

Exploring the Influence of the Use of an ERP System on Strategy Development in German and Polish Manufacturing Enterprises: An Empirical Investigation

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Abstract. This article aims to explore the effects of the use of an ERP system in a manufacturing company on strategy development as described by defined factors. The work is based on a survey and data obtained from 62 Polish manufacturing enterprises from the Lubuskie region, and from 23 German manufacturing enterprises from the Brandenburg region, in which the companies were categorised as either “construction” or “automotive” – a total of 85 manufacturing enterprises. Special attention was placed on the description of understanding the usage of an ERP system within a company. Nevertheless, relatively little information has been published that focuses on the post-implementation stages of ERP usage in a manufacturing company. In particular, this study pays attention to the likely consequences and results of the use of defined functionalities of an ERP system by employees. This is followed by a discussion of the results of the empirical studies and of key supporting literature. The summary indicates potential directions for further work.

Keywords: ERP system · Strategy development · Manufacturing enterprises in poland and in germany

1 Introduction

Many manufacturing companies invest in implementing ERP systems and, naturally, expect positive benefits to the firm. According to Al-Mashari (2001) [1], an ERP system is software which integrates information and processes within an organization. Many authors have researched critical success factors (CSF's) in the ERP implementation process [3, 6, 11]. However, we can observe a gap in the research on

This work was supported in part by the project: “Assessing the relationship between business strategy and knowledge transfer in German Manufacturing Enterprises” by the German Academic Exchange Service (DAAD), Bonn, Germany, Nr: 235585.

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W. Abramowicz et al. (Eds.): BIS 2016 Workshops, LNBIP 263, pp. 13–22, 2017.

DOI: 10.1007/978-3-319-52464-1_2

post-implementation ERP usage [5, 9]. Gable et al. [7] stated that organizational impact can define an ERP's success. Moreover, DeLone and McLean (2004) [2] observed that in the context of an ERP system, service quality, which includes the uses of the system and intentions of use, is the most significant factor of ERP success.

So, it is very important to adequately understand ERP usage. Based on the definition of Hsieh and Wang [10], this study focuses on ERP use by employees in a company. This is understood as the work by an employee in a defined module of the ERP system. The work must consist of at least 6 h per day, and be related to the department of the company in which the employee works, especially: (1) Production, (2) Customer Relationship Management (CRM), (3) Supply Chain Management (SCM), (4) E-Commerce. Our previous research, conducted in Polish manufacturing companies in the construction and automotive industries, showed that 52% of respondents were able to identify effects which directly resulted from ERP implementation within the company; usually only in the form of processes, which are carried out by the workers using the ERP system.

The analysis in this study also shows the relationships between the ERP system in the defined four areas of employee activity and also the four departments in manufacturing companies, along with factors describing strategy development. In accordance with Porter [20], in this study the following objectives in a company are defined in the context of strategy development (objectives that should be achieved by strategy realization), namely: (1) improving the competencies of staff, (2) increasing sales results, (3) improving process efficiency, (4) improving access to data and information, (5) increasing customer satisfaction, (6) increasing the number of new products and/or services, and (7) improving process quality. The proposed research model (which was based on data gathered from 62 Polish manufacturing companies from the Lubuskie region; and from 23 German manufacturing companies from the Brandenburg region) can enable management staff to analyze the progress of strategy realization over time as measured in the effects of the use of an ERP system.

Also, using survey data from Polish and German manufacturing companies, this study discusses the use of defined functionalities of ERP systems and how they affect the strategy realization processes in the cross-border cooperative region of Lubuskie/Poland-Brandenburg/Germany, in an approach that is expected to contribute to both academics and practitioners.

The remainder of this paper is organized as follows. A number of related works are briefly introduced in the following section. Section 3 presents an overview of the design of a research model and a hypothesis. Section 4 elaborates the research details and a structural model is presented. Closing remarks and a summary are then outlined in the last section.

2 Theoretical Framework and Research Model

Nwankpa and Roumanii (2014) [16] stated that the use of an ERP system can be understood as the exploitation of this system by employees to perform their tasks. Moreover, Nwankpa (2015) [15] pointed out that ERP usage is a consequence of a worker's competence in identifying and applying information technology. Therefore,

in this paper, and in accordance with Hsieh and Wang [10] and Moon [14] the use of an ERP system in a manufacturing company is defined as the work by a worker in a defined module of an ERP system: (1) Production, (2) Customer Relationship Management (CRM), (3) Supply Chain Management (SCM) and (4) E-Commerce. Also, the worker must use the functionality of the ERP system that relates to the department of the company in which he/she works, and the time must amount to at least 6 h per day.

A strategy in a company is typically described in a strategic document and is the configuration of a company's resources within a changing environment to achieve an advantage for the firm [12]. According to Johnson and Scholes [12] and our previous research [18–20], the implementation of a business strategy will be completed when a set of defined results is achieved. Moreover, based on previous research [17] this success is defined as the stage at which expected results in companies have been at least 70% achieved after a period of time of five years after the adoption of a strategic

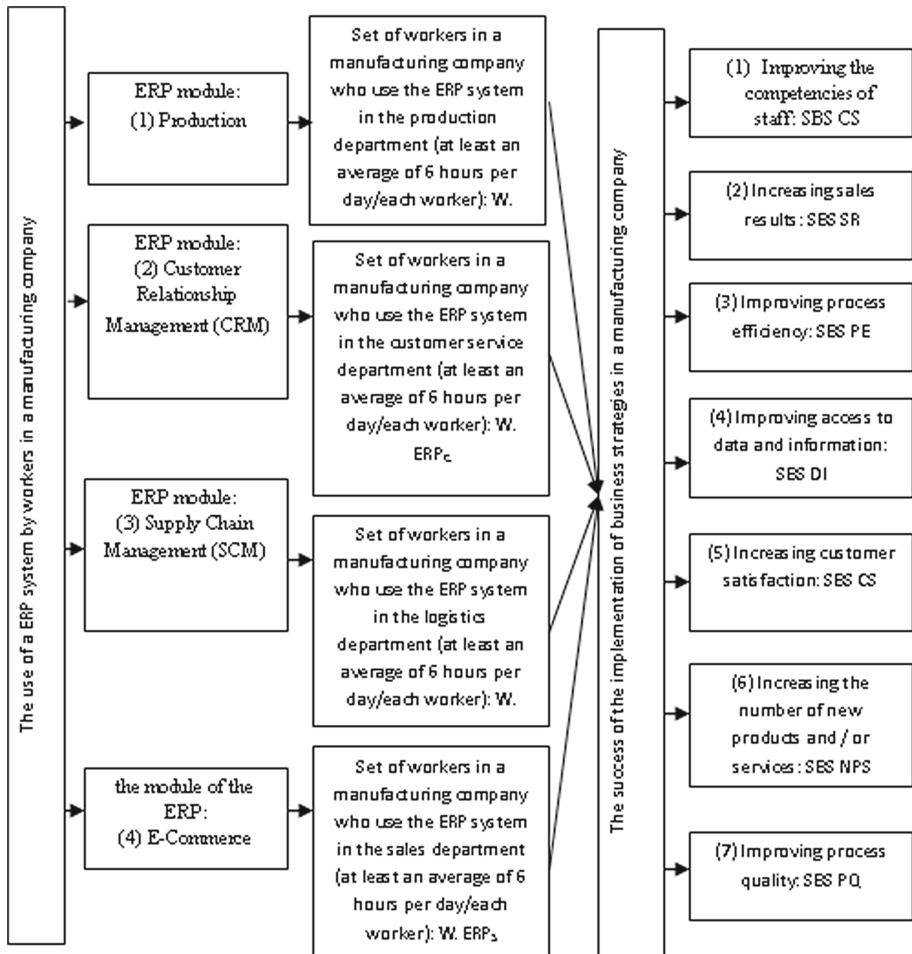


Fig. 1. A conceptual model

document. Therefore, the following factors describing the success of the implementation of business strategies in manufacturing companies are formulated: (1) improving the competencies of staff: SBS CS, (2) increasing sales results: SBS SR, (3) improving process efficiency: SBS PE, (4) improving access to data and information: SBS DI, (5) increasing customer satisfaction: SBS CT, (6) increasing the number of new products and/or services: SBS NPS, and (7) improving process quality: SBS PQ.

Kaplan and Norton [13] stated that relationships in a company exist between financial, customer and internal business processes; and learning and growth opportunities. Ehie and Madsen [4] pointed out that the effect of the use of an ERP system is a form of top management support, so we agree that the use of an ERP by employees in a firm should contribute to the effects of business strategy realization.

According to the results of the literature study, the following research model is defined (Fig. 1):

The conceptual model (see Fig. 1) posits (from the preceding argument) that the use of the defined module of the ERP system, by workers in a manufacturing company, will have an influence on the success of the implementation of business strategies.

3 Research Method

In order to verify the conceptual model (see Fig. 1), survey data were collected from 62 Polish manufacturing enterprises from the Lubuskie region and from 23 German manufacturing enterprises from the Brandenburg region between January to September, 2014 (Polish enterprises), and between November 2015 to January 2016 (German enterprises), a total of 85 manufacturing enterprises from the cross-border cooperative region of Lubuskie/Poland and Brandenburg/Germany in which the companies were categorised as either “construction” or “automotive”, or “others”. The profiles of the companies were strictly defined (see Table 1):

Table 1. Profiles of companies

Items	Frequency/Polish manufacturing enterprises (N = 62)	Frequency/German manufacturing enterprises (N = 23)
Construction	24 (39%)	5 (22%)
Automotive	30 (48%)	15 (65%)
Others	8 (13%)	3 (13%)

The research was specially provided in manufacturing companies from the Lubuskie/Poland and the Brandenburg/Germany cooperative region, because these regions form a special joint “cross-border area” and the chosen 85 manufacturing companies from the “automotive” and “construction” sectors contribute about 20% of those enterprises in the cooperative region.

The respondents were managers (over 80%) and chief executive officers and were surveyed in the form of direct meetings, email surveys and/or phone surveys. Moreover, this study only considered those manufacturing companies which stated, that they

have implemented an ERP system and that their workers use this system to help carry out their work activities.

The list of factors for the description of the use of the defined modules of ERP systems in Polish and German companies was based on feedback surveys and its sources are listed here:

The use of the defined module of the ERP system: the degree to which there is a statement of the use by workers of the defined module of the ERP system of at least an average of 6 h per day/each worker.

- WERP-factor1: I know that, in my organization, the use of the defined module in the ERP system is not very important for the achievement of strategic goals.
- WERP-factor2: I know that, in my organization, the use of the defined module in the ERP system is not important for the achievement of strategic goals.
- WERP-factor3: I know that, in my organization, the use of the defined module in the ERP system is marginally important for the achievement of strategic goals.
- WERP-factor4: I know that, in my organization, the use of the defined module in the ERP system is important for the achievement of strategic goals.
- WERP-factor5: I know that, in my organization, the use of the defined module in the ERP system is very important for the achievement of strategic goals.

Factors that describe the success of the implementation of business strategies in Polish and in a German manufacturing companies were based on feedback surveys and their sources are listed here:

The factors that describe the success of the implementation of business strategies in manufacturing companies: The degree to which the results from the realization of a business strategy in a company has been at least 70% achieved after a period of time of five years from the adoption of the strategy [17].

- SBS-factor1: I do not know that my work activities influence the success of the implementation of business strategies in my company.
- SBS-factor2: I know only a little that my work activities influence the success of the implementation of business strategies in my company.
- SBS-factor3: I know marginally that my work activities influence the success of the implementation of business strategies in my company.
- SBS-factor4: I know well that my work activities influence the success of the implementation of business strategies in my company.
- SBS-factor5: I know very well that my work activities influence the success of the implementation of business strategies in my company.

The surveys used for testing the research model (see Fig. 1) were developed by a five-point defining scale.

4 Research Results

The research model (see Fig. 1) was explored using a correlation approach with Statistica ver. 10.0. The data were carefully examined with respect to linearity, equality of variance and normality. No significant deviations were detected. Table 2 presents descriptive correlations for the main variables.

Table 2. Research results

Construct/Item: WERP-factor1/WERP-factor2/WERP-factor3/WERP-factor4/WERP-factor5 SBS-factor1/SBS-factor2/SBS-factor3/SBS-factor4/SBS-factor5	Correlation	r2	t	p
Polish manufacturing companies: Wi ERP _p /SBS CS	0.1368	0.0187	1.0694	0.2892
German manufacturing companies: Wi ERP _p /SBS CS	0.1111	0.0124	0.5125	0.6137
Polish manufacturing companies: Wi ERP _p /SBS SR	0.2929	0.0858	2.3730	0.0209
German manufacturing companies: Wi ERP _p /SBS SR	0.1331	0.0177	0.6153	0.5450
Polish manufacturing companies: Wi ERP _p /SBS PE	0.0693	0.0048	0.5381	0.5925
German manufacturing companies: Wi ERP _p /SBS PE	-0.2732	0.0746	-1.3013	0.2072
Polish manufacturing companies: Wi ERP _p /SBS DI	0.3359	0.1128	2.7619	0.0076
German manufacturing companies: Wi ERP _p /SBS DI	-0.2416	0.0584	-1.1412	0.2666
Polish manufacturing companies: Wi ERP _p /SBS CT	0.2594	0.0673	2.0808	0.0417
German manufacturing companies: Wi ERP _p /SBS CT	0.2875	0.0827	1.3756	0.1835
Polish manufacturing companies: Wi ERP _p /SBS NPS	0.3769	0.1421	3.1523	0.0025
German manufacturing companies: Wi ERP _p /SBS NPS	0.1476	0.0218	0.6837	0.5017
Polish manufacturing companies: Wi ERP _p /SBS PQ	0.2815	0.0793	2.2727	0.0266
German manufacturing companies: Wi ERP _p /SBS PQ	-0.0694	0.0048	-0.3187	0.7531
Polish manufacturing companies: Wi ERP _c /SBS CS	0.2866	0.0821	2.3171	0.0239
German manufacturing companies: Wi ERP _c /SBS CS	0.2061	0.0425	0.9654	0.3453
Polish manufacturing companies: Wi ERP _c /SBS SR	0.4144	0.1717	3.5266	0.0008
German manufacturing companies: Wi ERP _c /SBS SR	0.1078	0.0116	0.4967	0.6246
Polish manufacturing companies: Wi ERP _c /SBS PE	0.3526	0.1243	2.9185	0.0049
German manufacturing companies: Wi ERP _c /SBS PE	0.5190	0.2694	2.7826	0.0112
Polish manufacturing companies: Wi ERP _c /SBS DI	0.4248	0.1805	3.6350	0.0006
German manufacturing companies: Wi ERP _c /SBS DI	0.3615	0.1307	1.7770	0.0901
Polish manufacturing companies: Wi ERP _c /SBS CT	0.2182	0.0476	1.7317	0.0885
German manufacturing companies: Wi ERP _c /SBS CT	0.0484	0.0023	0.2220	0.8265
Polish manufacturing companies: Wi ERP _c /SBS NPS	0.1277	0.0163	0.9973	0.3226
German manufacturing companies: Wi ERP _c /SBS NPS	0.1884	0.0355	0.8792	0.3893
Polish manufacturing companies: Wi ERP _c /SBS PQ	0.2972	0.0883	2.4114	0.0190
German manufacturing companies: Wi ERP _c /SBS PQ	0.4704	0.2213	2.4429	0.0235
Polish manufacturing companies: Wi ERP _l /SBS CS	0.1968	0.0387	1.5546	0.1253
German manufacturing companies: Wi ERP _l /SBS CS	0.1881	0.0354	0.8777	0.3900
Polish manufacturing companies: Wi ERP _l /SBS SR	0.0966	0.0093	0.7515	0.4553
German manufacturing companies: Wi ERP _l /SBS SR	0.0881	0.0078	0.4053	0.6893
Polish manufacturing companies: Wi ERP _l /SBS PE	0.3692	0.1363	3.0772	0.0031
German manufacturing companies: Wi ERP _l /SBS PE	-0.1135	0.0129	-0.5235	0.6061
Polish manufacturing companies: Wi ERP _l /SBS DI	0.1611	0.0259	1.2643	0.2110
German manufacturing companies: Wi ERP _l /SBS DI	-0.2336	0.0546	-1.1008	0.2834
Polish manufacturing companies: Wi ERP _l /SBS CT	0.0018	0.0000	0.0137	0.9891
German manufacturing companies: Wi ERP _l /SBS CT	0.1486	0.0221	0.6886	0.4986

(continued)

Table 2. (continued)

Construct/Item: WERP-factor1/WERP-factor2/WERP-factor3/WERP-factor4/WERP-factor5 SBS-factor1/SBS-factor2/SBS-factor3/SBS-factor4/SBS-factor5	Correlation	r2	t	p
Polish manufacturing companies: Wi ERP _L /SBS NPS	0.3611	0.1304	2.9996	0.0039
German manufacturing companies: Wi ERP _L /SBS NPS	0.0131	0.0002	0.0600	0.9527
Polish manufacturing companies: Wi ERP _L /SBS PQ	0.3907	0.1527	3.2877	0.0017
German manufacturing companies: Wi ERP _L /SBS PQ	0.0378	0.0014	0.1733	0.8641
Polish manufacturing companies: Wi ERP _S /SBS CS	0.0622	0.0039	0.4824	0.6312
German manufacturing companies: Wi ERP _S /SBS CS	0.1653	0.0273	0.7679	0.4511
Polish manufacturing companies: Wi ERP _S /SBS SR	0.0321	0.0010	0.2485	0.8046
German manufacturing companies: Wi ERP _S /SBS SR	-0.0698	0.0049	-0.3208	0.7515
Polish manufacturing companies: Wi ERP _S /SBS PE	-0.0616	0.0038	-0.4778	0.6345
German manufacturing companies: Wi ERP _S /SBS PE	-0.1356	0.0184	-0.6274	0.5372
Polish manufacturing companies: Wi ERP _S /SBS DI	0.0279	0.0008	0.2165	0.8294
German manufacturing companies: Wi ERP _S /SBS DI	-0.3362	0.1130	-1.6358	0.1168
Polish manufacturing companies: Wi ERP _S /SBS CT	-0.1045	0.0109	-0.8138	0.4190
German manufacturing companies: Wi ERP _S /SBS CT	0.1239	0.0154	0.5724	0.5732
Polish manufacturing companies: Wi ERP _S /SBS NPS	0.1422	0.0202	1.1126	0.2703
German manufacturing companies: Wi ERP _S /SBS NPS	-0.0074	0.0001	-0.0339	0.9733
Polish manufacturing companies: Wi ERP _S /SBS PQ	0.2997	0.0898	2.4330	0.0180
German manufacturing companies: Wi ERP _S /SBS PQ	-0.0704	0.0050	-0.3236	0.7494

In our research results we can match the relationships between the use of an ERP system by workers and the success of the implementation of business strategies in manufacturing companies in German and in Polish companies. In Polish manufacturing companies we can observe many significant relationships between the use of an ERP system by workers and the success of the implementation of business strategies those manufacturing companies:

- workers in a manufacturing company who use an ERP system in the production department (at least an average of 6 h per day/each worker) can positively influence the improvement of access to data and information within a company (corr = 0.3359) and also the increase in the number of new products and/or services (corr = 0.3769).
- workers who use an ERP system in the customer service department can positively influence the increase in sales results (corr = 0.4144) and also the improvement of process efficiency (corr = 0.3526) and the improvement of access to data and information (0.4248).
- workers who use an ERP system in the logistics department can positively influence the improvement of process efficiency (corr = 0.3692) and also the increase in the number of new products and/or services (corr = 0.3611) and the improvement of process quality (corr = 0.3907).

According to our research results, we can also state that workers in Polish manufacturing companies who use the ERP system: module e-commerce in the sales department (at least an average of 6 h per day/each worker) have a negative influence on the improvement of process efficiency (corr = -0.0616) and also a negative influence on the increase in customer satisfaction (corr = -0.1045).

It is a surprising result, perhaps it due to the fact that this is a new module in the ERP system and users need still to improve their skills to fully use its functionality. However, this assumption requires further research and verification.

In German companies, the interaction of the use of the module of the ERP system: CRM by workers in the customer service department makes a significant contribution to an increase in process efficiency: SBS PE (corr = 0.5191) and also to an increase in process quality SBS PQ (corr = 0.4704). Unfortunately, other relationships between the use of the ERP system and the success of the implementation of business strategies in manufacturing companies are not expressed in German manufacturing companies. However, we can also find negative relationships (but also not so significant) between the use of the ERP system by workers in a manufacturing company and the factors describing the success of the implementation of business strategies. This is especially evident with workers who use the ERP system: module e-commerce in the sales department, as they may decrease sales results (corr = -0.0698), process efficiency (corr = -0.1356), access to data and information (corr = -0.3362, the number of new products and/or services (corr = -0.0074), process quality (corr = -0.0704).

We received similar research results from both German and Polish manufacturing enterprises (based on research results from Polish and German companies in a special joint cross-border region of Lubuskie/Poland and Brandenburg/Germany). So, the findings determine our further research in manufacturing enterprises from the cross-border cooperation region to explain this negative interaction.

Also similar research results were received for the positive relationship between workers in a manufacturing company who use the ERP system: module CRM in the customer service department (at least an average of 6 h per day/each worker) who can have a positive influence on the improvement of process efficiency (corr = 0.3526). This finding corresponds with the statement of Ghalayini, Noble and Crowe [8], that the use of an ERP system within a company can facilitate the evaluation of organizational performance at the strategic level.

Our research model was developed and tested. It was evident that the use of an ERP system can play an important role in the success of the implementation of business strategies in manufacturing companies in German and in Polish companies (based on a total of 85 manufacturing enterprises from the cross-border cooperation region which exists between Poland and Germany).

5 Conclusions

The results of our research demonstrate the positive influence of workers in a manufacturing company, who use the ERP system: module CRM in the customer service department (at least an average of 6 h per day/each worker), on the improvement of process efficiency. This was evident in Polish and in German manufacturing companies, based on a total of 85 manufacturing enterprises from the cross-border cooperative region of Lubuskie/Poland and Brandenburg/Germany in which the companies were categorised as either “construction” or “automotive”. Unfortunately, on the other hand, a negative effect is also present in relationships between the use of the ERP system: module e-commerce by workers from the sales department and an improvement in

process efficiency. Therefore, it would be useful to provide research to identify a practical exploitation of this finding.

Furthermore, the research results indicate, in accordance with the views of Kaplan and Norton [13], Ehie and Madsen [4], that the use of an ERP system: especially with the CRM module may influence the success of the implementation of business strategies in German and Polish manufacturing companies. The research is focused on those manufacturing companies which have implemented an ERP system and that their workers use this system to help carry out their work activities.

This may possibly be a good recommendation for an area of further cooperation between Polish and German manufacturing companies in the cross-border cooperation region which exists between Poland and Germany regarding the field of post-implementation ERP usage in a manufacturing company.

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Business Information Systems Workshops
BIS 2016 International Workshops, Leipzig, Germany,
July 6-8, 2016, Revised Papers
Abramowicz, W.; Alt, R.; Bogdan, F. (Eds.)
2017, XXVIII, 430 p. 85 illus., Softcover
ISBN: 978-3-319-52463-4