing and preparation for financial statements decreases because of ERP implementation. However, the importance of certain operations increases such as understanding internal processes, verifying the accuracy of a new system to make sure when to operate it instead of the old one and providing up-to-date information for decision making.

We summarize 14 operations of accountants from past research and literature. Based on advice of interviewers and results of the case study, there are four more operations of accountants on the questionnaire including review of front-end data mapping, provision of financial statements, management of cash flow, taxation planning (Table I).

Questionnaire

The questionnaire is divided into four parts:

- (1) *Job contents of accountants.* We summarize 18 operations as the questionnaire items from literature and interview results to find out the changes of operations before and after ERP implementation.
- (2) *Roles of accountants.* Changes of operations will directly affect the role of accountants. According to the literature we summarize, the questionnaire classifies roles of accountants into eight types, including transaction data handlers and financial report providers, transaction auditors, evaluators of ERP system, communicators among departments, integrators of cost throughout

| Literature review results | Interview results |
|--|--|
| Data input | Data input |
| General accounting transactions | General accounting transactions |
| Data compilation and filing | Data compilation and filing |
| | Review of front-end data mapping |
| Data adjustment and amendment | Data adjustment and amendment |
| Financial analysis | Financial analysis |
| | Providing financial statements |
| Enterprise risk assessment | Enterprise risk assessment |
| Risk management | Risk management |
| ERP system maintenance | ERP system maintenance |
| ERP system evaluation | ERP system evaluation |
| Communication and coordination among departments | Communication and coordination among departments |
| Integration of cost data related to operation | Integration of cost data related to operation |
| Participating in management decision making | Participating in management decision making |
| Computer auditing | Computer auditing |
| Education and training | Education and training |
| | Taxation planning |
| | Cash flow management |

Table I.
Operations of
accountants

the production processes, reviewers of front-end data mapping, consultants of data analysis and decision making, and computer auditors. After ERP implementation, we compare the differences of the role of accountants between the literature and our case study.

- (3) *Impact of ERP implementation on accountants.* Working environment, routine tasks and roles of accountants may change after ERP implementation. When a company is under the process of reform, it may change operations of accountants, put pressure on them and cause a decrease in work satisfaction and resignations (Robbins, 2001). Therefore, we conclude 11 items for discussing the development of the accounting department and accountants after ERP implementation in the case study company.
- (4) *Improvement of accountants.* The questionnaire classifies nine items accountants should improve. This paper discusses functions accountants should have and solutions they may come up with after ERP implementation.

There are 27 responses from 40 issued questionnaires and the response rate is 67.5 percent. The 27 respondents are the relevant stakeholders (typical representatives of each group). Table II lists the basic information of respondents.

In the questionnaire, we classify 18 items that are the most important job contents of accountants to find out the effects of ERP system before and after ERP implementation. The results are as follows.

(1) *Job contents of accountants.* In Table III, traditional operations such as “data input” are still the main job of accountants after ERP implementation. This implies the basic operations of accountants do not change even with ERP implementation. On the contrary, management and IT operations are still not the main jobs of accountants after ERP implementation.

| Category | Item | No. of people |
|-----------|---|---------------|
| Gender | Male | 5 |
| | Female | 22 |
| Education | Vocational school | 2 |
| | University | 19 |
| | Graduate school | 6 |
| Major | Accounting | 10 |
| | Finance | 13 |
| | Business management | 2 |
| | Others | 2 |
| Workplace | SFC | 15 |
| | Accounting departments in region business | 12 |
| Seniority | Below one year | 1 |
| | One to two year(s) | 4 |
| | Three to five years | 11 |
| | Six to ten years | 7 |
| | Over ten years | 4 |
| Position | Supervisor | 8 |
| | Non-supervisor | 19 |

Table II.
Statistic of basic
information

| Operation of accountants | Implementation | | T-test | |
|--|----------------|-----------|-------------|-----------|
| | Before (%) | After (%) | T-statistic | p-value |
| Data input | 52 | 52 | 0.000 | 1.000 |
| General accounting transactions | 63 | 56 | 0.488 | 0.659 |
| Data compilation and filing | 52 | 42 | 0.422 | 0.701 |
| Review of front-end data mapping | 48 | 30 | 14.0697 | 0.001 *** |
| Data adjustment and amendment | 57 | 59 | -0.346 | 0.752 |
| Providing financial statements | 59 | 59 | 0.000 | 1.000 |
| Financial analysis | 48 | 56 | -8.000 | 0.004 *** |
| Cash flow management | 26 | 26 | 0.000 | 1.000 |
| Taxation planning | 22 | 26 | -0.478 | 0.666 |
| Enterprise risk assessment | 15 | 19 | -1.215 | 0.311 |
| Risk management | 15 | 19 | -0.767 | 0.499 |
| ERP system maintenance | 0 | 11 | -12.050 | 0.001 *** |
| ERP system evaluation | 4 | 15 | -26.944 | 0.000 *** |
| Communication and coordination among departments | 37 | 48 | -8.981 | 0.003 *** |
| Integration of cost data related to operation | 26 | 22 | 0.470 | 0.671 |
| Participating in management decision making | 19 | 19 | 0.000 | 1.000 |
| Computer auditing | 15 | 11 | 0.616 | 0.581 |
| Education and training | 33 | 44 | -3.45 | 0.041 ** |

Note: p-values significant at: *10, **5 and ***1 percent levels

Table III.
Changes of operation of
accountants before
and after ERP
implementation

The changes of operations of accountants before and after ERP implementation are not obvious. The importance of “review of front-end data mapping” decreases progressively. Front-end staff gradually carries out routine operations. Accountants save much time and concentrate on more value-added jobs.

Traditional financial accounting operations such as “data input” are still the main operations of accountants. We conclude that accountants still need a certain degree of knowledge in traditional accounting. In addition, the importance of “financial analysis” has risen since ERP implementation. That complies with the viewpoint of scholars the focus of accountants’ work turns to providing analysis and immediate information for decision making (Desormeaux, 1998; Scapens, 1998; Cooper and Kaplan, 1998; Wang, 2003). The rise in importance of “ERP system maintenance” and “ERP system evaluation” is in line with the standpoint of other scholars that accountants participate in ERP implementation and help the company set up system rules (Ou, 2000). However, in the company of the case study, management and IT are not the main jobs of accountants. This does not accord with the viewpoint of scholars. Therefore, this paper aims to explore the cause of this difference from the aspects of “SFC, accounting department of region businesses”, “managerial accountants, non-managerial accountants”, “accounting graduates, and non-accounting graduates”.

In Table IV, we find the SFC focuses on jobs such as “general accounting transactions” and “providing financial statements” before ERP implementation. Importance of other traditional financial accounting operations decreases except for “data input” after ERP implementation because there is operational adjustment after the establishment of financial center. Under the centralized management, accountants

| Operation of accountants | SFC | | | | Accounting departments in region businesses | | | |
|--|------------|-----------|-------------|----------|---|-----------|-------------|----------|
| | Before (%) | After (%) | T-statistic | p-value | Before (%) | After (%) | T-statistic | p-value |
| Data input | 40 | 47 | -0.673 | 0.549 | 67 | 58 | 0.956 | 0.410 |
| General accounting transactions | 73 | 53 | 4.155 | 0.025** | 50 | 58 | -1.040 | 0.375 |
| Data compilation and filing | 47 | 33 | 5.230 | 0.014** | 58 | 67 | -1.035 | 0.377 |
| Review of front-end data mapping | 33 | 20 | 6.369 | 0.008*** | 67 | 42 | 12.769 | 0.001*** |
| Data adjustment and amendment | 47 | 33 | 4.850 | 0.017** | 67 | 92 | -6.979 | 0.006*** |
| Providing financial statements | 73 | 67 | 0.438 | 0.691 | 42 | 50 | -0.703 | 0.532 |
| Financial analysis | 47 | 53 | -8.485 | 0.003*** | 50 | 58 | -0.613 | 0.583 |
| Cash flow management | 27 | 20 | 0.524 | 0.637 | 25 | 33 | -1.013 | 0.386 |
| Taxation planning | 13 | 13 | 0.000 | 1.000 | 33 | 42 | -1.223 | 0.309 |
| Enterprise risk assessment | 7 | 7 | 0.000 | 1.000 | 25 | 33 | -0.834 | 0.465 |
| Risk management | 7 | 7 | 0.000 | 1.000 | 25 | 33 | -0.911 | 0.430 |
| ERP system maintenance | 0 | 7 | -3.575 | 0.037** | 0 | 17 | -6.584 | 0.007*** |
| ERP system evaluation | 0 | 13 | -6.64 | 0.007*** | 8 | 17 | -6.971 | 0.006** |
| Communication and coordination among departments | 20 | 33 | -5.461 | 0.012** | 58 | 67 | -5.058 | 0.015** |
| Integration of cost data related to operation | 20 | 20 | 0.000 | 1.000 | 33 | 25 | 0.863 | 0.451 |
| Participating in management decision making | 13 | 13 | 0.000 | 1.000 | 25 | 25 | 0.000 | 1.000 |
| Computer auditing | 7 | 0 | 2.401 | 0.096 | 25 | 25 | 0.000 | 1.000 |
| Education and training | 20 | 33 | -1.452 | 0.242 | 50 | 58 | -0.643 | 0.566 |

Note: p-values significant at: *10, **5 and ***1 percent levels

in SFC have to perform only certain operations in the accounting process such as accounts receivable.

The importance of each operation of accountants does not change significantly before and after ERP system. “ERP system maintenance” and “ERP system evaluations” are not the main jobs of accountants currently but the importance of them rises. “Computer auditing” has been transferred from the SFC to the accounting departments in region businesses since ERP implementation because the SFC focuses on integration of operations while accounting departments in region businesses concentrate on routine operations.

Traditional financial accounting operations such as “general accounting transactions” are still the main jobs in region businesses after ERP implementation. Accountants from the SFC and those from region businesses have different viewpoints

on the importance of operations of accountants such as “data adjustment” after ERP implementation.

In Table V, the main jobs of managerial accountants are traditional financial accounting operations and management operations. The two operations of “financial analysis” and “training” are considered the most important operations. If managerial accountants are unable to provide proper training to help the staff, it will affect the efficiency of the new system. For non-managerial accountants, traditional financial accounting operations like “data input” are still their main jobs. Therefore, the importance of management operations is not high. But, the importance of “ERP system evaluation” and “communication among departments” have risen significantly ($p = 0.05$). “Enterprise risk assessment”, “risk management”, “ERP system maintenance” and “participating in decision making” are not working field for non-managerial accountants before or after ERP implementation. There is significant difference in recognizing

| Operation of accountants | Managerial accountants | | | | Non-managerial accountants | | | |
|--|------------------------|-----------|-------------|----------|----------------------------|-----------|-------------|----------|
| | Before (%) | After (%) | T-statistic | p-value | Before (%) | After (%) | T-statistic | p-value |
| Data input | 38 | 50 | -1.625 | 0.203 | 58 | 53 | 0.435 | 0.693 |
| General accounting transactions | 38 | 38 | 0.000 | 1.000 | 74 | 63 | 0.476 | 0.666 |
| Data compilation and filing | 38 | 25 | 0.985 | 0.397 | 58 | 58 | 0.000 | 1.000 |
| Review of front-end data mapping | 50 | 25 | 15.811 | 0.001*** | 47 | 32 | 8.429 | 0.004*** |
| Data adjustment and amendment | 50 | 63 | -0.660 | 0.557 | 58 | 58 | 0.000 | 1.000 |
| Providing financial statements | 75 | 88 | -0.215 | 0.311 | 53 | 47 | 0.317 | 0.772 |
| Financial analysis | 88 | 100 | -5.657 | 0.011** | 32 | 39 | -0.643 | 0.566 |
| Cash flow management | 50 | 50 | 0.000 | 1.000 | 16 | 16 | 0.000 | 1.000 |
| Taxation planning | 63 | 63 | 0.000 | 1.000 | 5 | 11 | -1.477 | 0.236 |
| Enterprise risk assessment | 50 | 63 | -0.550 | 0.621 | 0 | 0 | 0.000 | 1.000 |
| Risk management | 50 | 63 | -0.709 | 0.529 | 0 | 0 | 0.000 | 1.000 |
| ERP system maintenance | 0 | 38 | -25.816 | 0.000*** | 0 | 0 | 0.000 | 1.000 |
| ERP system evaluation | 13 | 25 | -3.372 | 0.043** | 0 | 11 | -12.050 | 0.001*** |
| Communication and coordination among departments | 75 | 75 | 0.000 | 1.000 | 21 | 37 | -5.146 | 0.014** |
| Integration of cost data related to operation | 75 | 63 | 0.957 | 0.409 | 5 | 5 | 0.000 | 1.000 |
| Participating in management decision making | 63 | 63 | 0.000 | 1.000 | 0 | 0 | 0.000 | 1.000 |
| Computer auditing | 25 | 25 | 0.000 | 1.000 | 11 | 5 | 1.527 | 0.224 |
| Education and training | 88 | 100 | -7.589 | 0.005*** | 11 | 21 | -2.364 | 0.099 |

Note: p-values significant at: *10, **5 and ***1 percent levels

Table V.
Changes of operation of managerial accountants and non-managerial accountants before and after ERP implementation

importance of “financial analysis” between managerial accountants and non-managerial accountants after ERP implementation.

We learn there is the difference in the job contents between managerial accountants and non-managerial accountants. Under the Shared Service Center mode, financial supervisors are responsible for more management functions. We also find out middle supervisors are in charge of e-business project instead of the consulting company or IT staff in the company. However, previous studies did not explore the change in importance of accountants’ operations from different positions. Therefore, their findings may not be correct.

Table VI shows accounting graduates tend to involve in traditional financial accounting operations after ERP implementation. Operations such as “ERP system evaluation”, “communication among departments” are not the major job contents of accounting graduates but the *p*-value of changes of these two operations before and after ERP implementation reaches a significant level. Clearly, accounting graduates not only specialize in accounting profession, but also develop their profession in management and IT after ERP implementation.

| Operation of accountants | Accounting graduates | | | | Non-accounting graduates | | | |
|--|----------------------|-----------|---------------------|-----------------|--------------------------|-----------|---------------------|-----------------|
| | Before (%) | After (%) | <i>T</i> -statistic | <i>p</i> -value | Before (%) | After (%) | <i>T</i> -statistic | <i>p</i> -value |
| Data input | 50 | 50 | 0.000 | 1.000 | 53 | 53 | 0.000 | 1.000 |
| General accounting transactions | 60 | 70 | -0.980 | 0.399 | 65 | 47 | 1.685 | 0.191 |
| Data compilation and filing | 50 | 60 | -1.151 | 0.333 | 53 | 41 | 0.703 | 0.533 |
| Review of front-end data mapping | 40 | 30 | 9.258 | 0.003*** | 53 | 29 | 7.827 | 0.004*** |
| Data adjustment and amendment | 50 | 70 | -7.845 | 0.004*** | 59 | 53 | 3.207 | 0.049** |
| Providing financial statements | 50 | 60 | -0.974 | 0.402 | 68 | 59 | 0.841 | 0.462 |
| Financial analysis | 20 | 30 | -0.948 | 0.413 | 68 | 71 | -2.598 | 0.081* |
| Cash flow management | 30 | 40 | -0.864 | 0.451 | 24 | 18 | 0.484 | 0.662 |
| Taxation planning | 30 | 50 | -1.821 | 0.166 | 18 | 12 | 0.499 | 0.652 |
| Enterprise risk assessment | 10 | 20 | -2.034 | 0.135 | 18 | 18 | 0.000 | 1.000 |
| Risk management | 10 | 20 | -1.663 | 0.195 | 18 | 18 | 0.000 | 1.000 |
| ERP system maintenance | 0 | 0 | 0.000 | 1.000 | 0 | 18 | -11.384 | 0.001*** |
| ERP system evaluation | 0 | 10 | -10.954 | 0.002*** | 6 | 18 | -1.986 | 0.141 |
| Communication and coordination among departments | 10 | 30 | -4.827 | 0.017** | 53 | 59 | -1.448 | 0.243 |
| Integration of cost data related to operation | 20 | 20 | 0.000 | 1.000 | 29 | 24 | 0.294 | 0.788 |
| Participating in management decision making | 10 | 20 | -1.103 | 0.350 | 24 | 18 | 0.828 | 0.468 |
| Computer auditing | 0 | 0 | 0.000 | 1.000 | 24 | 18 | 0.827 | 0.469 |
| Education and training | 20 | 30 | -0.638 | 0.569 | 41 | 53 | -6.414 | 0.008*** |

Table VI.
Changes of operations of accounting graduates and non-accounting graduates before and after ERP implementation

After ERP implementation, non-accounting graduates are mainly in charge of “financial analysis”, “ERP system maintenance”, “communication among departments”, “computer auditing” and “education and training”. There is an obvious difference in “financial analysis” because accountants have to understand the operational process, integration of ERP system, the correlation between information available in the system and the decision making of the enterprise (Scapens, 1998; Cooper and Kaplan, 1998). Most of the accountants who are non-accounting graduates in R company majored in finance and have basic accounting knowledge and better communication and analytical skills.

(2) *Roles of accountants.* From Table VII, we learn that “the transaction data handler and the financial report provider” are still the main roles accountants play after ERP implementation. Research shows that accountants who are responsible for data input and providing financial statements are affected most by ERP implementation. Their jobs have little to do with financial accounting (Desormeaux, 1998). However, our findings are different from this.

The importance of “transactions auditor”, “reviewer of front-end data mapping” has decreased since ERP implementation. This responds to the change of the importance of operations after ERP implementation but is different from the viewpoint of scholars that accountants save a lot of time in data input and filing after ERP implementation and become reviewers of data (Cheng, 2001).

We find that the roles of managerial accountants and non-managerial accountants have the biggest difference in “financial center, accounting departments in region businesses”, “managerial accountants, non-managerial accountants” and “accounting graduates, non-accounting graduates”. However, previous research does not study the change in importance of accountants’ operations from the aspects of different positions. Therefore, scholars conclude that accountants are considered consultants who are responsible for integrating data, providing and analyzing information (Desormeaux, 1998; Scapens, 1998; Cooper and Kaplan, 1998). This is biased by only focusing on the surface. Reviewers and computer auditors are not the major roles of accountants. However, ERP suppliers in Taiwan consider accountants financial guardian. It is clear there is still cognitive gap between accountants and ERP suppliers.

(3) *Effects of ERP implementation on accountants.* In this study, we classify the effects of ERP implementation on accountants into 11 items and we look into the development of accounting department and accountants of the case company after ERP implementation. In Table VIII, we find the effects of ERP implementation on accountants include “reducing the routine workload”, “increasing working efficiency”, “increasing the quality of analysis and management of statements”, “increasing the professional skills of IT”, “improving the motivation in learning and growth”, “raising competitive pressure”. These are in accord with various aspects.

In addition, we compare the effects of ERP implementation of the two sample groups. There are obvious differences between the SFC and accounting departments in region businesses in “reducing the routine workload”, “increasing working efficiency” and “reducing working satisfactory”. There are significant differences between managerial accountants and non-managerial accountants in “increasing the professional skills of IT”, “respecting traditional core competencies more”, “raising competitive pressure” and “reducing working satisfactory”. There are significant differences between accounting

Table VII.
Changes of roles of accountants before and after

| Roles of accountants | Implementation | | | After implementation | | | | | |
|--|----------------|-----------|---------------------|----------------------|----------------------------|---------------------|----------------------------|--------------------------------|---------------------|
| | Before (%) | After (%) | T-statistic p-value | SFC (%) | Region businesses (%) | T-statistic p-value | Managerial accountants (%) | Non-Managerial accountants (%) | T-statistic p-value |
| Transaction data handlers, the financial report provider | 67 | 78 | -0.703 0.531 | 73 | 83 | -12.247 0.001*** | 88 | 74 | 1.154 0.332** |
| Transactions auditor | 44 | 41 | 2.449 0.092* | 47 | 33 | 3.482 0.04** | 13 | 53 | -3.799 0.032** |
| Evaluator of ERP system outcomes | 11 | 30 | -2.234 0.112 | 27 | 33 | -0.392 0.721 | 63 | 16 | 2.331 0.102 |
| Communicator among departments | 44 | 48 | -0.281 0.797 | 33 | 67 | -1.875 0.157 | 100 | 26 | 0.750 0.508 |
| Integrator of cost throughout the production process | 19 | 22 | -0.507 0.647 | 13 | 33 | -1.687 0.190 | 63 | 5 | 2.912 0.062* |
| Reviewer of front-end data mapping | 41 | 26 | 5.196 0.014** | 20 | 33 | -0.865 0.450 | 13 | 32 | -1.719 0.184 |
| Consultant of data analysis and decision making | 30 | 33 | -0.174 0.873 | 27 | 42 | -2.051 0.133 | 100 | 5 | 55.679 0.000*** |
| Computer auditor | 11 | 11 | 0.000 1.000 | 7 | 17 | -1.974 0.143 | 13 | 11 | 0.527 0.635 |
| | | | | | Non-Managerial accountants | | Accounting graduates | Non-accounting graduates | |
| Transaction data handlers, the financial report provider | | | | 88 | 74 | 1.838 0.163 | 70 | 82 | -0.832 0.467 |
| Transactions auditor | | | | 13 | 53 | -3.547 0.038** | 40 | 41 | -0.046 0.967 |
| Evaluator of ERP system outcomes | | | | 63 | 16 | 2.688 0.075* | 10 | 41 | -2.676 0.075* |
| Communicator among departments | | | | 100 | 26 | 81.063 0.000*** | 30 | 59 | -2.141 0.122 |
| Integrator of cost throughout the production process | | | | 63 | 5 | 2.818 0.067* | 20 | 24 | -8.250 0.470 |
| Reviewer of front-end data mapping | | | | 13 | 32 | -2.293 0.106 | 20 | 29 | -1.072 0.362 |
| Consultant of data analysis and decision making | | | | 100 | 5 | 28.014 0.000*** | 30 | 35 | -0.289 0.792** |
| Computer auditor | | | | 13 | 11 | 1.633 0.201 | 0 | 18 | -3.286 0.046 |

Notes: p-values significance at: *10, **5 and ***1 percent levels; SFC, Shanghai Financial Center

| Effects of ERP implementation on accounting department (accountants) | After implementation (%) | SFC (%) | Region businesses (%) | Managerial accountants (%) | Non-managerial accountants (%) | Accounting graduates (%) | Non-accounting graduates (%) |
|--|--------------------------|---------|-----------------------|----------------------------|--------------------------------|--------------------------|------------------------------|
| Reduce workload of regular jobs | 78 | 100 | 50 | 88 | 74 | 80 | 77 |
| Improve work performance | 82 | 100 | 58 | 88 | 79 | 80 | 82 |
| Increase the quality of statement analysis and management | 85 | 93 | 75 | 88 | 84 | 80 | 88 |
| Improve the status of accounting department (accountants) | 37 | 47 | 25 | 50 | 32 | 40 | 35 |
| Raise the professional skills of IT | 63 | 73 | 50 | 88 | 53 | 70 | 59 |
| Respect the traditional core competencies (such as taxation) | 48 | 40 | 58 | 75 | 37 | 50 | 47 |
| Reinforce motivation in learning and growth | 82 | 73 | 92 | 88 | 79 | 100 | 71 |
| Rising competitive pressure | 63 | 60 | 67 | 88 | 53 | 70 | 59 |
| Unemployment crisis because of personnel cuts | 48 | 47 | 50 | 63 | 42 | 80 | 29 |
| Reduce job satisfaction | 26 | 13 | 42 | 50 | 16 | 20 | 29 |
| Reduce involvement in job | 15 | 20 | 8 | 13 | 16 | 10 | 18 |

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impact on
accountants

Table VIII.
Effects of ERP
implementation on
accounting department
(accountants)

and non-accounting graduates in “unemployment crisis caused by simplification of human resources” and “enhancing the motivation in learning and growth”.

In conclusion, ERP implementation does bring many positive effects on the accountants. It is different from the viewpoint of scholars that ERP implementation raises the role and position of accounting department (Desormeaux, 1998). Middle managers are the actual decision-makers in e-projects. This explains that recognition of position of accounting department and accountants except for managerial accountants does not rise remarkably.

(4) *Enhancement of accountants.* Table IX shows “professional managerial accounting skills”, “IT skills”, “communication skills”, “analysis ability”, “presentation skills” are the abilities accountants should improve most after ERP implementation. While “taxation consulting ability”, “strategic thinking ability”, “management ability” and “system design ability” are not the abilities accountants should improve after ERP implementation in general. When we analyze the effects of ERP implementation on accountants from different aspects such as the “SFC, accounting department of region businesses”, “managerial accountants, non-managerial accountants” and “accounting graduates, non-accounting graduates”, we find the results vary because of different organizational structure, positions and backgrounds.

In conclusion, accountants do not always understand e-business, accounting and taxation process of e-commerce. Abilities of communication and presentation become more important than professional skills. They are necessary requirements after ERP implementation.

5. Conclusion

This paper uses the case study method to discuss the changes of roles and operations of accountants individually by their position, background and department, which is the major difference from past research. We find that the difference of changes of the roles of managerial and non-managerial accountants is the most obvious after ERP implementation. However, past research does not explore this difference from the aspect of different positions. After ERP implementation, the role of non-managerial accountants does not change as much as that of managerial accountants, leader of the e-business project, does. Managerial accountants have to take over more management functions such as education and training and financial analysis. Past research thinks all accountants, including managerial and non-managerial accountants, are considered consultants who are responsible for integrating data and providing and analyzing information (Desormeaux, 1998; Scapens, 1998; Cooper and Kaplan, 1998) but our findings are different from that. This paper provides a better understanding of the changes of operations of accountants by exploring them separately in categories of position, background and department.

We summarize the top three changes of operations in each group after ERP implementation in Table X. For the changes of operations in each group, review of front-end data mapping was decreased because ERP system integrates business processes and provides the instant access to integrated data across the entire enterprise to improve operational efficiency (Chou and Chang, 2008; Ke and Wei, 2008; Liang *et al.*, 2007). As mentioned above, managerial accountants are responsible for more education, training and financial analysis operations than non-managerial accountants are after ERP implementation. For the changes of operations in SFC and region business, accountants of SFC increase operation of financial analysis. For the changes of operations

| Enhancements of accountants after ERP implementation | After implementation (%) | SFC (%) | Region businesses (%) | Managerial accountants (%) | Non-managerial accountants (%) | Accounting graduates (%) | Non-accounting graduates (%) |
|--|--------------------------|---------|-----------------------|----------------------------|--------------------------------|--------------------------|------------------------------|
| Tax advisory ability | 44 | 33 | 58 | 63 | 37 | 50 | 41 |
| Strategic thinking ability | 48 | 60 | 33 | 75 | 37 | 60 | 41 |
| Professional management accounting skill | 59 | 60 | 58 | 75 | 53 | 70 | 53 |
| Organization and management skill | 41 | 47 | 33 | 63 | 32 | 60 | 29 |
| IT skills | 85 | 87 | 83 | 100 | 79 | 90 | 82 |
| System design ability | 48 | 53 | 42 | 75 | 37 | 50 | 47 |
| Communication and coordination abilities | 59 | 67 | 50 | 88 | 47 | 60 | 59 |
| Analysis ability | 78 | 87 | 67 | 88 | 74 | 80 | 77 |
| Presentation ability | 63 | 73 | 50 | 75 | 58 | 70 | 59 |

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Table IX.
Enhancements of
accountants after
ERP implementation

| Rank | SFC | Region businesses | Managerial accountants | Non-managerial accountants | Accounting graduates | Non-accounting graduates |
|------|--------------------------------------|--------------------------------------|--------------------------------------|--|--|--------------------------------------|
| 1 | Financial analysis (+) | Review of front-end data mapping (-) | ERP system maintenance (+) | ERP system evaluation (+) | ERP system evaluation (+) | ERP system maintenance (+) |
| 2 | ERP system evaluation (+) | ERP system evaluation (+) | Review of front-end data mapping (-) | Review of front-end data mapping (-) | Review of front-end data mapping (-) | Review of front-end data mapping (-) |
| 3 | Review of front-end data mapping (-) | Data adjustment and amendment (-) | Education and training (+) | Communication and coordination among departments (+) | Data adjustment and amendment (-) | Education and training (+) |
| 4 | Data compilation and filing (-) | ERP system maintenance (+) | Financial analysis (+) | - | Communication and coordination among departments (+) | Financial analysis (+) |

Notes: (+) operation increase; (-) operation decrease

Table X.
Top three changes in operations of each group after ERP implementation

of accounting and non-accounting graduate accountants, non-accounting graduate accountants are mainly in charge of “financial analysis”, “ERP system maintenance”, “education and training” and “financial analysis” after ERP implementation. There is the difference in “financial analysis” because most of the non-accounting graduate accountants majored in finance in R company. Therefore, they already have knowledge in finance and accounting and are better than accounting graduate accountants in analysis and presentation. Therefore, non-accounting graduate accountants have an increase of operation of financial analysis after ERP implementation.

The transaction data handler and financial report provider are the roles accountants mainly play in all aspects of “Shanghai Financial Service Center, accounting departments of region businesses”, “managerial accountants, non-managerial accountants” and “accounting graduates, non-accounting graduates”. The major effects on accountants after ERP implementation are “reducing the routine workload”, “increasing working efficiency”, “increasing the quality of statements of analysis and management”, “increasing the professional skills for IT”, “enhancing the motivation in learning and growth” and “raising competitive pressure”.

The transaction data handler and financial report provider will still be the major roles accountants mainly play when ERP implementation is not adequately effective. If it is, accountants should change their role from the traditional transaction data handler and financial report provider to the analytical and decision making consultants, who provide their suggestions for the company. If traditional accounting operations are still



the major jobs for accountants after ERP implementation, it implies accountants are still required to have a certain degree of knowledge in traditional accounting.

As ERP implementation begins, IT replaces highly repeated traditional accounting operations. Under successful ERP implementations, data quality increases, decision making is improved, and the percentage of reports automatically generated by the ERP system is greater than under the traditional ISs. Many reports produced automatically by ERP system were previously prepared by the accountants using other software, such as spreadsheets. Therefore, besides compiling data and preparing financial statements, accountants need to enhance communication and analytical ability and to familiarize with working processes in the company. Because of the complete records of transactions and clear audit trail of ERP systems, accountants can utilize the drill down function to track down every transaction in order of general ledgers, sub ledgers and transactions to improve the auditing of the company. This will strengthen its internal control to reinforce its corporate governance. After ERP implementation, the focus of internal control has shifted from accounting operation to the whole business operations. Traditional auditing emphasizes on the results such as signature and documentation instead of the causes. While the whole business auditing stresses on processes and procedures. Accountants play critical roles on effectively promoting business core value.

This paper provides companies with job requirements of accountants of different positions and backgrounds after ERP implementation. Moreover, it helps accountants realize what kind of skill they need to have after ERP implementation. The research limitation of this paper is the data we obtained are mainly from SFC and region businesses in Shanghai, Beijing and Taiwan. Therefore, we are unable to consider the effects of ERP system on accountants in other regions. We suggest future study expand the sampling scope and compare the difference in different industries and regions.

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