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EVALUATION OF SOCIO-ORGANIZATIONAL ENVIRONMENT OF ERP PROJECTS

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Abstract
The paper presents the method supporting analysis and evaluation of organizational and socio-psychological issues of ERP projects. It is based on socio-organizational implementation determinants (SOID) model. The aim of the study is to assess the usefulness of this model for evaluation – and consequently improvement – of this critical aspects of ERP implementation projects.
SOID consists of over 160 elements influencing the effectiveness of ERP implementation projects. They all deal with human aspects of system projects and can be embraced in three categories: enterprise culture, project management and knowledge management. The methodology of SOID application is outlined. Then, based on a case study of Polish company, possible utilization of its results for project development sake is described.

Keywords
ERP implementation, project management, organizational culture, knowledge management.

Introduction

ERP systems belong to the most technologically advanced types of business supporting software. They are very important for contemporary corporations what is mirrored in the rising number of their implementations. But to maximize business value from their application it is necessary to improve a realization process first. It is because the implementation process is the weakest point in IT-related value chain, what is typical for most of IT business solutions [1].

Implementation of integrated information systems is a very challenging process [2]. Realization of ERP system requires high level of involvement of different company resources for relatively long period of time what makes it very challenging and difficult. But difficulty in such projects is not only a problem of their scope, time and budget; even more important is knowledge required for conducting changes and organizational culture that should be modified to support and preserve them. From this point of view changes related to ERP implementation should be classified as 'fundamental' [3].

There are many perspectives to observe and analyze effectiveness of ERP implementation: tactical and strategic [4], technical and behavioral [5], focused on organizational fit [6], etc. But implementation determinants can also be seen from another perspective, which consists of two categories: determinants directly referring to participation of people in change process and other ones. Let the pretext for the second perspective be the assumption, that people are the most important success factor for any organizational change. It is often expressed explicitly [7] or by stressing importance of such change effectiveness factors as: organizational culture [8], personnel attitudes [9], leadership [10, 11], motivation process and instruments [12, 13], knowledge and competences [14], delegation [4], teamwork [9, 15], or resistance to change and strategies to diminish it [16, 17], etc.

Such perspective enable enumeration of the implementation determinants with a human as a common denominator. This set encompasses all the socio-psychological determinants, as well as that subcategories of organizational and technical elements which refer to human factor in implementation process, e.g. team forms of work organization, design of reward and motivation systems, process of personnel recruiting and development, technical and business knowledge management, tools and methods supporting interpersonal communication, group work, etc.

Due to the lack of sufficient number and quality of dedicated publications discussing "soft" aspects of ERP realization, the mentioned set of determinants was built upon achievements of other streams in management science. To the most prominent ones belonged: project management, change and knowledge management, organizational development and behavior. The extensive literature review of 104 publications within the outlined areas, presented in extended form in the authors' paper [18], led to the enumeration of 167 elementary project determinants. They formed a foundation on which Socio-organizational Implementation Determinant (SOID) model was built.

The gathered factors were organized within three groups, referring to:

- organizational culture,
- project management,
- knowledge management.

Each category contains 6 additional elements embracing elementary factors. This additional level is due to maintenance reasons. It helps to understand specificity of the factors collected on the third level of the model and through that to make a better analytical use of them.

Based on the model structure and content a questionnaire was prepared. A questionnaire is one of the most important tools in SOID applications. It serves for the gathering of data on the importance of each elementary factor and referring as-is state in the analyzed ERP project. After gathering stage data is transferred to an analytical form. Based on the findings from it practical recommendations on implementation process improvement are made.

Detailed description of those basic tools together with the SOID methodology is presented in the next chapter. Then a case study of model application in one of the biggest Polish mobile telecommunication companies is described. At the end the main benefits from using the SOID model are summarized and its' basic limitations pointed out.

Methodology

It is assumed, that factors referring to the place and role of human in ERP implementation projects belong to the most important determinants of the success or failure of such undertakings. The complexity level of ERP projects depends on many circumstances, and one of the most prominent ones is the size of a company in which the implementation takes place. The model was built and verified as a tool for implementation projects taking place in big companies. Although smaller projects can also benefit from its utilization, it requires more in-depth studies to adjust the model itself and provide basic guidelines.

The aim of the study is to assess the usefulness of the SOID model for evaluation – and consequently improvement – of the critical socio-organizational aspects of ERP implementation projects. In particular the question is which area – from the ones covered by the scope of the model– represents the biggest need for improvements. Deepened analysis of the most problematic areas can lead to elementary factors, which are the final objects of improvement actions.

Use of the presented model is based on the opinions of a carefully chosen group (groups) of respondents. The group selection depends on the reason for which the model is applied.

If the reason is to identify the critical human aspects of the implementation, and then to map them against as-is description, the simplest and probably the most effective way is to ask experts. An expert here should be a person with long and diverse experience in the realization of such kind of systems in a similar environment e.g. an ERP consultant.

Experts are given basic questionnaires (based on the SOID model structure) and asked to assign the importance to all of the factors. A 3 point scale is used: 0 – factor is not important for the development of the upper-level determinant; 1 – factor is important for particular determinant development, and through this for ERP project effectiveness; 2 – factor is critical for implementation effectiveness in the area outlined by superior determinant. Simultaneously respondents answer the question on presence/absence of the particular factor in the analyzed case (W parameter).

The notes for each and every determinant are encompassed within the range $<0, 2>$. This is why the average from all the answers (i) should be counted for further analysis. It is useful for an analytical sake to break the range into 3 smaller ones. They are named A (critical factors), B (important factors) and C (unimportant factors) and presented on Fig. 1.

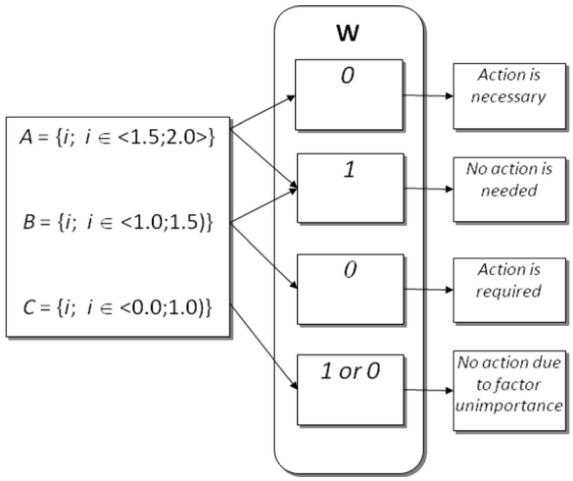

Fig. 1. The follow-up due to the importance and presence of the factor.

More information from a SOID application can be acquired when engaging an additional group of respondents for instance internal project managers and/or specialists. They undergo the same procedure of data gathering. The opinions of this group (i_p) are then confronted with an "expert profile" that is based on experts opinions (i_e). Thanks to this action it is possible to observe not only what is the most important from an expert point of view, but also what is important for internal personnel. Although the basic recommendations and actions should be based on the expert profile (due to the broader knowledge and more objectivism of external experts), opinions of the latter group may play an important role in explaining sources of identified problems or in predicting future ones. The mode of results interpretation and actions recommendation for two groups of respondents is presented in Fig. 2.

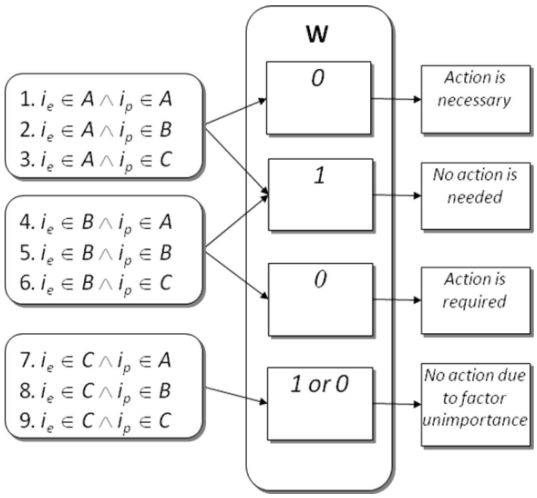

Fig. 2. The follow-up due to the importance and presence of the factor in two-group case.

Of high importance is also the fact, that during such research internal system personnel acquire knowledge on what can be important for implementation success. If the educational reason is the only one research can be limited to one internal group of respondents.

In any case when internal system personnel is involved SOID can be beneficial also for project managers for checking the results of actions and initiatives they set up. It is possible simply by repeating model application (in a form limited to the verification of the presence/absence of success factors) before and after implementing changes.

One should remember, that opinions of internal people are usually subjective, influenced by the most recent or visible actions (e.g. training) and lack sufficient perspective (due to limited system knowledge and implementation experience). That is why they should not be the only basis for making decisions on project development.

Based on those assumptions most attention should be paid to 1-3 cases, which experts encounter as the most important for implementation success. The next group to be improved are cases 4–6.

High notes of internal personnel point out factors that are very important for that group of respondents regardless of expert notes. Lack of such factors in the implementation process can be a source of significant discomfort for them. For this reason sufficient attention should also be paid to cases, where $i_p \in$ A (4 and 7).

The stage of data gathering is followed by presentation of the results using a dedicated form presented in Fig. 3. In each such document data on elementary factors within every grouping determinant is collected.

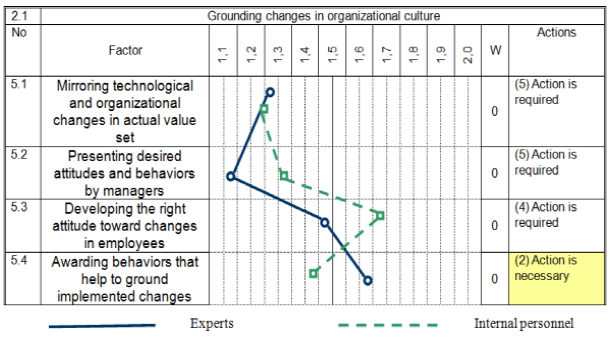

Fig. 3. Example of the analytical form.

The left column contains the list of factors. In the middle one the scale is drawn on which the importance of factors should be marked. After the individual notes are connected with a line, a determinant profile appears. Using different colors for each group

of respondents it is possible to observe the differences in perceiving these factors'. This information, together with that in column W (presence) determines the recommendations in the far right column formed according to rules from Figs. 1 or 2.

As mentioned before the chance for additional insights appears when the expert and internal profile are put together. The most interesting and valuable information comes when those two differ meaningfully (0,5 point or more of the average evaluation). Such situations are additionally marked as they are important for further results interpretation.

As a result of SOID application one receives information on the level of development within each model area. Based on that corrective or preventive actions can be undertaken. This is not a single note evaluation approach. Although generalization of results is possible, one should keep in mind, that the real value of model usage lies in detailed analysis of each and every factor, and they should be an actual base for project improving activities.

Case study: SOID in telecommunication company

Research object and respondent groups

The presented case study was designed to verify usefulness of the SOID framework for analysis, evaluation and development of big ERP implementation processes. It was applied to a big Polish mobile telecommunication company, where the project was quite advanced (most modules had already been implemented and most of specialists attention was dedicated to the development of additional functionalities, configuration of new scenarios, user training and support, etc.).

It was decided to apply SOID in a two-group mode. The first group of respondents consisted of SAP Polska consultants acknowledged with specificity of telecommunication industry. From the whole group of 60 consultants 32% returned correctly filled questionnaires. It is worth mentioning, that they were asked only for evaluation of factor importance, not for determining their presence or absence, although some of them were working for the analyzed company. Based on their opinions an expert profile of importance was created.

As the second group of respondents internal implementation staff (system specialists and managers) was chosen. Like in the previous case all 26 members of this group took part in the survey. Questionnaire return rate was in this group as high as 46%. They were asked for both: factor importance evaluation and factor presence determination as well.

Using the procedure described in the previous chapter data was collected and put into 18 analytical forms – each for one determinant with its' elementary factors. Due to limited space only 3 summarizing tables will be presented here – one for every model area. Each table enumerates determinants in one area and presents a number of factors in every group of analytical cases.

Results analysis

Out of 167 factors influencing effectiveness of ERP implementation 56 were identified as critical. Most of them (26) belonged to the area of project management (Table 2). The second area in terms of the number of critical factors identified was organizational culture (Table 1), and the last the area of knowledge management (Table 3).

Table 1
Summary of results for the area of organizational culture.

Determinant	Number of factors				
	Cases		Cases		Cases 7-9
	Total	To be changed	Total	To be changed	
Effective and efficient communication process	3	2	6	2	1
Employee involvement	3	1	4	4	–
Organizational openness for change	3	1	3	2	1
Features and attitudes of personnel	10	7	4	3	2
Grounding of changes in organizational culture	1	1	3	3	–
Change of the existing organizational culture	7	5	3	2	–
Total	**27**	**17 63%**	**23**	**16 70%**	**4**

Table 2
Summary of results for the area of project management.

Determinant	Number of factors				
	Cases 1–3		Cases 4–6		Cases 7–9
	Total	To be changed	Total	To be changed	
Leadership	5	2	5	5	–
Managers' roles	4	2	6	6	–
Compensation and motivation system	8	4	3	2	–
Empowerment	5	3	4	4	–
Teamwork	5	4	3	2	–
Coordination of activities	2	1	4	3	–
Total	**29**	**16 55%**	**25**	**22 88%**	–

Table 3
Summary of results for the area of knowledge management.

Determinant	Number of factors				
	Cases 1–3		Cases 4–6		Cases 7–9
Knowledge management	1	–	8	7	–
Use of knowledge management tools	2	1	13	8	3
Training and development of implementation staff	6	2	9	9	–
Training and development of end users	5	1	–	–	–
Acquiring knowledge from consultants	2	–	4	4	1
Documentation management	3	1	2	1	–
Total	**19**	**5 26,3%**	**36**	**27 75%**	**4**

However the most important from an analytical point of view is not the number of critical factors alone, but the number of those, which are absent in the analyzed process. From this standpoint the most problematic area was organizational culture, where 63% of all critical factors were absent and still awaited introduction into the implementation practice. Only slightly better in that context was the area of project management (55% to be changed). Relatively least to do was in the area of knowledge management – over 73% of all critical factors were already in place.

Much bigger differences between expert profile (and also personnel profile due to high results coherence) and implementation reality appeared with reference to the second group of importance (cases 4–6 from Fig. 2). In every model area the need for change referred to over 70% of important factors. It implied the high potential for project development also within that group. The worst situation here was the area of project management (88% of the important factors were missing), then knowledge management (75%) and organizational culture (70% still to be changed).

In the scope of development actions an additional 4 factors where differences between expert and personnel opinions exceeded the 0.5 point should be included. Two of them belonged to the area of knowledge management: 'treating mistakes as learning opportunities' and 'customer orientation' – both missing. The remaining two were covered by the knowledge management area: 'creating organizational and technological infrastructure for knowledge management' (missing) and 'document management system' (present).

Courses of improvement actions

The presented results provide knowledge on desired directions for improving the ERP implementation project. The rule is that in the first place project managers should concentrate their attention on the most problematic areas. In the presented case it means organizational culture and project management areas. Then managers may approach issues from the last area – the knowledge management one.

After satisfying most of the needs of the critical factors managers may switch their attention to the important ones (cases 4-6). In the first place they should pay attention to those factors, that were particularly important for employees (mentioned four with high opinion differences). Lack of elements important for internal personnel can be a source of their

dissatisfaction and potential decrease in project actions effectiveness. Then attention should be paid to the remaining factors in the areas of: project management, knowledge management and organizational culture.

One should remember that the analysis and recommendations presented here are at a very high level due to paper limitations. They are just for explanation purposes. They are far too general to plan any corrective action. To build a detailed plan of improvement requirements and actions an in depth analysis of elementary, low level factors should be used and their interrelations considered.

Final remarks

The SOID model provides cognitive structure for analysis and evaluation of ERP implementation processes with reference to socio-organizational aspects of such activities. Using the SOID model in the basic form can be beneficial for both: external consultants and internal project managers. In the first case the reason for model usage could be the need for identification of existing and potential problems, that may appear and influence the effectiveness of ERP implementation. It should help in planning particular actions aimed at the improvement of implementation process.

Managers can use this tool for the same reasons as the first group. Additionally they can apply the SOID model to:

- identify factors that are the most important for employees,
- monitor implemented changes aiming at project improvement,
- increase the level of consciousness regarding the importance of socio-organizational aspects for implementation success,
- increase employee participation in project improvement activities,
- identify differences in perception of specific factors by different project participants.

All of those SOID-enabled and supported actions should contribute to the improvement of ERP implementation processes and through this to increase the overall ERP investment effectiveness and efficiency.

There are also some limitations of SOID application. Beneath some of the most important ones with recommendations on how to cope with them.

The SOID model is a universal and flexible tool for analyzing the different issues most of which are hard to measure due to their qualitative nature. This "universality" and "flexibility" have their price: the tool is susceptible to the subjectivism of respondents, both in terms of factor importance as well as their presence or absence in the implementation practice. It is especially troublesome when discussing expert profile creation, on which all the future actions should be based. While it is impossible to remove all the subjectivism from the model application, it is possible to reduce it to a reasonable level. One can do it by increasing the quantity of respondent groups and – in terms of expert profile creation – by building expert respondent teams taking special care of their professional track. The background of experts should not be limited to technical aspects only, but should cover also organizational, business and social aspects.

As it was already stated in the text, application of SOID is also susceptible to different "actions" taking place in a short time distance from the survey (e.g. training, important changes in organization, etc.). They diminish the usefulness of the results of a SOID survey. To avoid the "action bias" contextual results interpretation is necessary.

The last limitation refers to the scope of the model. One should keep in mind, that all the aspects encompassed in the SOID model represent only one dimension of ERP implementation. To manage these kind of projects effectively it is necessary to involve technical and organizational aspects as well.

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