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Stakeholder analysis of critical success factors in ERP implementation

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Abstract

Enterprise Resource Planning systems aim at integrating and streamlining organisational processes. Their adoption, coupled with an attempt to adhere to industry best practice, often bring to light much needed organisational transformation, the social dimensions of which are often sidelined. This latter dimension is also often found to have a strong bearing on success.

In a drive to identify the needs for successful Enterprise Resource Planning implementation, this paper aims to categorise known critical success factors and to subsequently present these to multiple stakeholder groups for acceptance.

Index Terms

CSF, Critical Success Factors, ERP, Enterprise Resource Planning, ERP Implementation, Multi Stakeholder Perspectives

1. Introduction

Enterprise Resource Planning (ERP) packages have set their mark in the information technology frontier and have enticed the interest of the global business community [2]. In today's turbulent business environment ERP systems are considered as a license to play in the market and a pre-requisite to achieve operational excellence. On the other hand there is consensus that ERP implementation projects could be one of the single major projects an organisation undertakes with all that it encompasses. As a consequence, implementation processes and success factors have been one of the major concerns in industry, further exacerbated by the numerous failed endeavours and in a minority of cases fatal disasters [14]. Therefore, despite the benefits that can be accrued from successful ERP system implementation, there is a lot of evidence of failure in projects related to ERP implementations.

Frequently, ERP implementation projects tend to put technical issues at the centre of attention overlooking other non-technical issues. Davenport and Brooks (2004) when referring to enterprise systems installation, made it clear that the technical issues, although complex, are only a small part of the complexity concerned with behavioural change. The redistribution of roles and responsibilities among members can obliterate an organisation if reprehensibly managed [12].

Notwithstanding the extensive implementation experience acquired, ERP implementations continue to be laden with complications. Estimates produced by Barki et al. (2005) indicated that many such projects are delivered substantially late and over budget, fail to achieve intended benefits, and deliver less than what is expected. Over the years, many private and public enterprises endured significant losses after either pre-maturely terminating their ERP projects or entirely sojourning the use of ERP systems post implementation. Given that the technical capabilities of these ERP systems are proven, consensus that planning concerns are the chief barriers to effectively employing these systems has increased considerably [5].

In an attempt to address these implementation issues, several researchers have tried to apply the critical success factors (CSFs) approach to analyse ERP implementations. Akkermans and Helden (2002) also identified that the presence and attitudes of stakeholders were the root causes driving performance of the acknowledged core processes. In their particular context, it emerged that simultaneous and mutually reinforcing changes in the presence and attitudes of stakeholders enabled a change in the project directional success.

Therefore, the scope of this research will be to primarily identify the CSFs for ERP implementations, to formulate a conceptual model for implementation and to subsequently analyse this model from a multi-stakeholder perspective.

2. Literature Review

Important changes in organisations' core business applications have materialised over the last two decades. Amongst these reside two very important trends that entail: the shift towards commercial off-the-shelf vis-à-vis tailor-made systems and the move from local to global, in networks enabled by the world-wide web.

Complementing these transformations, nowadays organisations mandate enterprise data integration in support of enterprise-wide linked processes and

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standards in human-computer interfaces. The sharing of a 'single-truth', centralised data source derived from such integrated systems has also been widely recognized.

The response to these new realities is Enterprise Resource Planning (ERP) systems that have become ubiquitous in today's business world. In an overview of how much importance was directed to ERPs from the business world, Davenport (1998) compared the attention given to enterprise systems by businesses to the media attention given to the rise of the internet. Davenport also stated that "*enterprise systems may in fact be the most important development in the corporate use of information technologies in the 1990 's.*"

2.1. Implementation Failures

Despite the benefits lauded, ERP systems propel their own snags. Vogt (2002) sustained that ERPs generality and intricacy leaves such implementation projects exposed to glitches and poor performance, adding that they are strenuous to maintain and nightmarish to implement. Literature reveals many implementation failures and as with most novel technologies ERP efforts have had their share of drawbacks.

It is not within the scope of this paper to detail these events however it is beneficial to mention a few such stories to provide an understanding of the repercussions that can be suffered if such implementations are not approached with the right mind-set. An unsuccessful ERP implementation has been cited as one of the factors that led the $5 billion pharmaceutical distribution company, FoxMeyer Drugs to declare bankruptcy [5]. Whirlpool's shipping system was crippled following an ERP implementation, leaving appliances stacked on loading docks and un-delivered to paying customers for a full eight weeks. Hershey Foods suffered a 19% decline in earnings triggered by a slacking ERP implementation that caused distribution chaos during the US: Halloween season, a prime and largely profitable time.

However, it is noteworthy to mention that more than half of the issues in such events are of non-technical nature. Poor change management, lack of top management support and inability to align business processes accordingly have all been cited as failure factors. Finally these failure chronicles should serve as indicators of what not to do and be considered as valuable experiences by other organisations.

2.2. Stakeholder Importance

ERP implementations are not just technical artefacts that are installed into the enterprise. ERPs necessitate organisational transformation that will affect the enterprise holistically.

Apart from the difficulties that are synonymous with such changes, it is important to keep in mind that organisations are social structures made up of stakeholders whose interests converge or diverge depending on roles, values or situations [15]. This complicates the matter even further.

Undoubtedly, stakeholders are important in view of the massive changes required. When stakeholders comprehend the proposed long-term benefits, related to an ERP implementation, acceptances of transient set-backs are more easily consented. A common malady, that should not be allowed to settle in, is to become complacent with the status-quo. Such mindsets are largely prevalent in enterprises with dominant ICT departments that might radiate the sentiment that in-place legacy systems will meet the enterprise needs better.

The stakeholder groups involved within this study include the following: developers, division and functional managers, top managers, external consultants, key users, project champions, project team members, vendor analysts and vendor consultants.

2.3. CSFs in ERP Implementation

Consensus exists on the fact that the process of implementing ERPs is one of enormous complexity. Many conditions and factors could potentially influence the outcome of such projects. Whilst these conditions and factors could have a positive effect on the outcome of the project, their absence could spawn difficulties during implementation [16]. This gives us an insight of the importance of CSFs in the ERP context.

3. Research Methodology

3.1. Quantitative Techniques

The character of this study calls for the participation of different stakeholders within ERP implementation projects. This starting point directs the research primarily towards the use of a quantitative research method to be applied. In this regard a questionnaire was used, the questionnaire being a frequent vehicle for collecting quantitative data, through a survey [10].

The Maltese government's, Ministry of Investment, Industry and Information Technology, web site, (www.miti.gov.mt) that provides a list of companies that offer ERP software solutions or support in the Maltese islands, was used the identify potential participants for this study.

Some companies were identified as local vendors or partners of the most commonly in use packages (Microsoft, Oracle and SAP) and these were contacted. An initial meeting was then set with four

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of these organisations that exhibited interest in participating in the study, where this research was discussed in detail. After holding these initial meetings with the local vendors demos of the products. (Oracle e-Business Suite, SAP Business One and MS GP) were also provided.

These vendors also provided access to any of their clients that were interested in participating in the study. Seven client organisations accepted to participate. Consequently, key persons, mostly in top management, from these organisations, were met, through which full support was attained. After conducting a pilot survey with the vendors, the survey was then distributed by-mail, together with a covering letter within participating organisations.

On the other hand, it is also recognized that qualitative research permits certain issues that are less amenable to quantitative research to be examined. In this context the use of an open-ended question within the survey allowed issues not present in the questionnaire to be included by the participants. It is believed that this approach should enhance the quality of the research presented.

4. Conceptual Framework

The rationale behind the devised model draws upon the critical success factor approach and stakeholder theory. It thereby attempts to make the most of the two different schools of thought within the information system domain.

Drawing from the above rationale the conceptual framework was formulated in three concrete steps. The first step was the reviewing of literature relevant to ERP implementation and draws from various studies [9], [17], [13], [4], [1], [18]. The list of identified CSFs was analysed producing a final list of twenty two CSFs, presented below in Table 1 using Esteves and Pastor (2000)'s unified CSFs model.

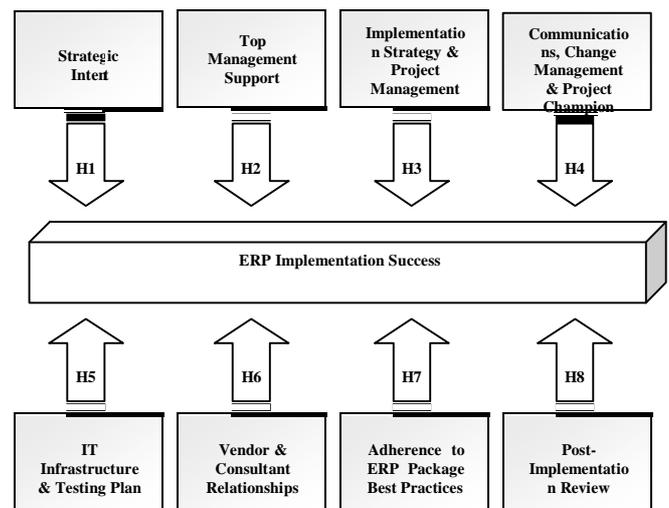|	Strategic	Tactical
Organisational	Top Management Commitment & Support	Project Team Balance, Competence, Motivation and Empowerment
	Building a Business Case, Vision and Planning	Communication Plan
	Project Champion	BPR
	Implementation Strategy	Consultants Selection and Relationship
	Project Management	Continuous Training and Education on new business processes
	Change Management	Post-Implementation Evaluation
	Managing Cultural Change	Vendor Support, Partnership and Tools
	Management of Expectations	
Technological	Vanilla ERP	IT Infrastructure and Architectural choices
	ERP Package Selection	Data Conversion and Integrity
	Legacy System Consideration	Systems Testing & Troubleshooting
		Package Configuration

Table 1 - Identified CSFs

The second step was to synthesise the identified CSFs to propose a base model upon which the final conceptual model could be built. The result of this
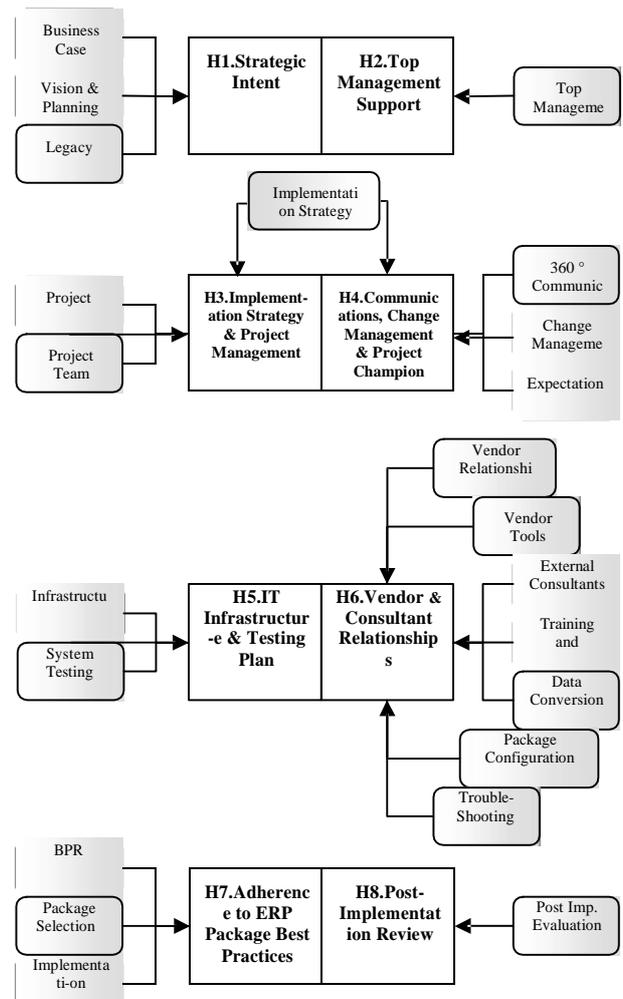
exercise is shown in Figure 1 below.

Figure 1 – Base Conceptual Model

Finally a conceptual model for implementation success was developed, shown in Figure 2 and submitted for analysis from a multi-stakeholder perspective.

Figure 2 – Implementation Conceptual Model

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4.1. Data Collection and Analysis

As explained within the research methodology section, the data was collected for this study by conducting a survey. The questionnaire was developed after an extensive review of the literature and was designed to look for feedback on the various identified CSFs by different stakeholders in order to validate the presented conceptual model.

With regards to the identified critical success factors, respondents were asked to indicate agreement with statements presented in the questionnaire using a 5-point Likert-type scale, with one representing *strongly disagree* and five representing *strongly agree*. A total of thirty-nine statements were presented within the submitted questionnaire.

Applying normalisation concepts on the questionnaire, a relational database was specifically designed and engineered for this purpose. The use of this normalised model facilitated the data collection phase and the subsequent analysis of the data.

Means and standard deviation could then be calculated both from the perspective of each individual stakeholder type, and also as a whole (not grouped by stakeholder type). Moreover these calculations were also performed both on a per-statement basis, as well as on a hypothesis basis (several statements for each hypothesis). This type of analysis, permitted the comparison of differing stakeholder views, in relation to the presented critical success factors. The evaluation of whether or not these views concur was therefore possible.

Standard deviation also indicated the statistical dispersion of the results obtained amongst participating stakeholders, by measuring the spread of data about the mean within each given data set. It was also possible to rank each submitted statement individually, and in doing so, the areas upon which there was agreement or disagreement amongst the different stakeholder types could be highlighted.

With regards to participation, fifteen local (Maltese) organisations were invited to participate with a final eleven (11) organisations finally participating. In total, seventy five (75) questionnaires were sent with a final return of thirty one (31) giving a response rate of 41.33%

5. Conclusion

5.1. Evaluation of Results

From the multi-stakeholder analysis performed it is evident that the conceptual model, based upon the eight hypotheses presented within this study, has been validated. Sustaining these results are the overall mean scores obtained by each of the eight hypotheses

shown in Table 2 below. The results are evidence of stakeholder agreement to the proposed hypothesis.

Hyp Id	Full Name	Overall Means	St. Dev
1	Strategic Intent	4.26	0.83
2	Top Management Support	4.87	0.43
3	Implementation Strategy and Project management	4.54	0.62
4	Communications, Change Management and Project Champion	4.35	0.68
5	IT Infrastructure and Testing	4.32	0.77
6	Vendor and Consultant Relationships	4.17	0.97
7	Adherence to ERP best practice	4.26	0.92
8	Post-Implementation Review	4.39	0.73

Table 2 – Overall Hypothesis Results

The hypothesis regarding Top Management Support (H2) emerged on top with regards to overall mean scores and lowest standard deviation. This outcome supports the results obtained by other studies [17], [11]. Another interesting factor regards the implementation strategy (H3). From the analysis carried out, participating stakeholders have clearly indicated a preference towards a phased approach in implementing ERP. This result also sustains other empirical researches such as that by Finney and Corbett (2007). The overall positive results for H3 also include the agreement that formal project management techniques are necessary for a successful implementation and that project teams need to be motivated, balanced, empowered and most of all highly competent.

Hypothesis six (H6) contained the largest number of statements submitted for analysis. It considered factors that have to do mainly with external relationships. It validates the importance of a healthy relationship with the vendor but also indicates that over-reliance on the same vendors can become a set-back for overall implementation success. This hypothesis also included other factors normally related to the vendor such as training, package configuration, data conversion and troubleshooting. The fact that, the data accuracy and integration process and effective troubleshooting ranked second and third respectively, with regards to overall total score, evidence the need to sustain healthy external relationships.

The fact that hypothesis eight (H8) ranked third overall as shown in Table 2, demonstrates how stakeholders appreciate the importance of a post-implementation review. However, from first-hand knowledge gained from the participating organisations, a thorough post-implementation review did not materialise. The review was executed against target budgets and milestones and only delved superficially into the gains that occurred through the package's implementation and in the actual deliverables. Nonetheless, participating

stakeholders insist that such reviews are essential to the overall success of the project.

Apart from the interesting findings that came to light when analysing the statements submitted to test hypothesis seven (H7), the overall mean obtained confirms that in general, adhering to best practice as provided by ERP packages is a preferred approach to customisation, especially by internal stakeholders. This stance is further nourished by the fact that business process re-engineering also features in the top-ten list of success factors, showing the importance given to such factor. These indications are important because they place ERP packages on a level playing field with other widely accepted packages such as accounting packages. Therefore, these findings reverse the trend spelt out by Wallace and Krezmar (2001), that ERP packages were not considered to have reached the industry's acceptance level, in terms of internal best-industry processes, of other packages in use.

Stakeholders also validated the fact that such projects are highly influenced by the organisational strategic intent. Hypothesis one (H1) revealed that participating stakeholders concur that a clear vision and a strong business case are essential, especially during the project's initial phases. The results obtained for hypothesis four (H4), ranking fourth overall, demonstrate the magnitude stakeholders place on efficient communications, change management and the important role of the project champion. One particular success factor concerning this hypothesis, namely, the importance of communication between IT and end-users, ranked sixth overall showing the need for communication to be present throughout such an implementation.

Hypothesis five (H5) was concerned mainly with technical issues involved within ERP implementation projects. Notwithstanding the fact that many participating stakeholders were non-technical the overall ranking of this hypothesis in Table 2 indicates an overall appreciation of the importance of dealing with technical issues. Above all, the success factor related to functional testing of the package also ranked fourth overall.

What surely emerges from this study is the fact that there are a number of factors that contribute to achieving ERP implementation success. This statement is substantiated by the fact that all hypotheses presented, each concerning several distinct aspects of an ERP implementation, were all validated from various stakeholders. This also gives us an idea about the intricateness inherent within such projects. Therefore, it is only justified to assert that the likelihood of success is essentially improved in ERP implementation projects, if they are approached with superior knowledge about the intricate success factors. This knowledge would prove essential as it

puts implementers in a better position to make critical decisions and assign required resources. [13]. Within this context, organisations should therefore consider, not some CSFs that seem to be the most important, but all the necessary CSFs as a whole, when devising strategies and plans for ERP implementations.

Finally it is still not wise to believe that there exists a universal solution. Contextual factors exert different pressures on what is deemed central to success. Within this context, awareness and intelligent adaptation of predominant success factors contained within the presented model, further contribute towards implementation success

5.2. Research Limitations

Primarily the small surveyed sample size and the fact that all participating organisations and individuals are national, poses some limitations on the generalisation of the results. Another bias resides in the methodology used within this research and the fact that the study relies mostly on survey data for the presentation of results. It would have been ideal, if the results would have been more supportive through additional qualitative data. Finally, despite the fact that the author has made every effort to cover extensive and latest literature within the ERP context, time and resources available may have restricted the acquisition of further knowledge on the topic.

5.3. Future research

Mainly based on the limitations highlighted above, the author calls for extended research utilising larger samples and additional qualitative methodologies, with regards to critical success factors analysed from a multi stakeholder perspective. Secondly, an investigation of the linkages between the identified success factors would greatly augment the validity of a unified success factor model, especially towards the identification of key areas for different stakeholder contribution.

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