A CONCEPTUAL FRAMEWORK FOR FORECASTING ERP IMPLEMENTATION SUCCESS

A first step towards the creation of an implementation support tool

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Keywords: ERP, Implementation, Forecasting

Abstract: The continuing soar in popularity when it comes to standardized information systems sold en masse under the labelling of Enterprise Resource Planning (ERP) Systems is somewhat kept under control by the ever flowing stream of reports from the industry of implementations gone bad. According to some researchers it is possible to assume that as many as 90% of all initiated ERP implementation projects can be regarded as failures as a result of changes in scope, prolongation of the project time or simply budget overruns. With the implementation of an ERP system being a very costly and risky endeavour, organizations considering "getting on the bandwagon" stand much to gain from pre-emptively forecasting the probability of success for an ERP implementation in their enterprise. Given this, the purpose of this paper is to investigate a possible conceptual framework for forecasting ERP implementation success and discuss the role of such a framework in a software based tool. This was achieved through an initial in-depth literary review aimed at finding factors affecting the outcome of the ERP implementation projects. These results were then communicated to an industrial support group comprised of possible ERP implementation stakeholders. After lengthy discussions concerning the usability, validity and reliability of the proposed list of factors, a conceptual framework was agreed upon for forecasting ERP implementation success. The framework was then tested against a number of possible stakeholders outside the industrial support group. As the results show we have been able to create a conceptual framework for forecasting ERP implementation success that is currently in the second wave of testing. The usability, validity and reliability of the framework is discussed and elaborated upon, and this paper concludes that the perceived usability and hence also value of the conceptual framework is substantial, whereas the validity and reliability remain to be tested.

1 INTRODUCTION

With the overall soar in popularity for enterprise wide systems such as MRP (during the 1970's) MRPII (during the 1980's) and ERP (during the 1990's) (See for instance Al-Mashari (2001) and Schtub (1999) for a historical overview of the evolution of enterprise wide systems), any possible business benefit that these systems bring to the adopting enterprise is directly dependant upon a successful implementation.

Parr & Shanks (2000) take a further look upon why there seems to be such an abnormal failure rate for the implementation of ERP and go as far as quoting Martin (1998) who stated that as many as 90% of all ERP implementations are either late or over budget. If the success of a project (such as an ERP implementation) is supposed to be measured as for instance Whyte & Fortune (2003) stipulate (with the variables time, budget, specifications and consequences of project on organization), this would lead to a failure rate of 90% for all ERP Implementations.

These figures might at first seem dismal, but with the process of ERP implementation encompassing both the actual implementation of a

Magnusson J., Nilsson A. and Carlsson F. (2004).
A CONCEPTUAL FRAMEWORK FOR FORECASTING ERP IMPLEMENTATION SUCCESS - A first step towards the creation of an implementation support tool.
In *Proceedings of the Sixth International Conference on Enterprise Information Systems*, pages 447-453
DOI: 10.5220/0002602404470453

standard system and a more or less extensive change in the fundamental process-structure of the enterprise to fit the processes supported by the standard system, they are not as extreme as might be expected. In fact, Procaccino et al (2002) state that 85% of all IT-related projects fail and with this relative high failure rate for projects spanning the entire spectra of complexity, a success rate of 10% for complex IT-related projects such as ERP implementation projects might even be considered acceptable.

With the current status of the IT-market being somewhat in turmoil, any estimation of the global ERP market is indicative at most. However, according to Yen, Chou & Chang (2003), over 70% of the Fortune 1000 companies have implemented core ERP systems and the license fees for ERP systems in Europe comprise of over half of the total software license fees in Europe. When it comes to the future size of the worldwide ERP market, estimates vary from 11,90 Billion $US in the year 2007 (ARC Advisory Group, 2002) to 66.6 Billion $US in the year 2003 (AMR Research, 1999).

As many researchers previously have pointed out, the risks involved with implementing an ERP are substantial (see for instance Davenport (1998); Scott & Vessey (2000) and Sarker & Lee (2003) for an overview of failed ERP implementations). However, as the boom in the ERP market has shown during the recent years, this does not intimidate the adopters.

Given the complex nature of the implementation of enterprise wide and enterprise critical systems, and the often painful and arduous experience that the ERP adoption process leads to, the purpose of this paper is to present a conceptual framework for forecasting the probability of ERP implementation success and discuss the role of such a framework in a software based tool.

The process of ERP implementation is in this paper regarded as any alteration in the current system architecture of the enterprise related to some kind of enterprise wide information system. With this broad definition of ERP implementation, we encompass such alterations to the system architecture as upgrades and continued roll-outs. The notion of “ERP implementation success” is defined as the success of the implementation project, and “probability of ERP implementation success” is measured by to what extent an organization fulfils a number of factors.

2 METHODOLOGY

A schematic graph of the research-process is presented in Figure 1 below.

As can be seen in Figure 1, the first step was to identify a number of factors (15) through an extensive literary review (encompassing a total of 155 articles or books) and present these to the Industrial Support group. The factors were then discussed and one factor (Competence) was added along with a division of the now 16 factors into 4 categories. In addition to this a lengthy discussion concerning the usability of the resulting conceptual framework and the scientific validity and reliability was held, creating further input for the academic representatives and their further work with the conceptual framework.

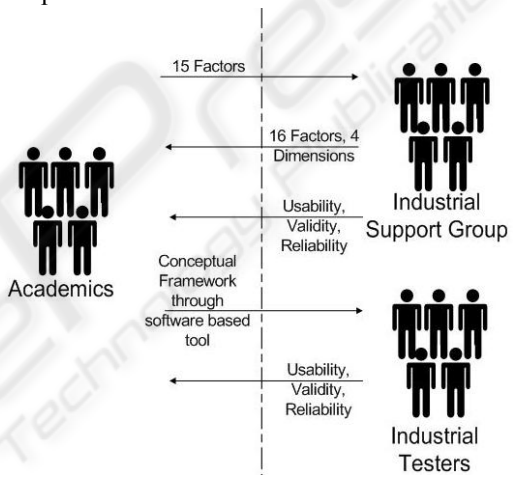

Figure 1: Methodological design

After designing the framework taking all input into consideration the academics decided to distribute the results through a software-based tool with a web interface. This decision was based on previous experience from the researchers stating that the spread out usage of web-based technology would in this way work in our favour, but several other possibilities like workshop-methodology and expert interviews were taken into consideration.

The software based tool ERP Scorecard was designed as simply an electronically distributed version of the questions comprising the conceptual framework. Along with some additional functionality regarding the management and distribution of results, the tool was distributed free-of-charge to 10 organizations currently undergoing some sort of ERP implementation. As the tool underwent initial testing during the summer of 2003 and was redesigned in accordance to the test-results, the end results were a tool ready for extensive dissemination during the late fall of 2003. As part of

ongoing research at the University of Gothenburg, the tool pools all data centrally, creating a large database for future quantitative analysis. The results from the testing towards the Industrial Testers (see Figure 1) was information regarding the perceived usability of the software based tool and the conceptual framework, along with data to be used as a means of measuring the validity and reliability of the framework.

3 RESULTS

The conceptual framework is as previously stated a framework comprised of a number of un-weighed factors with the ERP implementation project as a focus. This highlights the link between fulfilment of the factors and a positive outcome of the project, and for the framework to as usable as possible we have based the total level of factor fulfilment on how many of the final 16 factors were fulfilled. For instance; if the responding organization fulfils 12 out of the 16 factors (simply yes or no based on 5 questions per factor), this will result in the forecasting of a 75% probability of success, and in the tool a text describing what the organizations strengths and weaknesses are related to the different factors will be presented along with a quick-list of possible future managerial actions to strengthen the identified weaknesses.

A description of the 16 factors with the corresponding literary support can be found in Table 1 below. As shown under the heading of "Factor description", the object of analysis is the organization.

During the industrial feedback sessions concerning the first draft of the conceptual framework, a need for the user to see some sort of structure in the 16 factors was identified (see Figure 1 for further information regarding the research methodology). This resulted in the reorganizing of factors into four overlying categories or that would enhance the usability of the framework. The reliability and validity of such a categorization was considered to be irrelevant, with the need of the future user in sharp focus.

The four categories were identified as Top Management, Project, Organization and System; and they are presented together with the underlying factors in Figure 1 below. As previously described the fulfilment of the factors is in the basic outline of the framework measured by five questions each (Q1-5 in Figure 2), resulting in a total of 80 questions. These questions have been left out of this paper as an affect of them constantly being under revision and testing.

Table 1: Factor name, description and corresponding literary references

Factor Name	Factor Description	Literary support
Strategy	The organization should have a clear, communicated business strategy and an aligned IS/IT strategy.	Aladwani, 2001;Al-Mashari et al, 2003 Al-Mashari, 2001; Cooke & Peterson, 1998; Davenport, 1998; Donovan, 1999 ; Holland 6 Light, 1999; Pinto & Slevin, 1987; Schneider, 1999 ; Stevens, 1998; Umble et al, 2003; Whyte & Fortune, 2002
Leadership	The organization should have a strong and committed leadership that has the ability to motivate the employees to change.	Al-Mashari & Zairi, 2000; Al-Mashari et al, 2003; Mandal & Gunasekaran, 2003; Sarker & Lee, 2003 Schneider, 1999; Skok & Legge, 2002 Whyte & Fortune, 2002
Support	The organization should have a top management and steering committee of the ERP Implementation project that is highly committed to the implementation and is comprised of individuals with differentiated views of the implementation.	Aladwani, 2001; Kerzner, 1987; Mabert et al, 2001; Mandal & Gunasekaran, 2003; Parr & Shanks, 2000; Pinto & SLevin, 1987; Procaccino et al, 2002; Skog & Legge, 2002 ; Umble et al, 2003 Whyte & Fortune, 2002
Competence	The organization should have individuals with a broad competence of ERP, BPR or other IT-related projects involved in both the steering committee and the entire project.	No clear support found
Team	The organization should have an implementation project team that is comprised of individuals representing different views and perceptions of the enterprise and the enterprise system.	Mabert et al, 2001; Sarker & Lee, 2003; Schneider, 1999; Skog & Legge, 2002; Umble et al, 2003; Whyte & Fortune, 2002
Management	The organization should have an excellent project management for the implementation project and ensure that the management does not present only a business- or technical perspective of the implementation.	Cooke & Davis, 2002; Kerzner, 1987 Kirby, 1996; Mandal & Gunasekaran, 2003; Parr & Shanks, 2000; Procaccino et al, 2002; Skog & Legge, 2002; Umble et al, 2003; Whyte & Fortune, 2002

Plan	The organization should have a previously defined and well communicated project methodology that envelops both documentation procedures and clear performance measurements with routines for monitoring progress.	Al-Mashari et al, 2003; Cooke-Davis, 2002; Mabert et al, 2001 ; Mandal & Gunasekaran, 2003; McDonough III, 2000; Parr & Shanks, 2000; Pinto & Slevin, 1987; Procaccino et al, 2002; Schneider, 1999; Skog & Legge, 2002; Umble et al, 2003; Whyte & Fortune, 2002
External	The organization should have an ability to manage the influence of external consultants in the implementation project and also be able to optimally transfer the knowledge from the consultants into the organization.	Skog & Legge, 2002; Whyte & Fortune, 2002
Culture	The organization should have a business culture that highlights the importance of learning, knowledge, past experience and change, as well as a strategy for knowledge management.	Al-Mashari, 2001; Ash & Burn, 2003; Chan, 1999; Cooke-Davis, 2002 ; Davenport, 1998 ; Gable et al, 1998 ; Holland & Light, 1999; Krumbholz & Maiden, 2001; Schneider, 1999; Scott & Vessey, 2000; Soffer, Golany & Dori, 2003; Stevens, 1997; Sumner, 1999; Whyte & Fortune, 2002
Change	The organization should have a fundamental willingness and readiness for change as well as an explicit change management strategy.	Aladwani, 2001; Al-Mashari & Zairi, 2000; Al-Mashari et al, 2003; Ash & Burn, 2003; Hall, 2002; Hammer & Stanton, 1999; Hong & Kim, 2002; Jiang & Muhanna, 2000: Kerzner, 1987; Laughlin, 1999; Mabert et al, 2001; Mandal & Gunasekaran, 2003; Markus & Tanis, 2000; Parr & Shanks, 2000; Schneider, 1999; Skog & Legge, 2002 ; Umble et al, 2003 ; Whyte & Fortune, 2002
Process	The organization should have a high level of process-maturity and explicit guidelines for process management.	Al-Mashari et al, 2003; Al-Mashari, 2001; Bingi et al, 1999; Cooke-Davis, 2002; Edwards, 1999; Hong & Kim, 2002; Hong & Kim, 2002; Koch et al, 1999; Mandal & Gunasekaran, 2003; Marius & Ashok, 1996; Palaniswamy & Frank, 2000; Skok & Legge, 2002; Soh et al, 2000;Weil & Olson, 1989
Communication	The organization should have a detailed communication plan and strategy that ensures the successful communication of project plan and progress to all relevant stakeholders.	Aladwani, 2001; Al-Mashari & Zairi, 2000; Al-mashari et al, 2003; Mabert et al, 2001; Mandal & Gunasekaran, 2003; Pinto & Slevin, 1987; Schneider, 1999; Skog & Legge, 2002; Swan et al, 1999; Whyte & Fortune, 2002
Technology	The organization should have a clear understanding of the existing legacy environment and the technological aspects involved in the implementation of the ERP system.	Al, Mashari et al, 2003; Al-Mashari, 2001; Bancroft et al, 1998; Barnes, 1999; Bingi, 1999; Harrell et al, 2001; Holland & Light, 1999; Hong & Kim, 2002; Keller & Teufel, 1998; Koch et al, 1999 ; Mabert et al, 2001 ; Mandal 6 Gunasekaram, 2003; Parr & Shanks, 2000; Schneider, 1999; Soffer, Golany & Dori, 2003; Swan et al, 1999; Umble et al, 2003; Xu, Nord, Brown & Nord, 2002
Training	The organization should have a clear educational strategy concerning the ERP implementation that involves routines for early hands on training for the employees.	Aladwani, 2001; Al-Mashari et al, 2003 ; Mabert et al, 2001; Mandal & Gunasekaran, 2003; Skok & Legge, 2002; Umble et al, 2003; Whyte & Fortune, 2002
User	The organization should have an implementation process that strives for a high level of user acceptance early on through the use of constant presumptive end-user consultations.	Mandal & Gunasekaran, 2003; Pinto & Slevin, 1987; Procaccino et al, 2002; Skog & Legge, 2002; Whyte & Fortune, 2002
Empowerment	The organization should have a high level of implementation process transparency and a staff policy that empowers team members, end-users and management.	Aladwani, 2001; Grifith et al, 1999 ; Hong & Kim, 2002 ; Mabert et al, 2001 ; Markus & Robey, 1988 ; McDonough III, 2000; Parr & Shanks, 2000; Sarker & Lee, 2003; Schneider, 1999

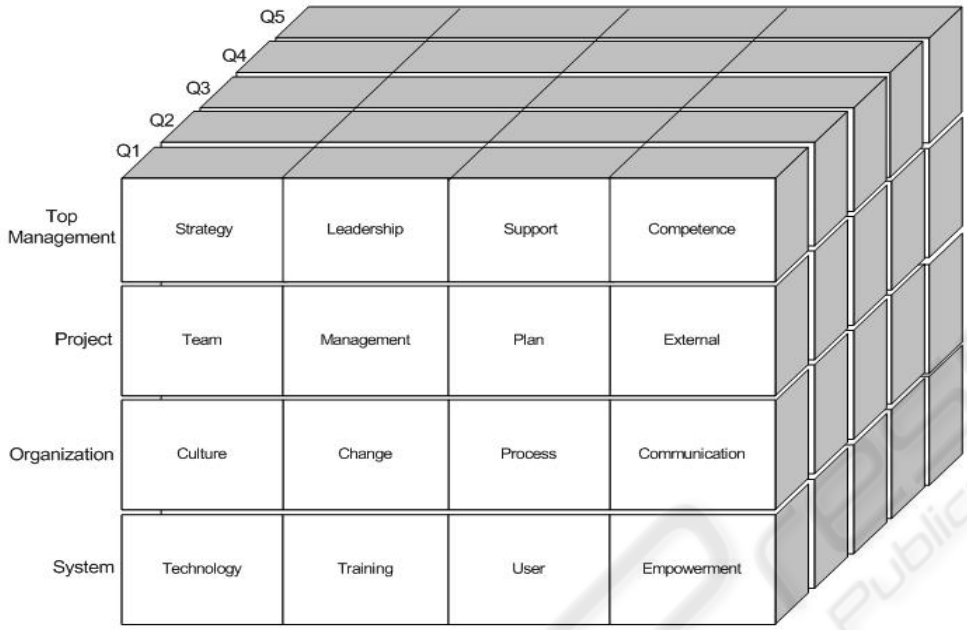

Figure 2: The resulting conceptual framework

4 DISCUSSION

With the methodology applied to exploring the possible conceptual framework for forecasting ERP implementation success involving a literary review followed by a re-evaluation of the identified factors towards industrial representatives, there are some implications concerning the usability, validity and reliability of the framework that need to be addressed.

When it comes to the usability and the pragmatic value for the users of the conceptual framework it has through our first meetings with the industrial representatives and the first wave of testing been rated as very high. The outcome of the assessment is according to our findings not primarily the forecasting of the probability of success, but rather the pedagogic value of, on a conceptual level, identifying relevant factors of importance for the outcome of the ERP implementation project. By disseminating the questionnaire (and perhaps also the results) throughout the organization to relevant stakeholders, the organization will act to heighten the level of consciousness concerning possible pitfalls during a potential ERP implementation and hence be better prepared for the project. After the initial wave of testing, this (along with the creation of a material for discussion in the Steering Committee or equivalent) is regarded as the chief added value of the forecast.

Concerning the validity of the 16 factors as representing the basis for forecasting the total probability of success, it is fairly weak. Very little research has been conducted with data that provides the opportunity to see the relationship between the fulfilment of one factor and a positive outcome regarding ERP, and this clearly limits the possibility of creating a conceptual framework with high validity. There is also the issue concerning the relationship between the different factors and their interlacing. It is natural to assume that they both overlap and miss several necessary factors that in the end will be necessary to correctly forecast the outcome of the project, IF this is at all possible.

When it comes to the reliability of the approach of using the fulfilment of a number of un-weighed factors as the basis for assessing and forecasting the outcome of the project in focus, it can be regarded as weak. We can not be sure that we have the correct instruments to measure what we set out to measure, but this is a question that more or less becomes an issue for the future design of possible methods for collecting the necessary data.

As we have described in this paper, the current design of the forecasting is through the use of a

distributed web-based questionnaire encompassing a total of 80 questions, five per factor; but this is in no way the only design possible for conducting the assessment. Alternative designs such as workshop-based meetings with future stakeholders within an organization and semi-structured interviews with organizational representatives are also quite possible, and also most likely to result in a higher degree of reliability when it comes to the final forecast. This can be seen as a trade-off between quantity and quality in the resulting data, and with the current design we have chosen to aspire a high quantity, perhaps at the cost of quality.

Concerning the role of the conceptual framework in the software-based tool, we can conclude that according to our initial findings we regard the pragmatic value as substantial.

ACKNOWLEDGEMENT

This work was made possible through the Paper Mill and EKIT-project at Gothenburg School of Economics and Commercial Law/University of Gothenburg, and the Enterprise Systems Research Group.

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