The Impact on the Organisational Effects of the Implementation of ERP and Selected Management Methods

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Abstract The aim of the article was the analysis of the relations of the coexistence of the Enterprise Resource Planning (ERP) and selected management methods: Benchmarking, Business Process Management (BPM), Business Process Reengineering (BPR), Balanced Scorecard (BSC), Competency-based Management (CBM), Customer Relationship Management (CRM), Knowledge Management (KM), Lean Management (LM), Outsourcing, Six Sigma, Total Quality Management (TQM). Contemporary organisations invest more and more in enterprise systems, including ERP systems, and high growth of these investments is still predicted. The complexity and dynamics of modern management systems in fact determine the simultaneous and sequential application of many management concepts and methods. In the main, however, the coexistence of implemented solutions should be beneficial for an organisation. The theoretical views on the relations of ERP and selected management methods have thus been empirically verified in the analysis of differences in the assessment of a number of effects of using the selected management methods in pairs with ERP as well as separately (business, efficiency, management, social and environmental effects) were investigated. One-way ANOVA was used for a sample of 167 Polish organizations.

Keywords ERP • Management methods • Organisational performance

1 Introduction

Contemporary organisations invest more and more in enterprise systems, including ERP systems, and high growth of these investments is still predicted. Enterprise resource planning (ERP) systems are found to be critical to organisational performance and survival (Liang and Xue 2004). Davenport (2000) underlines the ERP

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systems' potential to greatly enhance organisational performance and establish competitive advantage (Liang and Xue 2004). According to Cebeci, ERP systems play a vital role in today's organisations in fulfilling their visions and strategies (Cebeci 2009).

However, installing an enterprise system is not merely a computer project, but an expensive and risky investment, which impacts on a firm's primary and support processes, its organisational structure and procedures, the existing legacy systems, and the personnel's roles and tasks (Aloini et al. 2012, p. 183).

It is understandable that a significant body of research on ERP systems has been focused on the reasons for implementation, the challenges of the implementation project itself and critical success factors in implementation (Laframboise and Reyes 2005). Some studies also investigate the impact of ERP implementation on organisational performance (Liang and Xue 2004; Galy and Sauceda 2014). Although much research has been conducted on ERP implementation issues, there are still too few studies related to the post-implementation phase, including estimating the impact of ERP on organisational results not only just after or even during implementation, but in the long term (i.e. Laframboise and Reyes 2005; Varzandeh and Farahbod 2010; Satzinger et al. 2011), and most of them are concerned only with financial performance (i.e. Katerattanakul et al. 2014). According to Aloini et al., ERP has wide-ranging, cross-functional (difficult to isolate) and 'long-term' impact on resources and competences (Aloini et al. 2012, p. 183).

The purpose of this article is to present the results of the empirical research on the impact of organisational effects on the interaction between ERP systems and selected management methods. Much research has been carried out in an attempt to understand ERP's success. The bulk of this research body consists of variance research, which seeks to identify success factors and utilise these factors in order to explain variation in ERP implementation outcomes (Satzinger et al. 2011, p. 401). However, there is relatively little empirical research on the effects of using ERP together with other management methods.

2 ERP Definitions

Gable (1998), Holsapple and Sena (1999) define ERP system variously as a software, integrated standard software package, enterprise system, enterprise-wide system, enterprise-business system, integrated vendor software and enterprise application system (Al-Mashari et al. 2003). Gable (1998) adds an additional perspective to the ERP system as one that presents a holistic view of the business from a single information and IT architecture (Al-Mashari et al. 2003). However, ERP is a way of doing business, not merely a software package, as it combines both business processes in the organisation and IT into one integrated solution (Al-Mashari et al. 2003). According to Satzinger et al. ERP is a process in which an organisation commits to using an integrated set of software packages for key

information systems to improve the effectiveness and efficiency of the enterprise (Satzinger et al. 2011).

3 Empirical Research

The results of the study presented in this paper are part of the empirical research carried out by the Management and Marketing Systems Department of the Organisation and Management Institute of Wroclaw University of Technology in 2009. The aim of the study was defined very broadly: to explore the usage of management methods in Poland—in general and for various groups of organisations; to investigate the reasons for methods' implementation, the barriers to their implementation and their impact on organisational effects; and finally to explore the coexistence of management methods. A research tool was a survey questionnaire, which was addressed to enterprises functioning in Poland (differing in terms of business type, size and ownership form). The selection of the organisations was of a target-based character. We looked for those organisations that made use of one or more of the management methods under analysis and, at the same time, represented different types of activity, different sizes and forms of ownership. Only one survey was conducted, anonymously, in each company. The questionnaire was filled in by the employees who have a broad view of the whole enterprise (i.e. CEO, management team, quality specialists etc.). As a result of the research activities, 173 questionnaires were returned to the authors. However, for the final analysis, a sample containing 167 correctly filled-out questionnaires was accepted (Bieńkowska and Zgrzywa-Ziemak 2011). The empirical study concentrated on 13 selected contemporary management methods. The number of the enterprises that have implemented particular methods has been presented in Fig. 1. ERP was implemented in 49 enterprises.

Table 1 presents the structure of the enterprises that declared the implementation of ERP.

3.1 The Coexistence of ERP and Selected Management Methods

As can be observed in Fig. 2, ERP is usually connected with controlling, CRM, BPM and TQM implementation (in more than 50 % of cases) but statistical analyses showed that not every relationship is significant (Table 2). However, there is a large number of organisations that do not implement any of the analysed methods.

From the results presented in Fig. 2, it emerges that for each pair, the most numerous group in particular pairs is the situation in which neither of the methods is used. The results of the statistical analyses (the cross tabulations, chi-squared test)

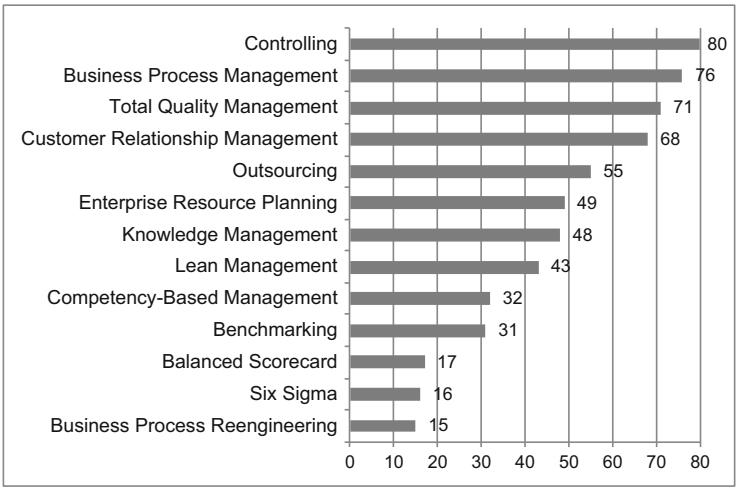

Fig. 1 The number of the enterprises which have implemented particular management methods (*Source*: Bieńkowska and Zgrzywa-Ziemak (2013))

Table 1 The structure of the analysed organisations using ERP in terms of their selected characteristics

	The number of researched organisations	The percentage of organisations using ERP (%)
Activity type		
Production	63	33.33
Service	54	24.07
Production-service	37	35.14
Commercial	13	16.67
Organisation size		
Up to 50 people	44	27.27
51–250 people	53	20.75
251–500 people	33	24.24
Above 500 people	37	48.65
Headquarters' location		
In Poland	139	26.62
Abroad	28	42.8
Total	167	29.34

Source: The authors' own study

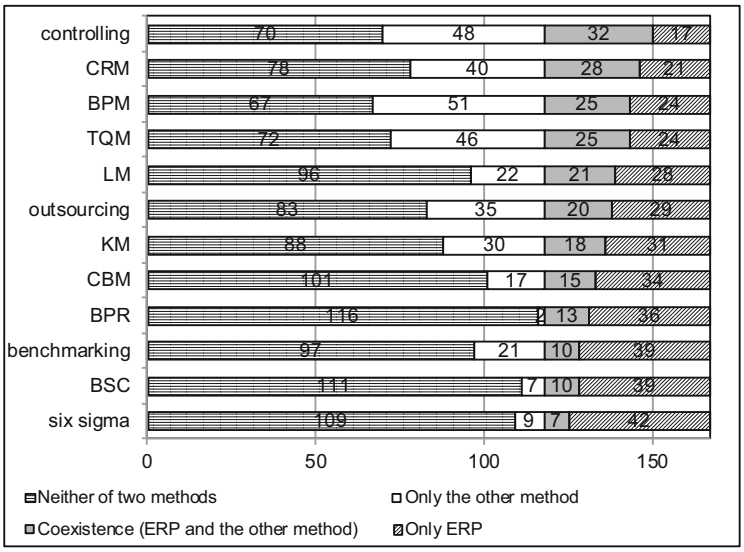

Fig. 2 The coexistence of ERP with particular management methods (*Source*: The authors' own study)

show that the differences in the groups are statistically significant for the following pairs: ERP-BSC, ERP-BPR, ERP-CRM, ERP-controlling, ERP-LM, ERP-CBM (presented in Table 2). The values calculated from the cross tabulations are under a great influence of the number of the coexistences of particular methods.[1]

3.2 The Effects of ERP Usage

Five groups of organisational effects were determined[2]: business, efficiency, management, social and environmental effects. The items that build the scale of each group of effects, together with the internal consistency factor (measured by Cronbach α parameter consistency), are presented in Table 2.

The enterprises that implemented ERP benefit from significantly greater business effects than those enterprises who do not use this method (Table 3 presents the statistical results).

[1] The authors realise that the major difficulty that occurred in the course of the study was the different number of the existence of particular methods in the organisations under study. This fact affects the 'potential' possibilities of the coexistence of these methods.

[2] 39 organisational results were listed by the research team. Each result was evaluated on the Likert's scale of 1–5 (from 'very negative' to 'very positive') by the respondents. The exploratory factor analysis was used to group the results. Factors satisfy the condition of normality (Kolmogorov–Smirnov test was used).

Table 2 The coefficients of the internal consistency of the scales of variables making up the effects of the application of management methods ($n = 167$)

Effects	α Cronbach parameter
Business effects	0.818
1. General improvement of financial results in the organisation 2. Improving profitability and organisation management efficiency 3. Improving financial liquidity 4. Increasing the revenues 5. Guaranteeing the condition for the long-term existence of the organisation 6. Eliminating 'bottlenecks' and barriers in enterprise development 7. Increasing the speed of capital turnover in the organisation 8. Improving organisational adaptation to environment changes 9. Reducing the business risk 10. More effective achievement of the organisational goals	
Efficiency effects	0.822
1. Increasing organisational productivity 2. Increasing the quality of products 3. Improving the storage system, including the decrease of stock level 4. Improving the timely rate of production orders 5. Decreasing the time of new product development 6. Implementing more ecologically friendly technologies 7. More effective and more rational organisational resources management 8. The decrease in functioning costs, the decrease of prodigality in the enterprise 9. Increasing work productivity	
Social effects	0.802
1. Increasing employees' motivation 2. Improving the satisfaction of employees 3. Improving the innovation and creativity of employees 4. Improving job involvement 5. Improving the competences of employees	
Management effects	0.762
1. Improving task coordination in management 2. More accurate decisions in the process of organisation management 3. Reducing the time of decision-making 4. Improving the competence and responsibility division on various levels of management 5. Improving the information flow in the organisation 6. Providing various levels of management with additional multidimensional information necessary in enterprise management 7. Improving the integration of employees and the cooperation between different organisational units	
Environmental effects	0.673
1. Improving communication between the organisation and environment 2. Increasing the synergy effect in cooperation with customers and/or business partners 3. Increasing customers' satisfaction 4. Improving relations with suppliers	

Source: Bieńkowska and Zgrzywa-Ziemak (2013)

Table 3 The use of ERP and business effects

	ERP implemented[a]	ERP not implemented	*t*-statistic	Significance level	Effect size measure[b]
Business effects	M = 3.87, SD = 0.47	M = 3.65, SD = 0.38	t(153) = −3.03	p = 0.003	g = 0.530

Source: the authors' own study
[a]*M* mean, *SD* standard deviation
[b]Hedges' g statistic was used (an effect size of 0.2 is a small effect, an effect size of 0.5 is a medium effect, and an effect size of 0.8 is a large effect; g can take values greater than 1)

The effects were even higher when ERP was implemented together with other researched management methods.

3.3 The Effects of the Coexistence of ERP and Other Methods

In order to investigate the relationship between the coexistence of selected management methods and the effects of their use, the analysis of variance method was performed. One-way ANOVA was used to determine whether the business effects depend on using a pair of management methods (ERP and another method), a single method or no method at all. Tukey post hoc test was used for multiple comparisons. All statistically significant relations between the coexistence of ERP with selected management methods and organisational effects are listed in Appendix.

The coexistence of ERP and other methods allowed—in some cases—all groups of effects to be better achieved. It should be noted that the use of ERP and other methods did not, in any of the cases, lead to a reduced assessment of organisational effects. Key research findings are as follows:

- In almost all the analysed methods—11 out of 12 (no significant relation is present in the case of BPR)—their use in conjunction with ERP brought greater business effects than in those cases where ERP was not implemented. Moreover, in as many as nine methods (out of 12), the implementation of the pair of methods with ERP led to greater business effects than the use of ERP only or any other method on its own (these methods were: BPM, LM, Controlling, CBM, Benchmarking, Six Sigma, BSC, Outsourcing and CRM). The implementation of ERP together with KM or TQM brings higher business effects than the use of KM or TQM only.
- The coexistence of ERP and TQM or BSC leads to higher efficiency effects than the implementation of ERP only. The results show that ERP supports CRM, because the efficiency effects are higher when a pair of methods is implemented than when CRM is used alone.

- The findings show that the social and management effects of the coexistence of ERP and KM, CBM or BSC are higher for the pairs of methods than when ERP is used alone (but not vice versa).
- The coexistence of ERP and CRM leads to significantly higher environmental effects than for either method used separately.
- The coexistence of ERP and BPR has no impact on the organisational effects.

4 Discussion and Conclusions

The research proved that using ERP significantly benefits the business effects responsible for overall condition of the entire organisation (including general improvement of financial results, profitability, revenues, adaptability etc.). This result correlates with numerous literature statements (Li et al. 2008; Cebeci 2009; Aloini et al. 2012). However, there was no significant relationship between ERP implementation and more specific effects—mainly efficiency and management effects. In the literature, attention is often directed to these kinds of benefits resulting from the use of ERP (Kale 2001; Hitt et al. 2002; McAfee 2002; Stratman and Roth 2002; Al-Mashari et al. 2003; Hendricks et al. 2007). On the other hand, the coexistence of ERP and other methods allowed better effects to be achieved—not only business effects, but also efficiency, management and environmental ones.

The results of the research point to the fact that the implementation of ERP together with controlling gives higher effects than for either method used separately. Among the assumptions of implementing ERP are, most of all, the increase in transparency and information relevance as well as the integration of the information resources of various enterprise functional areas (Al-Mashari et al. 2003; Hendricks et al. 2007; Aloini et al. 2012). Thus, ERP can constitute an important tool for improvement of decision-making process (Kluge and Kużdowicz 2011). Furthermore, the two methods used together, give an opportunity of basing decisions on the same information. However, the findings show that controlling also supports ERP.

Operations' coordination, which is the consequence of the use of the ERP system as well as having access to reliable information, is essential to achieve a given level of organisation efficiency in almost all conditions. However, it should be emphasised that the use of ERP in an organisation seems to support in particular the orientation process and this is the reason for the correlation with BPM. This is because, among other reasons, as claimed by Kieser and Walgenlach work in the ERP system is determined by the standard of task execution defined in the phase of process modelling, and system configuration can take place only in accordance with the adopted specifications (Kieser and Walgenlach 2003). The fundamental role that the process models play in the implementation and use of ERP systems in enterprises is stressed by Kasprzak (2005). The findings prove that ERP and BPM are complementary methods—the methods mutually support one another in achieving the organisational goals.

According to this study's research results the use of ERP together with BSC leads to an increase in nearly all effects (business, managerial, social as well as efficiency) in relation to the use of ERP on its own—without BSC. Management in a balanced way should provide the avoidance of the defects resulting from the phenomenon of suboptimalisation. Thus, the decisions made by the management members should be based on the data coming from different areas of the organisation and ERP allows for the aggregation of such information. 'Moreover, it is very important to match the ERP package objectives with business objectives' (Cebeci 2009, p. 8902). Balanced scorecard helps to define key objectives, benefits and expectations, thus the expectations for ERP are clear (Cebeci 2009).

The use of ERP together with TQM leads to higher efficiency and business effects. In the literature there are some who suggest that ERP can be used as an enabler for the implementation of effective TQM. Moreover, Li et al. examined the relationship between TQM and ERP implementation, operations management, customer satisfaction and firm's performance and they claim that those methods are complementary, due to the organisation of an enterprise's processes, and they believe that ERP plays an important role in high-level management and in the coordination of procedural quality functions (Li et al. 2008). Furthermore, in the view of Schniederjans and Kim (2003), TQM gives proper ERP support—corporate culture and organisational infrastructure (after: Kowalak 2009). Laframboise and Reyes believe that a successful implementation of ERP and TQM provides a potentially complementary resource leading to the competitive advantage (Laframboise and Reyes 2005). Schniederjans and Kim (2003) argued that change methods, such as BPR, and catalysts for change methods, such as TQM, must be aligned to support the implementation of ERP (after Laframboise and Reyes 2005). Jha and Joshi (2007) emphasized the relevance of TQM for the facilitation of ERP implementation (after Movahedi and Nouri Koupaei 2011).

In the context of quality there is another method that should be mentioned—Varzandeh and Farahbod studied the role of ERP among selected industries to achieve 'Six Sigma' quality (Varzandeh and Farahbod 2010). The new Six Sigma is data-driven and needs a reliable source of information. Enterprise resource planning would guide the organisations and provide them with a road map to better meet customers' needs with virtually zero dissatisfaction. The research findings prove that ERP and Six Sigma mutually support one another in achieving the business and management goals.

The analysis of the results shows that the coexistence of ERP and CRM leads to higher efficiency effects than using CRM alone. Order cycle times can be reduced, resulting in improved throughput, customer response times, and delivery speeds stemming from ERP implementation (McAfee 2002; Cotteleer and Bendoly 2006; Hendricks et al. 2007). But according to research results, ERP and CRM mutually support one another in achieving business goals. On the one hand, ERP systems provide the infrastructure that facilitates a long-term relationship with customers (Hendricks et al. 2007), on the other, it is possible that with the integration of ERP and CRM the IT system is more customer-oriented.

In the literature, ERP is often combined with KM (Bieńkowska et al. 2013). It is stressed that the integration of both methods gives special benefits (e.g. Metaxiotis 2009), that ERP implementation is a KM tool (e.g. Chan et al. 2009) or KM must be strategically and systematically incorporated into each implementation phase of ERP-implemented projects (McGinnis and Huang 2007). Pang-Lo found that the introduction of ERP and KM has a positive impact on organisational performance (Pang-Lo 2011). The research results state that implementation of ERP together with KM brings higher social effects than the use of ERP only; however, a reverse situation did not occur.

The coexistence of benchmarking and ERP leads to higher business and efficiency effects—these methods can be considered as complementary, they assist each other in achieving organisational goals. From the point of view of benchmarking (especially internal), the importance of ERP systems is enormous. They allow updated information to be generated from each functional area of the enterprise (Kowalak 2009) and from the organisational environment (Koslowski and Strüker 2011). On the other hand, the designers of ERP systems, by using the effects of the benchmarking analysis, can identify the weaknesses of the implemented systems and take actions to improve the efficiency of the whole organisation.

Moreover, CBM with ERP leads to achieving higher business and management effects than for either method used separately, and ERP paired with CBM leads to better social effects than when used on its own (however, a reverse situation did not occur). In relation to the CBM, what is definitely helpful is an HRM module, which allows for the flow of current information. The research results confirm this relationship with regard to the business and efficiency effects but do not support the conjecture on the management effects. This is puzzling, since in principle ERP managers should facilitate rational decision-making (in the CBM as well). On the other hand, CBM supports ERP in the field of orientation towards the employee, and therefore the employee's knowledge and skills. This translates to higher business, performance and management effects achieved by an organisation in which two methods coexist, rather than those achieved when only ERP is implemented (without CBM).

Contemporary organisations need to apply various management methods and concepts (Jagoda and Lichtarski 2003; Sułkowski 2004; Sobczak 2009; Szpitter 2011). The results of the research confirm this thesis—implementing two methods helps to achieve a synergistic effect, which would not be achieved if the concepts were used separately. In the view of the authors, the issues presented in the paper should be treated as an introduction to the discussion of the coexistence of ERP and other management methods. What seems to be particularly important is to indicate the methods, to determine the influence of the implementation of particular management methods on the efficiency of ERP itself and to define the model solutions in this respect. At the same time, changing perspective into more general one could bring interesting results in the field of the coexistence of contemporary management methods and, in particular, to the issue of determining the character of the

relations of particular method pairs, as well as examining the order and scope of implementing the methods.

Other problems that need further investigation are the changes of the relations in time, the indication of the complementary methods, the consideration of their possible hierarchisation, the order of implementation, the possibility of the substitution use of methods (some methods can be more adjusted to the existing solutions in the organisation or to the organisational culture than others), the clear indication of which methods can be really considered contradicting, and how the character of the relations changes with time.

Appendix

See Table 4.

Table 4 Results of one-way ANOVA: the coexistence of ERP with selected management methods and organisational effects (only significant mean differences are included)

		N	M	SD	Sig. lev.	F statistic
Business effects						
ERP and BPM	No method	62	3.66	0.43	0.000	$F(3,151) = 8.92$; $p < 0.001$
	Only BPM	46	3.64	0.31	0.000	
	Only ERP	22	3.62	0.39	0.000	
	ERP and BPM	25	4.08	0.42	–	
ERP and KM	No method	81	3.63	0.37	0.001	$F(3,151) = 4.99$; $p < 0.01$
	Only KM	27	3.70	0.43	0.037	
	ERP and KM	18	4.03	0.56	–	
ERP and controlling	No method	64	3.61	0.37	0.000	$F(3,151) = 6.84$; $p < 0.001$
	Only controlling	44	3.70	0.40	0.014	
	Only ERP	15	3.61	0.42	0.014	
	ERP and controlling	32	3.99	0.44	–	
ERP and CRM	No method	71	3.62	0.39	0.000	$F(3,151) = 5.72$; $p < 0.01$
	Only CRM	37	3.71	0.36	0.032	
	Only ERP	20	3.70	0.44	0.062*	
	ERP and CRM	27	3.99	0.45	–	
ERP and CBM	No method	93	3.67	0.34	0.000	$F(3,151) = 10.53$; $p < 0.001$
	Only CBM	15	3.52	0.58	0.000	
	Only ERP	32	3.70	0.43	0.000	
	ERP and CBM	15	4.23	0.32	–	
ERP and TQM	No method	69	3.67	0.40	0.021	$F(3,151) = 3.82$; $p < 0.05$
	Only TQM	39	3.62	0.36	0.013	
	ERP and TQM	25	3.94	0.54	–	

(continued)

Table 4 (continued)

		N	M	SD	Sig. lev.	F statistic
ERP and benchmarking	No method	90	3.62	0.38	0.000	$F(3,151) = 8.37$; $p < 0.001$
	Only benchmarking	18	3.78	0.35	0.012	
	Only ERP	37	3.76	0.42	0.003	
	ERP and benchmarking	10	4.26	0.44	–	
ERP and BPR	No method	106	3.64	0.38	0.008	$F(3,151) = 4.47$; $p < 0.01$
	ERP and BPR	13	4.03	0.43	–	
ERP and outsourcing	No method	77	3.64	0.39	0.001	$F(3,151) = 5.28$; $p < 0.01$
	Only outsourcing	31	3.68	0.36	0.014	
	Only ERP	27	3.74	0.46	0.068*	
	ERP and outsourcing	20	4.04	0.43	–	
ERP and six sigma	No method	100	3.65	0.39	0.001	$F(3,151) = 5.86$; $p < 0.01$
	Only six sigma	8	3.59	0.16	0.008	
	Only ERP	40	3.80	0.46	0.030	
	ERP and six sigma	7	4.26	0.31	–	
ERP and BSC	No method	102	3.65	0.39	0.000	$F(3,151) = 8.26$; $p < 0.001$
	Only BSC	6	3.63	0.24	0.008	
	Only ERP	37	3.75	0.43	0.001	
	ERP and BSC	10	4.29	0.34		
ERP and LM	No method	90	3.65	0.35	0.000	$F(3,151) = 8.86$; $p < 0.001$
	Only ERP	26	3.66	0.40	0.000	
	Only LM	18	3.64	0.52	0.001	
	ERP and LM	21	4.12	0.42	–	
Efficiency effects						
ERP and BPM	No method	64	3.71	0.51	0.048	$F(3,154) = 3.86$; $p < 0.05$
	Only BPM	48	3.62	0.52	0.009	
	Only ERP	23	3.62	0.46	0.030	
	ERP and BPM	23	4.02	0.42	–	
ERP and controlling	No method	66	3.59	0.52	0.052*	$F(3,154) = 2.65$; $p = 0.051$
	ERP and controlling	30	3.88	0.50	–	
ERP and CRM	No method	73	3.70	0.54	0.098*	$F(3,154) = 2.71$; $p < 0.05$
	Only CRM	39	3.63	0.46	0.044	
	ERP and CRM	26	3.96	0.48	–	
ERP and CBM	No method	97	3.69	0.51	0.020	$F(3,154) = 3.39$; $p < 0.05$
	Only CBM	15	3.57	0.56	0.023	
	Only ERP	32	3.70	0.46	0.056*	
	ERP and CBM	14	4.10	0.41	–	

(continued)

Table 4 (continued)

		N	M	SD	Sig. lev.	F statistic
ERP and TQM	No method	71	3.62	0.56	0.011	$F(3,154) = 3.52$; $p < 0.05$
	Only ERP	23	3.65	0.38	0.085*	
	ERP and TQM	23	4.00	0.52	–	
ERP and benchmarking	No method	92	3.66	0.52	0.005	$F(3,154) = 3.81$; $p < 0.05$
	Only benchmar.	20	3.74	0.47	0.074*	
	Only ERP	36	3.71	0.44	0.028	
	ERP and benchmar.	10	4.21	0.45	–	
ERP and six sigma	No method	103	3.67	0.53	0.025	$F(3,154) = 2.83$; $p < 0.05$
	ERP and six sigma	7	4.22	0.31	–	
ERP and BSC	No method	106	3.66	0.52	0.003	$F(3,154) = 4.26$; $p < 0.01$
	Only ERP	36	3.71	0.43	0.017	
	ERP and BSC	10	4.23	0.45	–	
LM and ERP	No method	91	3.64	0.52	0.013	$F(3,154) = 3.59$; $p < 0.05$
	LM and ERP	20	4.01	0.48	–	
Management effects						
ERP and BPM	No method	64	3.68	0.50	0.092*	$F(3,155) = 2.80$; $p < 0.05$
	Only BPM	47	3.63	0.49	0.043	
	Only ERP	23	3.61	0.43	0.081	
	ERP and BPM	25	3.94	0.46	–	
ERP and KM	No method	83	3.62	0.53	0.013	$F(3,155) = 3.32$; $p < 0.05$
	Only ERP	31	3.65	0.40	0.063	
	ERP and KM	17	4.02	0.51	–	
ERP and CBM	No method	97	3.64	0.49	0.002	$F(3,155) = 4.95$; $p < 0.01$
	Only ERP	33	3.63	0.41	0.005	
	ERP and CBM	15	4.12	0.42	–	
ERP and benchmarking	No method	91	3.65	0.49	0.018	$F(3,155) = 2.97$; $p < 0.05$
	Only benchmarking	20	3.67	0.51	0.072	
	Only ERP	38	3.69	0.45	0.056	
	ERP and benchmark.	10	4.13	0.39	–	
ERP and six sigma	No method	102	3.66	0.49	0.016	$F(3,155) = 3.12$; $p < 0.05$
	Only six sigma	9	3.62	0.58	0.064	
	Only ERP	41	3.71	0.44	0.046	
	ERP and six sigma	7	4.22	0.39	–	
Management effects						
ERP and BSC	No method	105	3.65	0.48	0.004	$F(3,155) = 4.04$; $p < 0.01$
	Only ERP	38	3.67	0.43	0.012	
	ERP and BSC	10	4.20	0.41	–	

(continued)

Table 4 (continued)

		N	M	SD	Sig. lev.	F statistic
LM and ERP	No method	91	3.67	0.50	0.024	$F(3,155) = 3.41$; $p < 0.05$
	Only ERP	28	3.62	0.44	0.034	
	Only LM	20	3.60	0.47	0.040	
	LM and ERP	20	4.01	0.42	–	
Social effects						
ERP and KM	Only ERP	31	3.50	0.51	0.031	$F(3,157) = 3.40$; $p < 0.05$
	ERP and KM	18	3.92	0.56	–	
ERP and CBM	No method	96	3.60	0.50	0.021	$F(3,157) = 4.22$; $p < 0.01$
	Only ERP	34	3.49	0.55	0.007	
	ERP and CBM	15	4.01	0.42	–	
ERP and BSC	No method	106	3.62	0.52	0.020	$F(3,157) = 3.51$; $p < 0.05$
	Only ERP	39	3.53	0.53	0.009	
	ERP and BSC	10	4.12	0.45	–	
Environmental effects						
ERP and CRM	Only ERP	21	3.49	0.40	0.019	$F(3,155) = 4.40$; $p < 0.01$
	ERP and CRM	28	3.96	0.46	–	
Only ERP	Only CRM	36	3.89	0.54	0.042	$F(3,155) = 4.40$; $p < 0.01$
	Only ERP	21	3.49	0.40	–	
	ERP and CRM	28	3.96	0.46	0.019	

*Slightly outside the significance level

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