FACTORS AND REASONS FOR THE SUCCESSFUL IMPLEMENTATION OF SAP SYSTEMS

Based on the opinion of business students

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Abstract

The authors conducted a questionnaire survey with students of the Faculty of Foreign Trade at the Budapest University of Economics and Business in 2024. The main objective of the research was to find out the students' opinions on what factors they believe play a role in the successful implementation of an SAP integrated ERP system by a company. Only students who have studied SAP in the classroom and who have both theoretical and practical knowledge and ability to use the system were included in the research. These students had attended a minimum of six months of SAP training, but there were also respondents who had already completed the Faculty's advanced course, i.e. had at least one year of SAP knowledge of S4 SAP Hana. The results of the research showed that the success of the implementation of the system depends essentially on the hard enterprise characteristics and the reason for the implementation is the optimization and standardization of organizational processes.
Keywords: *SAP, implementation, success factors*
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Introduction

Today, an increasing proportion of companies has some form of ERP system. This is necessary because they want to optimise their processes, reduce their operating costs and create a more efficient, better structured company. For this reason, they expect the system to be implemented or already implemented, among other things, to enable them to manage and run their company assets and the company more optimally and cost-effectively. In their research, the authors undertook to conduct a study on the success of SAP implementation, one of the largest providers of ERP systems.

The authors analysed the skills that are important for a successful SAP implementation from the company's side. They also discussed whether there is a difference in the perception of success factors based on whether or not someone has used SAP before, i.e. whether they were familiar with the system before university.

A few words about SAP

Founded in 1972, SAP (System Analysis Program Development) became the world's leading provider of client/server business applications by the 1990s (Holmes et al., 1999) and has maintained its leadership in ERP software to this day.

ERP (Enterprise Resource Planning) stands for enterprise resource planning. ERP software is an IT product that supports core business processes in an integrated system. These processes include manufacturing, purchasing, logistics, materials management, inventory management, finance, controlling, human resources, and all other business processes that are integral to a company. It is important to note that SAP was one of the first companies to develop software for business solutions (SAP, 2024).

Today, SAP provides cloud-based solutions rather than server-based solutions, following industry and global trends.

SAP is a modular system because of its history. For each business process, it has developed a separate, yet coherent, integrated module(s). Some of these modules are listed here without claiming to be exhaustive:
- MM - material management
- SD - sales and distribution
- PP - production planning (production support)
- FICO - Finance and controlling
- HR - Human Resources etc. (SAP modules, 2024)

SAP has become one of the world's leading companies, with more than 105,000 employees in 157 countries around the world. It has more than 280 million cloud subscribers. SAP customers generate 87% of all global commerce and 85 of the world's 100 largest companies are SAP companies (www.sap.com).

The reason why companies choose SAP can be found in Tököli's 2016 article on the need for digital transformation. The SAP conference at the time was also organised around this theme. In his article, he highlights the words of the head of SAP Hungary, who said that a good example of transformation is that the largest of the taxi companies does not have a single car.

He also points out that while in the early 1900s manufacturing and industry dominated, and later advertising became very important, in today's world marketing plays less of a role, people can easily find the information they want. These changes are prompting companies themselves to open their doors to the digital world, which they can already do with a suite of business management systems.

In a 2012 study, Findik and colleagues argue that in today's information age, firms need to automate their service and production systems, one of the foundations of which is the implementation of ERP, or enterprise resource planning. They also stress that a good ERP system can easily reinforce industry practices and provide the company itself with a standardised business process. They also stress that these systems allow for creativity, which is essential in today's modern age. In 2022 Archana, Varadarajan and Medicherla state that ERPs are also implemented to improve the decision-making processes within an organization. (Archana et. al., 2022)

Shang and Seddon, in a study published in 2000, group the benefits and usefulness of ERP implementation along several dimensions. These are the operational, management, strategic, IT infrastructure and organisational capabilities. These are also subdivided into sub-dimensions, where further detailed and expected benefits that companies can expect and experience from an ERP implementation are also presented. These are none other than those within the operational dimension: cost reduction, cycle time reduction, productivity improvement, quality improvement and customer service improvement. Within the management dimension, there are three sub-groups: better resource management, better decision making and planning, and improved performance. The strategic dimension includes: supporting business growth, supporting business alliances, developing business innovation, developing cost leadership, creating product differentiation (including customisation) and developing external relationships with customers and suppliers. Within IT

infrastructure, they list building business resilience to current and future changes, reducing IT costs themselves and increasing IT infrastructure capacity. Within the organisational dimension, four sub-dimensions are listed: supporting organisational change, facilitating business learning, empowerment, and developing a shared vision (Shang et. al. 2000)

According to the authors, these dimensions may induce the implementation of an SAP system, while another reason to implement SAP may be when the company has reached a size where it is no longer able to manage its data on paper or with excel spreadsheets. At the same time, the convenience that a well-functioning system can provide, such as direct connection to various government portals, and all the other things that the service provider (SAP) undertakes, i.e. legal compliance, should not be forgotten.

In 2010, Maguire and colleagues wrote that 63% of large ERP customers acknowledged that their system implementation was beneficial and successful (Maguire et al., 2010). Interesting fact that another research that was conducted by Panorama in 2021 about ERP project success showed 91,7 % success rate. (Panorama, 2021)

It is important to stress that there are many suppliers of ERP systems. However, the five largest ERP system vendors are SAP, PeopleSoft, Oracle, J.D. Edwards and Baan. SAP is the acknowledged market leader with a market share of more than 50 per cent (Findik et al., 2012).

Material and method

As mentioned in the abstract, the authors conducted a questionnaire survey in 2024 at the Faculty of Foreign Trade of the Budapest University of Economics and Business Administration with the participation of students who study ERP systems, including the SAP integrated system, on a theoretical and practical level during their university studies.

The researchers point out that only 120-150 students have the opportunity to take this course every six months, as it is included in the compulsory curriculum for international business students. The success of the course is also demonstrated by the steady increase in the number of students who are willing to take the course, not only from this subject but also from other subjects in the Faculty. A further demand from students has been the possibility to learn a module of SAP after the basic studies, possibly at an advanced level, which they have been able to do since this year. Thus, some students have been studying SAP MM and SD modules at a very high level on a weekly basis for a year. By completing these courses, students have the opportunity to find employment in organisations where they need to manage SAP at user and key user level. Feedback from students shows that many students take advantage of this opportunity and specifically and purposefully seek only those employers where they can successfully apply this knowledge.

At the university, students will learn the S4 Hana on premise system and will acquire not only practical but also important theoretical knowledge related to it: project knowledge related to the implementation, legal obligations, differences between systems, steps in the SAP implementation process. During the course, the students had to voluntarily and anonymously fill in a digital questionnaire which basically focused on the factors that contribute to a successful SAP implementation in an organisation. The authors adhered to the university's GDPR regulations during the study and took care to ensure that the respondents could not be re-identified during the analysis. The questionnaire was available in digital format on the internet for the research participants to complete. Before the questions were sent to the students, the researchers also conducted a test survey, i.e.

five students had to answer and interpret the questionnaire. Since the respondents had no problems with the questionnaire's interpretability, the questions were sent out unchanged.

In the end, 112 respondents took part in the survey. The sample size calculator (https://www.calculator.net/sample-size-calculator.html) was used by the researchers to estimate the sample size. 150 respondents were used as a starting point at the 95% confidence level, resulting in a sample of 109 respondents. The authors accepted a sample of 112 respondents.

The questionnaire consisted of self-compiled questions based on categorical and metric variables. The metric variables were five-point Likert scales, with a value of one indicating not at all characteristic or not at all strong, and a value of five indicating fully characteristic or very strong. The questionnaire consisted of 16 questions, all of which were closed questions. The authors used the split half method to check the appropriateness of the questionnaire. Based on this, the Spearman-Brown coefficient ranged from 0.852 to 0.912, which is a very strong value, and thus the authors considered the questions to be appropriate. The questions of the questionnaire could be divided into three broad groups. The structure is presented in Table 1.

Table 1 Structure of the questionnaire

Specific characteristics of respondents	Skills needed to run SAP	Factors for the implementation of SAP
Gender of respondents Age of respondents Respondents' work experience and industry, if they have worked Knowledge of ERP systems before university education The SAP module used before university education	Which soft and hard skills are needed to make the system work? How much can SAP knowledge be paid on the labour market?	What soft skills are required from the project manager to successfully implement SAP? What business factors are needed for a successful SAP implementation? What employee skills are needed for a successful SAP implementation? Why are corporate governance systems important within an organisation?

Source: authors' own table

The study sought to answer a number of research questions. In this study, two of them are examined:

What are the reasons for implementing SAP as an enterprise management system within an organisation?

What hard and soft organisational characteristics are needed for a successful SAP implementation?

Along the lines of these questions, the following hypotheses are proved by the authors of the study:

Hypothesis 1 According to the opinion of the sample, the basic reason for the successful implementation of an SAP is to optimize and simplify business processes.

Hypothesis 2 According to the opinion of the sample, soft organizational characteristics typically play a more important role as success factors than hard organizational characteristics in an SAP implementation.

Before analysing the hypotheses, the authors summarised the specific characteristics of the sample in Table 2.

Table 2 Specification of the sample

Featured on	N	%
No	Male: 48 Female: 64	Male: 42.9 Female: 57.1
Did you have any work experience?	No: 7 Worked half a year or less: 9 Worked more than half a year but not more than one year: 17 More than one year working: 78	No: 6.3 Worked half a year or less: 8.1 Worked more than half a year but not more than one year: 15.3 Worked more than one year: 70.3
Did you use any of the SAP modules before your university education?	No: 91 Yes: 21	No: 81.2 Yes: 18.8

Source: authors' own table

The average age of respondents was 22.74 years. Women were more represented in the sample. 22.9% of the men had used the system prior to education, compared to 15.6% of the women. 6.4% of boys were not working at the time of the survey, compared to 6.3% of girls.

Results

In order to test the validity of the first hypothesis, respondents were asked to rate the importance of the given reasons for implementing an SAP system on a five-point Likert scale. One was not important at all, while five was absolutely important. Table 3 summarises the mean and standard deviation of the responses to each reason.

Table 3 Reasons for implementing SAP

Reasons	Average	Source
The organisation can build closer relationships with customers and suppliers.	3.78	0.946
It connects the organisation with national and international market players.	4.09	0.833
It names the responsibilities.	4.09	0.742
Standardise corporate information.	4.20	0.733

It provides comprehensive organisational control over the activities of the organisation.	4.20	0.769
Manage corporate activities in an integrated way.	4.21	0.807
It streamlines the flow of information within the organisation.	4.21	0.796
Promotes up-to-date information about the organisation.	4.22	0.835
The organisation can save resources.	4.23	0.816
Standardise your business processes.	4.26	0.732
Simplifies organisational processes.	4.29	0.767
It helps the competitiveness of the company.	4.35	0.681

Source: own table

The data in the table show that organisations are most likely to implement SAP for competitiveness reasons. In this respect, respondents were very unanimous, with the lowest standard deviation. Competitiveness is enhanced, among other things, by the fact that the system helps to standardise and simplify business processes, saves resources and allows the user to obtain up-to-date information from SAP on a regular basis.

Interestingly, the fact that the system allows for the naming of responsibilities and tasks was not considered as important by respondents. This is a very important issue for all organisations. On the one hand, it is important to know who is responsible for what tasks, how long they are to be carried out and to be able to trace the steps of the task, so that the cause of errors can be identified more quickly and with fewer resources. And SAP provides one of the best tools for this, linking each activity action to roles and, most importantly, documenting the activity elements step by step, linked to user and time. Overall, however, the high average scores show that the reasons listed above support the motivation for the implementation. For further analysis, the authors grouped the statements in Table 3 into factors. Factors were constructed using Varimax rotation and all variables were suitable for factorization. KMO and Barlett's test results. Explained coefficient of variance: 69.265%, which is quite adequate. The authors also plotted the Cronbach's Alpha values and they were very high for all factors, i.e. above the limit value of 0.5.

Table 4 Factors for the reasons for implementing SAP

Factor	Item	Component			Cronbach Alpha
		1	**2**	**3**	
I.	Promotes up-to-date information about the organisation.	0.832			0.892
	Simplifies organisational processes.	0.762			
	It streamlines the flow of information within the organisation.	0.681			
	Standardise your business processes.	0.631			
	It provides comprehensive organisational control over the activities of the organisation.	0.590			
	Standardise corporate information.	0.560			

II.	The organisation can save resources.		0.812		0.785
	It helps the competitiveness of the company.		0.803		
	Manage corporate activities in an integrated way.		0.588		
III.	It connects the organisation with national and international market players.			0.809	0.774
	The organisation can build closer relationships with customers and suppliers.			0.779	
	It names the responsibilities.			0.626	

Source: authors' own table

Three factors were constructed, which were given the following names based on their component values:

Factor I   Simplify and standardise the organisation's processes.
Factor II.   Optimising business processes.
Factor III   Building relationships with business and market players.

Using these three factors, the authors created clusters to investigate how homogeneous groups emerge from the sample through the given factors. Using the K-means procedure, the researchers created three clusters. The cluster centres are shown in Table 5.

Table 5 Cluster centres

	Cluster			
	1	**2**	**3**	**4**
Factor I	0.66961	-0.58891	0.62630	-1.45742
Factor II	0.26570	-1.01468	0.53226	1.25167
Factor III	0.67911	0.00213	-1.55437	-.15239

Source: authors' own table

Based on the cluster centres, the following clusters were formed:

Cluster 1   Those who think that all three factors could be important reasons for implementing SAP.
Cluster 2   Cluster 2   includes those who do not really rate any of the factors as a strong reason.
Cluster 3   This is the group of respondents who would implement SAP both for process optimisation and standardisation.
4.   Cluster A basic reason could be to optimise processes in this group.

The first group of respondents includes 44, the second 37, the third 18 and the fourth 13.

Based on the research results, the majority of the students believe that SAP should be implemented, among other things, to optimise and standardise processes, and the authors therefore accept their first hypothesis.

For the analysis of the second hypothesis, respondents were also asked to decide on a five-point scale which factors play an important role in the successful implementation of SAP. One was not at all typical and five was completely typical. Table 6 shows the mean and standard deviation of the scores for each factor.

Table 6 Business factors for successful SAP implementation

	Factors	Average	Source
Hard factors	Adequate financial capital	4.48	0.710
	Appropriate hardware	4.45	0.708
	Wide range of products and activities	3.61	1.134
	Integrated structure of activities	4.11	0.853
	Diversified business plan	3.78	1.020
	Advanced IT support	4.45	0.745
Soft factors	Innovative corporate culture	3.99	1.009
	A strong knowledge management approach	4.16	0.876
	Intercultural corporate culture	3.49	1.147
	Supportive leadership	4.35	0.732
	Strong trust values within the organisation?	4.11	0.953
	Adequate training and further training structure	4.34	0.823
	Supportive staff attitude	4.08	0.882

Source: authors' own table

According to the respondents, the most important capabilities required for a successful SAP implementation are adequate financial and IT resources and hardware that can run such a system successfully. The hard characteristics, therefore, have a major impact on how positive a project to launch an integrated system will be. From the soft characteristics of an organisation, the existence of appropriate training on the system, a supportive management approach to the project, a strong knowledge management system that can feed information into and extract knowledge from the system, and an integrated management of corporate knowledge within SAP can all contribute greatly to success.

The researchers also looked at which traits are strongly and typically positively correlated. Correlation analyses were able to confirm the following strong significant relationships:

1. Between financial capital and corresponding hardware (r:.697)
2. The company's product and activity scale, and the diversified business plan (r:.594)
3. between strong IT support and strong corporate knowledge management approach and system (r:.634)
4. The relationship between financial capital and supportive leadership (r:.628)
5. A supportive staff attitude and an appropriate training and development structure (r:.596)

It can be seen that there is a strong link not only between hard and hard, soft and soft elements for a successful SAP implementation, but also between hard and soft elements, i.e. the factors form a very strong network system for an integrated system to be successfully implemented. The authors have also analysed whether there is a difference in the perception of success factors based on whether one has used SAP before or not, i.e. whether one was familiar with the system before

university education. The independent sample t-tests confirmed that respondents did not think differently about any of the factors based on whether or not they had worked with the system before. The results of the study are summarised in Table 7.

Table 7 T-statistics results p=0.05

	T-test	p
Advanced IT support	0.445	0.329
Adequate capital	1.413	0.080
Appropriate hardware	1.155	0.125
Wide range of products and activities	0.159	0.437
Integrated structure of activities	-0.495	0.311
Diversified business plan	0.785	0.217
Innovative corporate culture	-0.284	0.389
A strong knowledge management approach	0.379	0.353
Intercultural corporate culture	-0.777	0.219
Supportive leadership	0.654	0.259
Strong trust values within the organisation	1.081	0.141
Adequate training and further training structure	0.799	0.216
Supportive staff attitude	0.736	0.232

Source: authors' own table

In the light of the above data, the authors do not accept their second hypothesis, because hard attributes are perceived by respondents to be more important for successful adoption than soft attributes.

Comments and suggestions

The authors' study outlined the factors for implementing one of today's most popular corporate governance systems and discussed the reasons why an organisation might decide to implement such a costly but useful system. In the literature section, the researchers showed that SAP is one of the most widely chosen and operated systems in the world, and that its diverse portfolio of modules allows it to cover a wide range of activities in companies in different sectors. The empirical study was carried out with the participation of students who are learning and using the system in practice and are aware of its integrative nature. They are also aware of the challenges an organisation faces when it decides to implement SAP. Their view is that, fundamentally, the most compelling reason for organisations to implement SAP is to optimise, streamline and standardise processes. On the one hand, this also means rethinking tasks and activities within an organization and possibly redesigning responsibilities. Another important finding of the study is that the interviewees believe that hard company characteristics definitely play a role in making the implementation successful. Here the role of capital and an adequate IT background is cardinal. Of course, it should not be forgotten that without the right management support and without a well-developed knowledge management system, no implementation project can be successful.

In the future, it will be worthwhile to conduct the research also in companies that have already gone through at least one implementation and their experiences during the project will be useful to analyse not only for the researchers but can also provide an important knowledge and experience base for companies that are planning to implement SAP.

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