

Evaluating the Effects of ERP Systems on Performance and Management Accounting in Organizations

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Abstract

Coordination of operation and information in order to elevate the efficiency is one of the processes in organizations and often has been accompanied with resorting to IT in a large scale. Organizations have implemented Enterprise Resource Planning (ERP) systems due to problems posed by separated systems. The aim of this research is to study whether ERP systems cause increasing performance efficiency and changing management practices in organization. In addition, the role of management accountants have been examined to find out that whether they are gaining new roles within organization and whether their work content has changed after the ERP implementation. The research is conducted with a survey questionnaire. The sample consists of 50 knowledgeable persons in organizations that have implemented ERP systems. Results indicated that ERP systems have had an impact on organization performance, accountants and management accounting. These systems provide more real-time and accurate information to budgets and techniques, and organizations have also introduced advanced management accounting techniques after the implementation. As regards the time use of accountants, the results exhibit that the respondents have used less time on their routine work after the ERP implementation. This extra time is devoted on interpreting data and performance evaluation and other tasks. Finally, accountants in the study consider that the implementation of ERP systems has made skills such as, IT skills and knowledge of other functional areas more important.

Keywords: Enterprise Resource Planning Systems; Organization Performance; Management Accountings Role; Management Accounting Practices

Introduction

Today, coordination of operation and information in order to elevate the efficiency is one of the processes of organizations, and it often has been accompanied with resorting to IT in large scale. Enterprise Resource Planning (ERP) systems are among those spreading technologies which take strategic advantages in competitive market. Organizations have implemented ERP systems due to problems posed by separated systems, but implementing ERP systems accompanies with challenges that may have different implications in various organizations.

The aim of this research is to study whether ERP systems have increased efficiency and changed management accounting practices in companies for example, by introducing advanced accounting practices such as ABC and the balanced scorecard or improving the quality of reports and budgets. In addition, management accountants' role will be examined to find out if they are gaining new roles within organization and whether their work content has changed after the ERP implementation.

Research background

According to Mashari (2003), an Enterprise Resource Planning (ERP) system is an information technology (IT) infrastructure that facilitates the flow of information within the organization, with suppliers, and with other members of the supply chain. ERP combines business processes in both the organization and IT into one integrated solution and is a way of doing business, not merely a software package. (Laframboise, 2005; Malhotra, 2010)

Organizations that produce and sell certain products, are acting in four main operational areas. All these areas also include connected functions and activities that in turn, shape business process of their respective organizations. ERP systems collectively have covered four main areas, including: control and marketing; production and sale; support; and marketing and development.

Implementation of ERP does not automatically provide any benefits for the organization. According to the researchers, the benefits of an ERP system can be classified into five different dimensions:

□ Operational benefits. An ERP system automates day-to-day operational processes and, thus, one would expect that the system offers benefits in terms of cost reduction, cycle time reduction and improvement in productivity, quality as well as customer service.

□ Managerial benefits. ERP systems with their databases and data analysis capacities can facilitate decision making and improve performance in operating divisions. Hence, ERP systems provide planning benefits to management.

□ Strategic benefits. An ERP system can provide an organization IT-based competitive advantage by assisting establishment of external alliances with customers and by promoting business growth, innovation and differentiation.

□ IT infrastructure benefits. An ERP system creates an infrastructure that facilitates an organization to adapt to future changes and at the same time reduces IT costs and increases capability to implement other applications.

□ Organizational benefits. An ERP system improves working patterns, organizational learning and communication among people. Therefore, improvements in organizational culture are also possible.(Tin Yoho.2006)

Abdinnour (2003) showed that the job occupation and the type of employee's work affect their view on ERP systems. Newer employees and managers have more positive view about ERP systems; on the other hand, older employees and staff in the category of personnel or engineering are more doubtful about the benefits of ERP systems.

Rajesh (2005) investigated effect of ERP implementation on five dimensions of Manager's job (autonomy, use of power, delegation, people skills and privileged information), five dimensions of organizational structure (specialization, formalization, centralization, standardization and complexity of work flow) and on the flexibility of organization.

It was found that use of power significantly increased in all the company. This was thought to be related to the 'change management' associated with ERP implementation in the firm. This could also be due to strategic shift in the firm's position (firm had now become a 'prospecter' from its earlier state of 'defender') which led to increased 'decentralization' and 'delegation' which increased 'autonomy' of the managers. Managers at the middle level felt that there was significant increase in the amount of 'privileged information' available with them. Need for maintaining informal relations for discharging official duties also remains nearly same for senior and middle level managers; however, lower level managers felt that the need for maintaining informal relations to discharge official duties has decreased. It was also found that the specialization, formalization and

standardization had significantly gone up. Thus this pilot study brings out that ERP implementation has significant effect on manager's job and organization structure.

Main factors for accepting ERP systems relates to technical and business reasons. Companies that have a technologically-led motivation perceive “improved service time in accounting tasks” as an internal efficiency benefit, “faster response to business change” as customer benefits, and financial benefits in terms of other improved efficiencies. Companies that have a business-led motivation perceive “economies of scale” as an internal efficiency benefit, and financial benefits in terms of “lower headcount costs” and “lower selling, general and administrative costs.” (Velcu, 2007)

The purpose of Velcu study was to explore what Business Process (BP) changes happen in companies implementing ERP systems with different motivations and implementation experiences.

Additionally, the study explores the impact of the respective process changes on organizational performance. The results provide a perspective into the interrelationships between ERP motivations and the benefits of ERP. Some similarities and differences were observed in how the case companies coordinated their motivations for implementing their system with the BP changes, and the ERP benefits perceived in the post-ERP implementation stage (Figure 1).

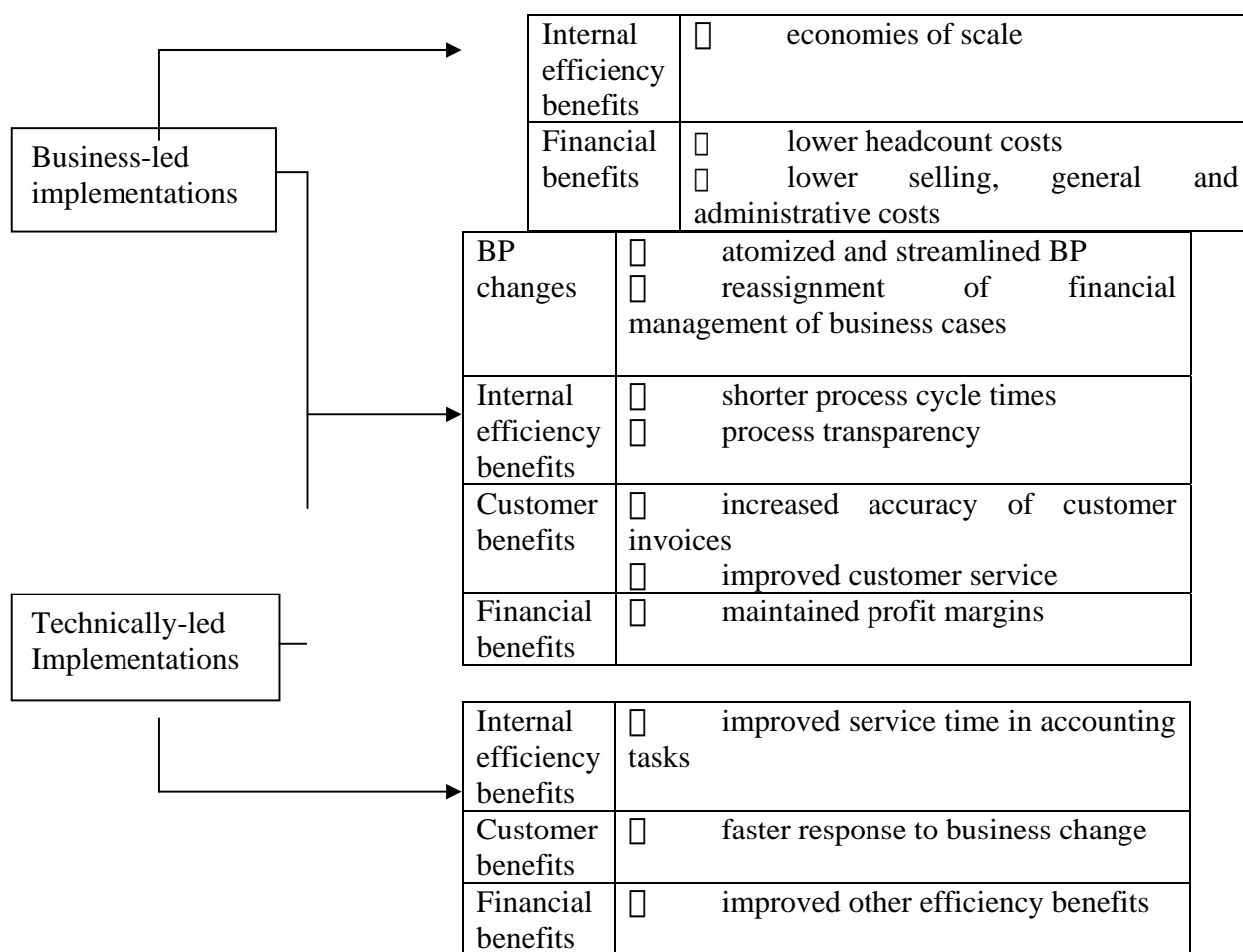


Figure 1. Similarities and differences between technically and business-led implementations.

It is possible to describe the different research genres in management accounting oriented ERP research (Figure 2). (Hyvonen, 2010)

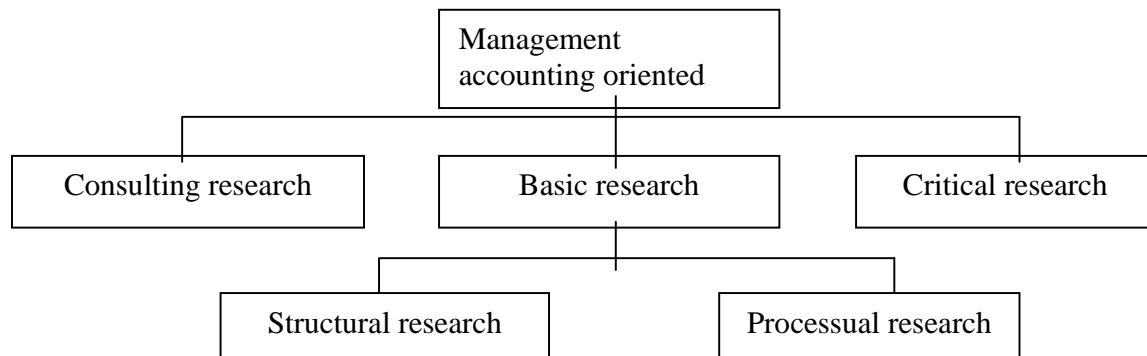


Figure 2. Research genres in management accounting oriented ERP research

In consulting research, the focus is twofold: either the possibilities to develop organizations with ERPs are presented, or the interest is in critical success factors in ERP implementation phase often studied by statistical methods. In the basic studies, however, the research questions concentrate more on the possible impacts of ERP implementations on management accounting, management control or the changing roles of management accountants. Structural studies have typically found only moderate impacts, while processual studies have also reported remarkable, albeit contradictory changes. Finally, critical studies as a basis will call into question the whole idea of ERP as integrated information systems. According to these, ERP systems will be seen either as a one form of managerial fashion or labor processing issue when these systems just offer a new device to forestall democracy by centralizing power on a small elite within the organization.

There are four different perspectives on management accounting change in the ERP systems context: (i) management accounting as a *technology*, (ii) management accounting as *knowledge*, (iii) management accounting as a *control structure*, and (iv) management accounting as a *profession*. The focus here is on the implementation phase, not on the impacts of ERP systems on management accounting.

The focus in the first perspective is on the *technological role* of ERPs when new management accounting systems are implemented. The elementary questions in this view are: why, and by whom was the new information system implemented in the industrial units studied? Another question is why and how modern multidimensional profitability management systems have been created in a big industrial enterprise with different cost accounting and management control off-the shelf software packages by using ERP system as a basic platform. The other important issue is what kind of reflections this has had on management control and the changing roles of controllers.

The second view approaches the issue from the perspective of *knowledge transfer*: how the standard software packages can help organizations to mobilize local management accounting knowledge or the focus is on the roles of standards when dis/re-embedding management accounting knowledge within a company.

In the third perspective, the focus is on how a company managed to create a new *management control system* (called virtual organization) by using the technology mentioned earlier, when the purpose is to increase headquarters' control and visibility over the local business units.

The essential point in this view is that when creating a new control structure the focus is on parallel processes and their social networks.

The last one concentrates on the management accounting *profession* and the role change of controllers. So far views on the subject have concentrated either on the national or organizational level of change. In this perspective, the focus is on a single controller: how the aspiring controller (an active agency) managed to expand his role from 'bean counter' and to create a new kind of role model to the organization by using the ERP-linked management accounting development project as a stepping stone.

The role of management accountant has changed significantly in the last two decades. Pierce (2003) has studied the managers' views on the future role of management accountants. Basic factors have been expressed by managers including: participation (collaboration with members of other functional areas such as, production and sale), position and physical presence (for having good vision of the company, management accountants should work closely with other departments), team working (management accountants should work as members of the management team and as managers, have specialized knowledge about accounting and financial issues), and business knowledge (management accountants not only need accounting and financial knowledge, but also they must have a business knowledge, especially the knowledge of production and sale activities).

According to Grabski et al., (2009) that has studied management accounting in ERP systems, the results are as follows:

- When management accountants are involved in an ERP system implementation, there is an increased likelihood of the implementation being a success.

- The impact of the ERP system on the role of the management accountant is related to the perceived success of the system implementation, with more successful implementations exhibiting the more dramatic changes to the role.

- While all ERP implementations results in changes in the tasks performed by management accountants, a successful ERP implementation results in a significant change in the management accountant's tasks, they become business partners not just data providers.

- A successful ERP implementation results in both increases in data quality and quality of decision-making, and in additional time for management accountants to become involved in value-adding tasks rather than mundane data recording and information reporting tasks.

- Management accountants in an ERP environment needs a strong understanding of the business and the business processes, significant interpersonal skills, leadership skills, decision-making skills, analytical skills, planning skills and technical skills.

- The role of management accountants in an ERP environment is more that of a business advisor to top management than that of a traditional management accountant.

Research hypotheses

We present 3 hypotheses along with the objectives of the project:

Hypothesis 1: ERP systems cause increasing performance efficiency in organizations.

Hypothesis 1-1: ERP systems cause increasing performance efficiency in sale unit.

Hypothesis 1-2: ERP systems cause increasing performance efficiency in planning unit.

Hypothesis 1-3: ERP systems cause increasing performance efficiency in production unit.

Hypothesis 1-4: ERP systems cause increasing performance efficiency in inventory control unit.

Hypothesis 1-5: ERP systems cause increasing performance efficiency in storehouse unit.

Hypothesis 1-6: ERP systems cause increasing performance efficiency in procurement unit.

Hypothesis 1-7: ERP systems cause increasing performance efficiency in accounting unit.

Hypothesis 2: ERP adopters will experience only minor changes in the management accounting function after the implementation.

Hypothesis 3: The role of management accountants and their work tasks change after the ERP implementation.

Materials and Methods

In the first step of research that was exploratory, a limited portion of the society, as well as some specialists and professors were interviewed in order to find their perspectives on the discussed subject, so a qualitative method was used in this step. In fact, this part of the study was conducted to better understand the nature of the problem, on which there have been few studies of its relevant phenomena.

Then, based on the findings, we attempted to present model (Figure 3 illustrates the proposed research model) and hypotheses. This study is inductive in terms of implementation logic. Questions were designed to refute or verify the hypothesis. At this stage of the research, which is survey-based (ground-finding) in its purpose, the nature of personal perceptions and characteristics of the people was investigated through the analysis of the answers to timely formulated questions, thus a quantitative method was used. Finally, we interpret evaluation results and findings of the research. As it is evident, this study is a combination of qualitative and quantitative methods linked to each other.

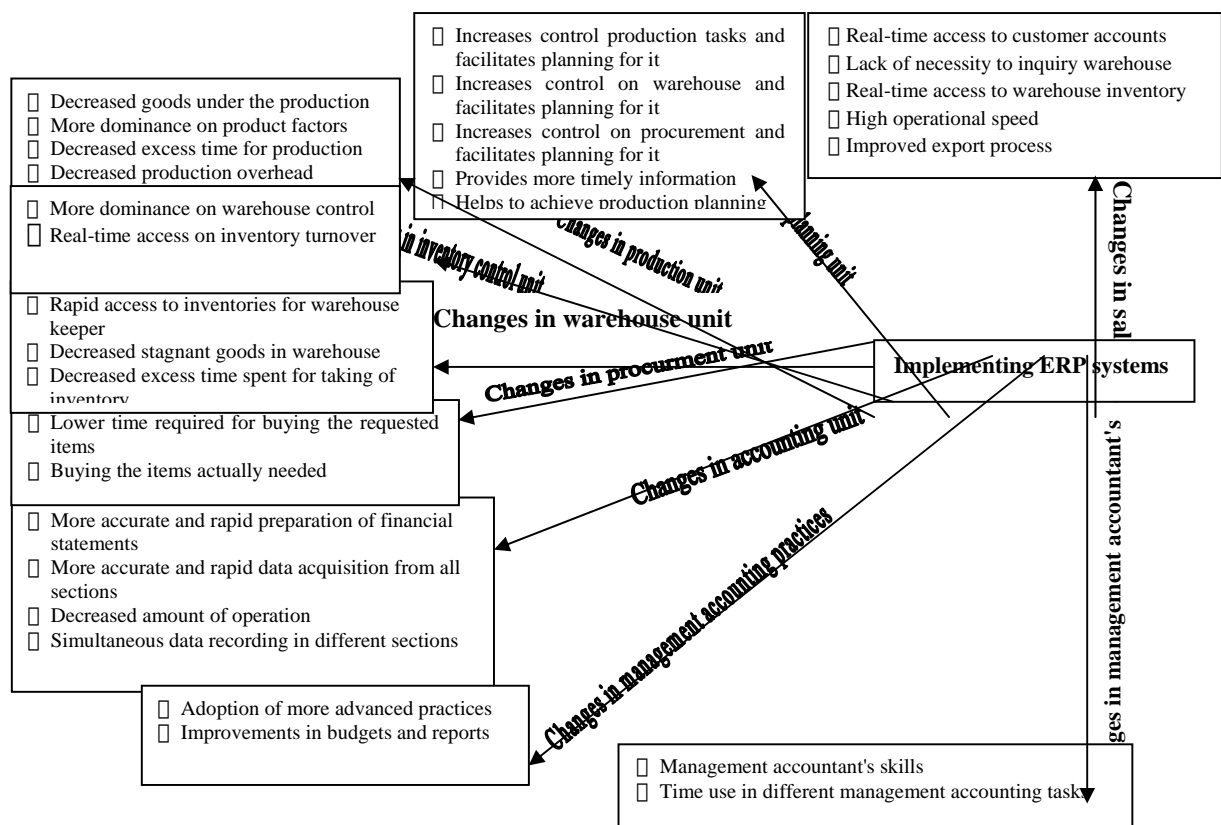


Figure 3. Research model

To test the validity of the designed questionnaire, it was given to a number of people who were expert in this area. The reliability of the questionnaire was calculated by Cronbach's alpha

(Table 1). The formulated questionnaire contains 13 questions, each having some sub-parts. 50 questionnaires were distributed in companies with ERP system and then they were collected after about 2 months, of which 36 items had been completed.

Table 1. Coefficient of Cronbach's alpha

variable	Reliability factor
The impact of ERP systems on performance of different units of an organization	0.875
The importance of different skills before and after ERP implementation from the perspective of management accountants	0.765
Time used before and after ERP implementation from the perspective of management accountants	0.905

In this study, considering the purpose of study and type of hypotheses and considering that the purpose of the study was the agreement of respondents with the questions of questionnaire in five different ranges, and also for the simplicity in making and interpreting the results of the Likert scale in comparison with other scales, this scale was used. To analyze questions, T-test and SPSS software has been used.

The statistical population includes all individuals related to the company, in which ERP system has been implemented. These are as follows: Iran Khodro, Saipa, Beh Pakhsh, Tractorsazi, Zob Ahan, SGS, DNV, Tahghigh Ertebat Toseeh (TETA), Renault Pars, and Henkel Iran Industrial Company. Also, statistical samples were selected from among those individuals expert in the areas of ERP having working and practical experiences.

Results and discussion

Data Analysis

Hypothesis 1.1 investigated the impact of ERP system on the sale unit. The degree of impact was evaluated with respect to the different states posed in the question. A summary of results is presented in Figure 4.

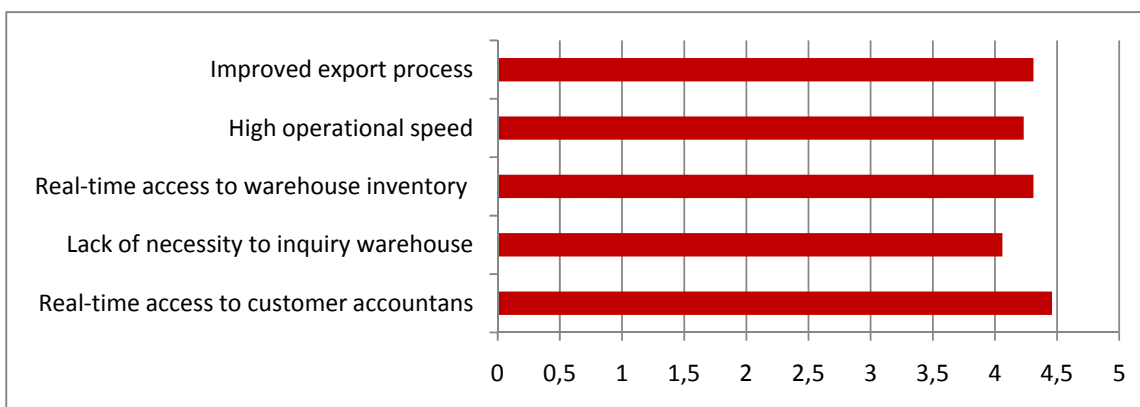


Figure 4. The impact of ERP systems on sale unit.

The mean results show that companies which have taken that ERP systems, “have access to customer accounts at any moment” (mean 4.46), “do not need to inquire the warehouse” (mean 4.06), "have access to warehouse inventory at any moment" (mean 4.31), "the sale operation speeds up in them” (mean 4.23), and "export process improves" (mean 3.6). The total average is 4.12, T-test was performed to determine whether there is significant difference in the mean value and this test revealed a significant difference; this hypothesis is accepted. The next hypothesis was explained to examine the impact of ERP system on planning unit and the following results were obtained (Figure 5).

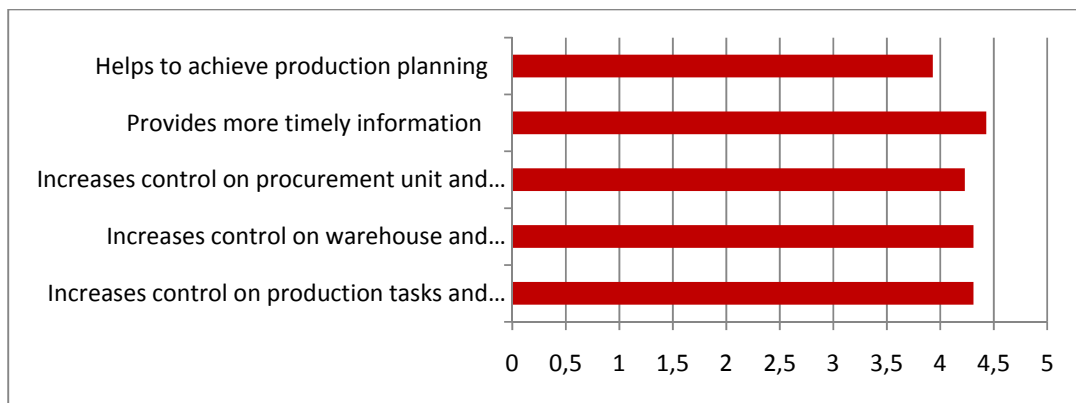


Figure 5. The impact of ERP systems on the planning units.

Mean results show that in companies implemented ERP, “control of production by planning unit increases and planning for production tasks becomes more easier” (mean 4.31), “control of unit by planning unit increases and planning for warehouse becomes more easier” (mean 4.31), "logistics control by planning unit increases and planning for it becomes easier” (mean 4.23), “more timely information is provided for planning unit (mean 4.43), “a considerable help is given to achieve production planning” (mean 4.93). The total average is 4.23 and T-test was performed to determine whether there is significant difference in the mean value and this test revealed a significant difference so this hypothesis is confirmed. In other hypothesis, we examined the impact of ERP system on production unit and degree of impact with respect to different conditions is as follows (Figure 6):

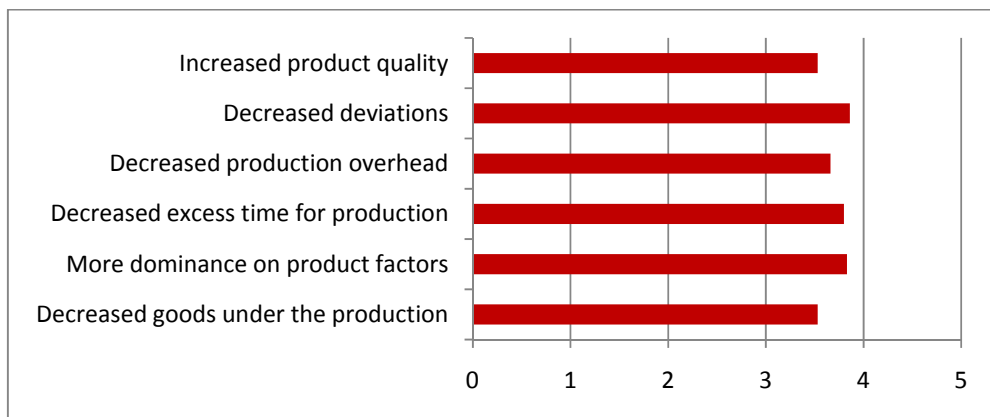


Figure 6. The impact of ERP systems on production unit

Based on information obtained after ERP system implementation," the amount of goods under the production is reduced in the production unit" (mean 3.53), " more dominance on production factors is induced" (mean 3.83), " lower excess time is spent for production" (mean 3.8), "production overhead reduces" (mean 3.66), "deviations reduce» (mean 3.86), and "quality of products increases " (mean 3.53); This hypothesis is also accepted with respect to the total mean (3.7) and T-test was performed to determine whether there is significant difference in the mean value and this test revealed a significant difference. The next hypothesis was explained to examine the impact of ERP systems on the inventory control unit and the degree of impact was evaluated with respect to two conditions stated in question 4 and the following results were obtained (Figure 7):

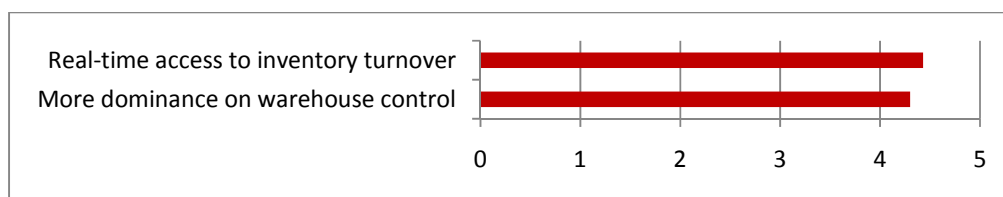


Figure 7. The impact of ERP systems on inventory control units.

The results showed that implementation of the ERP system on inventory control unit "creates more dominance on warehouse control" (mean 4.43), and "access to inventory turnover becomes possible at any time" (mean 4.43): thus hypothesis 1-4 is accepted because total average is 4.36 and T-test was performed to determine whether there is significant difference in the mean value and this test revealed a significant difference. Hypothesis 1-5 surveys the impact of ERP systems on warehouse unit and the results are as follows (Figure 8):

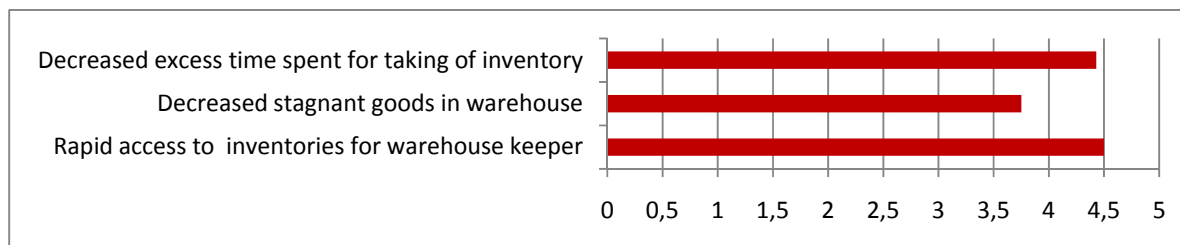


Figure 8. The impact of ERP systems on warehouse unit.

Based on information obtained from implementation of the ERP on warehouse unit, "the warehouse keeper accesses to inventories more quickly" (mean 4.5), "stagnant goods in warehouse reduces " (mean 3.75), and " less time is spent for taking of inventory (mean 4.43); Total average is 4.24 and T-test was performed to determine whether there is significant difference in the mean value and this test revealed a significant difference so this hypothesis is accepted. The next hypothesis examines the impact of ERP systems on logistics unit. The degree of impact was evaluated with respect to two conditions, and the results are as follows (Figure 9):

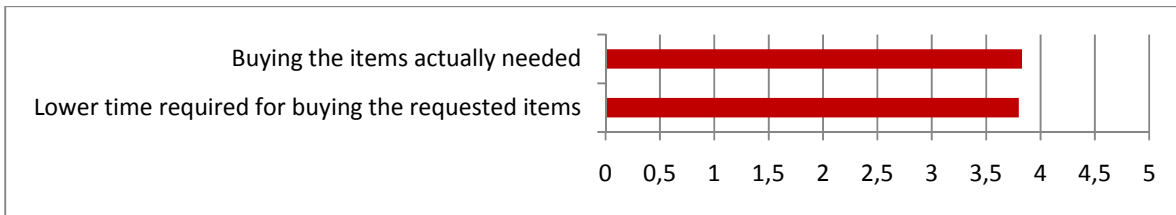


Figure 9. The impact of ERP systems on procurement unit.

Based on information obtained from implementation of the ERP on procurement unit, “the required time for purchasing the requested items is reduced” (mean 3.8), “items that are really required are purchased” (mean 3.83); Total average is 3.81 and T-test was performed to determine whether there is significant difference in the mean value and this test revealed a significant difference so this hypothesis is accepted. Finally, another hypothesis was expressed to examine the impact of ERP systems on the accounting unit, which the following results obtained (Figure 10):

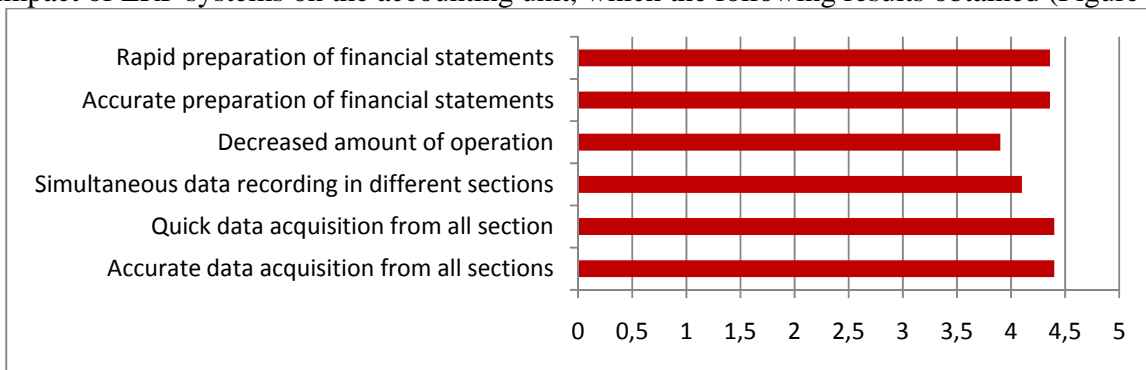


Figure 10. The impact of ERP systems on accounting unit.

Based on information obtained from implementation of the ERP system on accounting unit, “data acquisition from all sections of a company is performed with a higher accuracy” (mean 4.4), “data acquisition from all sections of a company is performed with a higher speed” (mean 4.4), “the required data in different sections is recorded simultaneously” (mean 4.1), “the amount of accounting operations is reduced” (mean 3.9), “preparation of financial statements is performed with a higher accuracy” (mean 4.36), and “it is also performed with a higher speed” (mean 4.36); total average is 4.25 and T-test was performed to determine whether there is significant difference in the mean value and this test revealed a significant difference this hypothesis is also accepted; considering what was said earlier, Hypothesis 1 is accepted. Second hypothesis was stated to investigate the impact of the ERP system on management accounting practices. The degree of change was measured by improvements in budgets and reports and the introduction of more advanced accounting practices. The questionnaire examined the opinion of respondents for statements about the impact of ERP on management accounting practices.

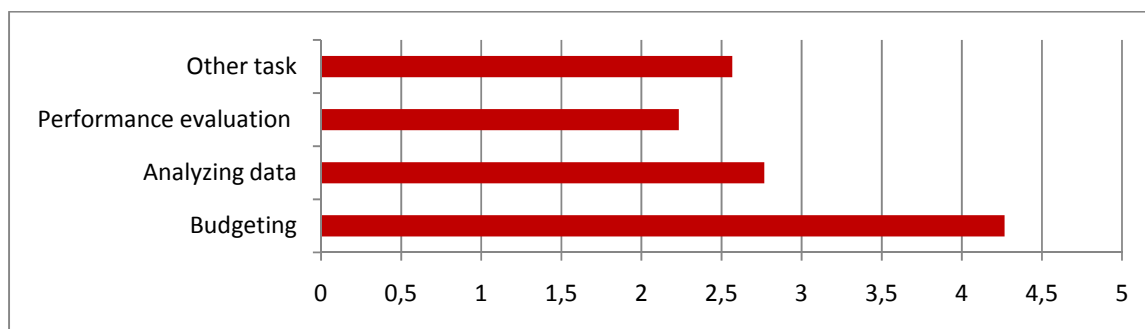


Figure 11. Impact of ERP systems on management accounting practices.

The result of the means indicates that those organizations which have adopted an ERP system “accuracy of reports has improved” (mean 4.23), “the ERP system has increased flexibility in information generation and acquisition” (mean 4.23), “less time needed for preparing budgets and reports” (mean 4.26) and “this system provides more real-time information” (mean 4.26) (refer to Figure 11). Independent samples T-test was run in order to find out if there were statistically significant differences in the mean values and the T-test reveal significant differences. Adoption of more advanced management accounting practices after the ERP implementations was also examined. Almost half of the respondents have introduced customer satisfactions surveys and financial key performance indicators (KPIs) after the ERP implementation. These were followed by the balanced scorecard and product lifecycle costing which have been employed by approximately third of the organizations (Table 2). Among ERP adopters there were only one organization who have not employed any advanced management accounting practices.

Table 2. Adoption of more advanced management accounting practices (ERP adopters)

Newer Accounting Practices	ERP adopters (%)	Newer Accounting Practices	ERP adopters (%)
Financial Key Performance Indicators	60	Activity Based Costing	70
Non-financial Key Performance Indicators	53.3	the Balanced scorecard	43.3
Target costing	60	Benchmarking	50
Product lifecycle costing	43.3	Customer Satisfaction surveys	60

On the basis of the discussion above, one can say that ERP implementations have affected management accounting practices in organizations. In the hypothesis 2 it was proposed that ERP systems would only have a minor improvement on budgets and reports. However, the results demonstrate that ERP systems have had more impact on budgets and reports because for instance, ERP adopters rated all the statements in the question higher.

Introduction of more advanced management accounting techniques were also considered to indicate changes in management accounting practices. ERP implementation has initiated

employment of modern management accounting techniques. On the basis of the evidence presented above, hypothesis is rejected. The effects of ERP implementations should not be considered minor but at least moderate.

Another hypothesis was stated to investigate the impact of ERP systems on management accountant's work and role in organizations. The degree of change was measured by the time use in different management accounting tasks before and after the ERP implementation as well as how management accountants perceive the four different skills suggested in the questionnaire before and after the ERP implementation. First, the results from the time use of management accountant are presented.

Figure 12 demonstrates that after the ERP implementation respondents have used less time in budgeting and cost accounting while more time has been devoted on analyzing data, performance evaluation and other tasks. Other tasks included leadership and strategy tasks, personnel issues, projects, business process development and tracing errors in the ERP system.

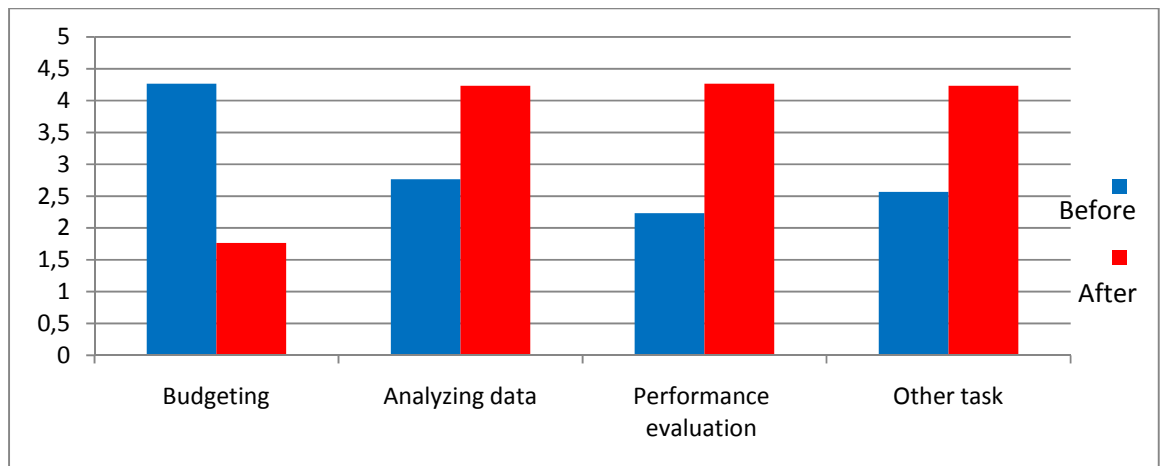


Figure 12. Time use in different management accounting tasks before and after ERP implementation

In the next phase, T-test for paired samples was run to discover if there are statistically significant differences in the results before and after the ERP implementation. The T-test confirms that there are significant changes in time use after the ERP implementation.

Have ERP systems altered the skill requirements of management accountants? This question was studied by requesting management accountants to rate four different skills considered important in the previous studies. The results indicate that (refer to Figure 13) that for ERP adopters the least important skill was IT knowledge whereas understanding both financial and management accounting was considered the most important skill.

In the next step, it was studied if the ratings of skills differ before and after the ERP implementation and whether these differences are significant. The results from the paired samples T-test indicate that there are significant differences on how management accountants consider all the four skills before and after the ERP implementation; after the ERP implementation all four skills have become more important.

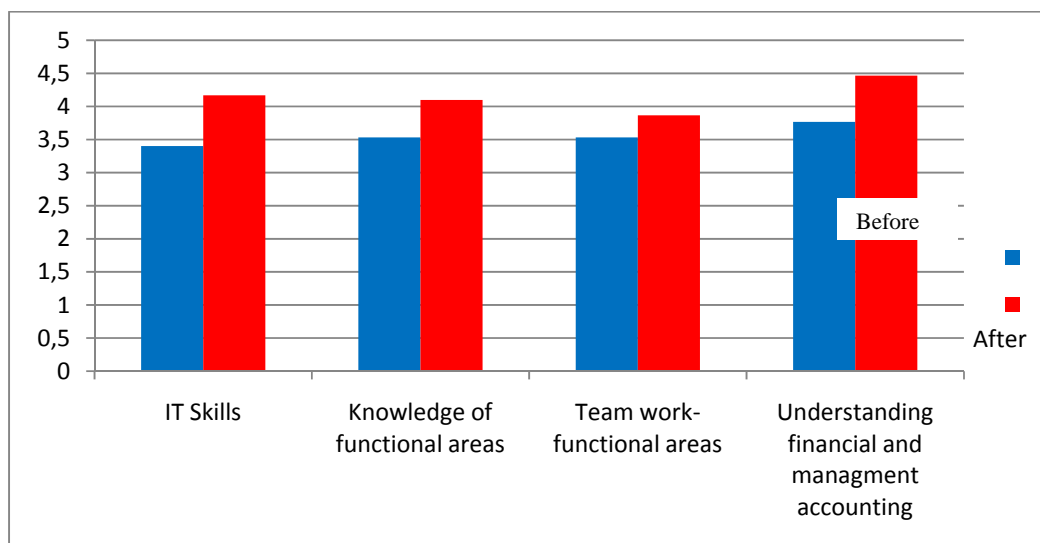


Figure 13. Impact of ERP systems on management accountants' skills

On the basis of the evidence presented above, the hypothesis 3 is accepted. Results from the T-test indicate that the time use of management accountants have changed after the ERP implementation (i.e. they have devoted less time on budgeting and more time on analyzing data) and in addition, the perceived importance of all the four skills have increased after the ERP implementation.

Discussion

The study confirms expectations that ERP systems have a desirable impact on different units; in the sales unit, the greatest impact is related to customers, and thus when this system is implemented, the customers are provided with services and goods as soon as possible without any delay, by which they are satisfied.

ERP system provides planning unit with timely information, so the staff of this unit will be able to do control and planning activities more easily. As a result, the flow of information from this unit to the production, warehousing and procurement units is facilitated.

It also has had a positive effect on production unit. By providing information in an appropriate time and thereby the increased dominance of supervisors on the factors of production, production process progresses as scheduled and deviations are reduced. Also, ERP system makes it possible to access inventory turnover in warehouse control unit, increasing dominance on it. As well, spending excess time for taking of inventory is reduced in warehouse unit due to accurate and timely information.

ERP system enables procurement unit to purchase items that are really necessary, because employees became aware of the scarcity of the required items in an appropriate time. And finally, the ERP system has a positive impact on the accounting unit. With this system, preparation of financial statements, which is very time consuming task requiring high precision, is done rapidly and accurately and since accounting records are systematically performed in different sections of an organization, the amount of accounting operations is reduced, and thus, the members can make use their time for analyzing data and solving the shortcomings of the system.

This research was a continuation to the previous research studying the impact of ERP systems on management accounting and the role and work tasks of management accountants. Compared to the previous research that has only found weak or moderate impact of ERP systems on management accounting since these systems have been considered best at transaction processing, the results from the empirical study indicate, however, opposite implications as the respondents considered the impact of ERP systems greater. There are many reasons which might explain the unexpected results. As Poston and Grabski (2001) have stated, benefits from ERP systems may be apparent only after 4 to 5 years from the implementation therefore conflicts may have resulted from the years in which companies have implemented these systems; however, it is noteworthy that the results of this research are consistent with the study by Tin Yu Hu (2006).

The other question concerning the time use of management accountants indicate that management accountants have used, in reality, significantly less time on preparing budgets and reports after the ERP implementation. For ERP adopters the extra time has been used on data analysis and performance evaluation. Management accountants use almost half of their work time, at least partly, on non-accounting tasks such as strategic and development work, personnel education and different projects. In conclusion, this research has provided some evidence to support Granlund's and Malmi's (2002) hypothesis which states that ERP systems would give controllers additional time to conduct more sophisticated analyses.

Furthermore, the results indicate that preparing different type of reports and budgets are still an important part of management accountants' work and that the implementation of the ERP system has indirectly improved the quality of the reports by providing more real-time and accurate information in a flexible way. Thus, one can say that by adopting these systems organizations are able to eliminate at least some of the problems associated with budgets. One of the respondents stated that after the ERP implementation information is more up-to-date and in addition, available to more people.

Further, this study confirms statements from the previous research concerning the changing role of management accountants (e.g., Maccarrone, 2000; Lodh and Gaffikin, 2003 and Scapens and Jazayeri, 2003) as a consequence from the ERP implementation. The results imply that adoption of ERP systems requires more IT skills, knowledge of other functional areas, teamwork skills with people in functional areas and knowledge of both financial and management accounting. Thus, the results indicate that controllers have to constantly develop their skills to be able to meet with the requirements posed by technology.

Considering that research hypotheses are accepted, it is suggested to organizations to emphasize on implementation of ERP system in order to: Enhance performance efficiency, reduce the time needed to perform routine accounting tasks, spend more time for data analysis and performance evaluation, and making use of benefits such as, providing timely data, improving the accuracy and validity of reports, and increasing the flexibility in creation and use of information.

Furthermore, the results indicate that when ERP system is implemented, accountants spend their time on non-accounting tasks, too. Thus, it is better for organizations to teach required skills and specializations to their accountants to avoid problems in dealing with these systems.

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