Knowledge transfer, process fit & other issues in ERP implementation in Indian SME

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Abstract

The paper describes the attempt of an Indian SME firm to develop an information system, based on an ERP system, to support the growth plans of the firm. The prior experience of the firm is limited to desktop based stand alone inventory control and accounting systems. The firm hires consultants for guiding the implementation. The paper uses available literature on ERP implementation to develop hypothesis about key variables in ERP implementation, such as change management, project management, and knowledge transfer from consultants. These hypothesis are then tested along with the hypothesis that the overall ERP implementation is ‘successful and beneficial’ to the company. The case highlights the problems and impact of lack of IT domain knowledge and the resulting effects on change management, organizational domain specific knowledge, project management etc. and shows how this correlates with a poor ERP implementation.

Key words: Knowledge transfer from consultant, ERP, process fit, package functionality, change management, project management

1.0 Introduction

The paper describes the efforts of a small firm at implementing an ERP system, as a part of their effort to support a major growth initiative. The managers of the firm had identified functionality such as support to processes and total transparency of operations across the business, and a common platform and database, so that similar information could be shared by the managers across functions, as the basic requirement for an ERP system. The firm had no prior experience of real time information systems, and had only desktop based standalone inventory management and accounting software. Therefore to guide it’s attempt at ERP implementation, the firm hired consultants for designing a solution for the information needs of the company, and to impart functional knowledge and package based knowledge to the managers in the company. The paper briefly describes the ERP implementation and it played out for the firm.

ERP implementation literature is used to develop hypothesis relating to various issues in ERP implementation. Available evidence is then used to test these hypotheses. The paper is thus structured as follows: In section 2 a brief account of the ERP implementation is shared with the reader, so that he may appreciate the evidence being presented. In section 3, a brief literature review is presented, and the hypothesis are developed. Section 4 briefly discusses the methodology for the study. Results of the test of hypothesis, and a discussion of these results is given in section 5.

2.0 ERP implementation : a brief description

ABC Refractories was a subsidiary of a large cement company, and was in the business of making ‘firebricks’ and refractory linings for the cement units of the company. There were three manufacturing plants employing about 900 people and the firm had a turnover of approximately $ 50 million. Plant 3, being the oldest plant in ABC Refractories Ltd., was also the largest with over 650 personnel. The company also had 5 regional marketing offices.

Market and cost pressures led to a planned change in product mix from low value adding firebricks, to more high tech and more value added products like high alumina and aluminum silicate refractories, refractory cements and castables, insulating products, high temperature ceramic products like tabular and bubble alumina and basic monolithics. Thus the firm also added client steel, fertilizer, glass, and construction industries.
The increasing number of products in the supply chain led to ‘coordination problems’. The management of the company then proposed the implementation of an ERP solution. The company had a very primitive knowledge base in IT with a few personal computers, running a financial software for keeping accounts. The CEO introduced the ERP implementation plan at a company dinner, and next morning a team was formed to implement the system. Then the team was sent to an industry user conference to learn about the ERP system. They learnt of many issues that other users were facing, and concluded that they had a lot to learn before they could start. However the CEO had bought hardware for the proposed project including the required servers and networking equipment, and so the project was launched without delay. The company then hired an implementation partner and started the training of the personnel into MRP and windows concepts. (Timeline in Table A1 in Appendix 1)

The first phase started with Financial (FI), Sales and Distribution (SD), and Materials Management(MM) modules being implemented. The FI module was not customized for Indian taxes, and thus various ‘workarounds’ had to be created in the system, leading to long procedures and a loss of credibility for the system. The consultants from the implementation partner were themselves new and had little knowledge of the system and the inbuilt processes in the system. Also they kept leaving the project to move abroad to better paying projects. The project phase which was supposed to last about 4-5 months thus got delayed to about 15 months. Also the project was highly understaffed as most officers had been assigned to the ERP project on a part time basis, along with their routine jobs. Thus they were highly overstretched and not able to contribute effectively. Then the head of the materials management team resigned. This was a blow as generally senior staff did not leave from the company.

Finally some semblance of closure was achieved, and the next phase was launched with Production Planning (PP) and Plant Maintenance (PM) modules. The plant could not configure the planning system as the required functionality was just not available for ‘refractory’ industry’. Thus the system remained advisory, and actual production planning was done as a parallel activity. The plant maintenance module was configured without much problem. Some systems discipline was introduced by the ERP system, and a lot of bad business practices were eliminated, such as purchasing without a purchase order, entry of material without records etc. The plant staff also had to learn about maintaining the server and IT infrastructure, as the personnel appointed for operating and maintaining the same kept leaving the company.

One year was spent on stabilizing and allowing the managers to learn the system. More user requested reports were generated and also made mandatory in company meetings. Some managers who had resisted ERP implementation were also trained and made to use the system. There were some objections to the benefits and utility of the system, and a formal external audit was done on the system in May of year 4. Based on the audit, the CIN patch of the FI module (Country India System) was implemented, which had Indian tax laws inbuilt, and so a lot of workarounds could be now dispensed with. This was implemented in 3 months from May year 4 to September year 4, and made the system easier to use. The marketing function however had the problem that even after the system was implemented, they still did not have visibility of the orders being implemented on the shop floor, or even the plan as to when the order would be executed. Hence they could not promise the order delivery to the customer, who did not perceive any benefit from the system. Internally however, a number of officers could perceive that the system was giving them the data that was required, and that a lot of time spent on data collection was now saved.

3.0 Literature Survey and Hypothesis Development:

The implementation of ERP systems has been studied by many researchers (Huang and Palvia,2001; Parr and Shanks, 2000; Markus et al, 2000; Prasad,1999). The implementation has been studied from a process perspective (Markus et al, 2000; Markus and Tanis, 2000; Sumner,2000) i.e. from the perspective of ERP implementation. Marcus and Tanis [24] have suggested a four stage process of ERP implementation and also have discussed the technical steps which were implemented in each implementation stage.

ERP implementation has also been studied from the perspective of critical success factors which affect the success of the ERP implementation. (Stedman,1999; Gargeya and Brady, 2005; Soja, 2006,Nah et al, 2003; Umble et al, 2002)
3.1 Change Management

Fiona et al (2001, 2003) have shown that change management is a major issue in ERP implementation and that most CIOs have rated change management as a critical issue which affects the outcome of the implementation. Kotter (1996) suggested eight salient steps for successfully managing change programs. Establishing the need for change, getting support of the dominant coalition in the organization, creating a vision for change, communicating the vision and planning for small wins are a few of the necessary steps for managing change. Adelwani (2001) has stated that communication benefits ERP implementation by involving groups and sub groups in the implementation process and increasing understanding between the groups. Besides preparing people for newer roles and job profiles, communication of anticipated benefits of ERP systems helps them to develop a positive attitude towards the change process. Shelley (2007) has also mentioned the importance of involving key people in the organization. Motwani et al (2006) and Willcocks and Sykes (2000) have also mentioned the need to create small wins to overcome resistance to the implementation. Based on the above discussion, we may propose the following hypothesis:

Hypothesis 1: Change Management activities were adequate in the ERP implementation

H1a: There was adequate communication of the need and benefits of ERP systems

H1b: The support of the dominant coalition and top management was obtained before starting the ERP implementation

3.2 Project Management

Since ERP implementations are large projects involving many people and activities over a substantial period of time, issues related to project management become important. (The average time reported in literature ranges from 18 months to about three years) Marcus and Tanis (2000) and Davenport (2000), Gosain et al (2005), Al Mashari (2003) have reported project creep and project delays as a major reason for failure of ERP systems implementation. Fiona et al (2001, 2003) have reported that project management has been named as a critical success factor in ERP implementation. Hirt (1999) and Markus (2000) have noted inadequate resources for the project as a major reason for poor ERP implementation at Siemens Power Corporation and Foxmeyer. Sumner (2000) has mentioned inadequate specification of the goals of the project or the project charter as a major reason of failure of the project. Marcus and Tanis (2000) mention the lack of project focus, and inadequate requirements specification as a reason for failure or poor outcome of the implementation. Ross et al (1999) mention inadequate IT domain knowledge and resulting inadequately specified work breakdown structure for improperly scheduled projects with major time over runs. Stedman (1999), Hirt (1999) and Marcus (2000) also mention how improper project phasing has affected the success of the ERP implementation. Stedman (1999) describes how Hershey’s went ‘live’ with it’s system at the same time as when shipping was being done for the peak holiday season, thus causing major delay’s in chocolate delivery to dealers at various regions. Markus (2000) also mentions how inadequate time budgeting for critical activities lead to the failure of the implementation project at Foxmeyer. Motwani et al (2006) and Wilcocks and Sykes (2000) have also mentioned the lack of planning for creating small wins by dividing the main project into smaller projects as a reason for poor implementation of ERP systems. Based on the above we can propose the hypothesis:

H2: Project Management of the various activities in the ERP implementation was adequate:

H2a: Adequate resources were provided for the project.

H2b: The breakup, specification and scheduling of activities for the project was such that adequate time was available to complete each activity.

3.3 Organizational domain knowledge and knowledge transfer from consultant

Cohen and Levinthal (1990) defined ‘absorptive capacity’ as the ability of an organization to
recognize the value of new external information, assimilate it, and apply it to commercial ends. The authors posited this absorptive capacity to be dependent on prior domain knowledge. Davenport and Short (1990) have proposed a recursive relationship between IT capability of the organization and its business processes, with slow learning. Jones (2005) has discussed the factors such as shared understanding, which lead to transfer of tacit knowledge between individuals and between teams. Generally the level of knowledge, of SMEs in the manufacturing sector, pertaining to the IT domain is low. As such the trend has been to hire consultants to impart knowledge to the managers in the company and also to design a solution for the information needs of the company. However, the experience of most firms has not been satisfactory, and researchers have reported opportunistic behavior on the part of consultants and also low desire to learn on part of the implementing firms. Ko et al (2005) have reported several such cases of less than satisfactory consultant knowledge transfer. Hirt (1999) has reported on the use of consultants by Siemens Power Corporation to map the package functionality onto existing processes while selecting the package. Bhattacharya (2005) also reports how consultants though technically competent, failed to provide support in the first phase of implementation at Geneva Pharmaceuticals, and how after they were replaced by another process focused consulting firm, the implementation was completed smoothly. Ross et al (1999) also describe how Dow Corning’s lack of IT domain knowledge acted as a barrier to knowledge transfer from the consultants, and how this lead to delays in the process which took a long time to overcome.

Haines and Good晦ue (2003) have also discussed the opportunistic behavior of consultants where on perceiving a low level of competence on the client side, the consultants determine the outcome based on self interest. Ko et al (2005) also discuss the factors which lead to higher consultant transfer of knowledge and its absorption by the implementing firm. They also cite the absorptive power of the client firm as a crucial factor in ensuring transfer of knowledge from the consultants, specially the tacit knowledge component. Rossman and Walsh (2004) mention the clarity and diligence in drawing up the contracts with the consultant, as a major factor which may lead to knowledge sharing and prevention of opportunism by the consultant.

Summarizing the above, we may conclude that

H3a: High IT domain knowledge base of the firm, does not allow consultants to indulge in opportunism and to avoid transfer of knowledge to client

H3b: In case the IT knowledge base of the firm is low, a strong contractual commitment is required to promote knowledge transfer from consultant to the client

Finally a successful implementation, where the theoretical recommendations have been followed, would lead to a better ERP implementation, and hence the perceived benefits from the ERP system should be high. We can thus hypothesize that:

H4: Was the ERP system beneficial to the organization so that the ERP implementation can it be considered a success?

4.0 Methodology:

The researcher spent about 35 days in residence at the firm in two visits and interviewed most of the senior and middle level managers at the firm. The interviews were recorded and then transcribed, and then content analysis was done to identify the major issues emerging from the study. Company documents and direct recorded observations were used to support the interview evidence collected. While, senior managers were subjected to in-depth interviews, junior and middle managers were asked three simple questions – i. How has your job changed since the ERP implementation? ii. How have the work processes changed over the last five year period? iii. How has this ERP (SAP) system helped you in your job? The responses were then content analyzed by two researchers based on analysis of themes underlying the responses. One theme was counted only once, even if repeated. The inter-rater reliability between the two researchers in identifying themes was 83 percent.

5.0 Results and Discussion
As discussed in the methodology, there were three sources of data:

CD: Company Documents about ERP implementation (factual information)

CA: Interviews of middle level managers were content analyzed and themes were also classified as strongly supported (> 66% respondents); Moderate Support (66%> No of respondents>33%)

IQ: Detailed interviews were taken for Top management and these may be quoted as an authentic response of factual company decisions

This data collected as mentioned above, is presented to test each hypothesis

**H1a: There was adequate communication of the need and benefits of ERP systems**

Test of Hypothesis H1a:

CA: Content Analysis data: Table CA1

<table>
<thead>
<tr>
<th>Issues related to theme</th>
<th>Support for theme</th>
</tr>
</thead>
<tbody>
<tr>
<td>- No prior experience with online IT systems</td>
<td>MS</td>
</tr>
<tr>
<td>- Business in expansion mode – requirement for IT based system</td>
<td></td>
</tr>
<tr>
<td>- Sudden announcement of ERP decision, timing , criteria of decision</td>
<td>WS</td>
</tr>
<tr>
<td>- No reference document of proposed benefits or investment justification, payback quantification</td>
<td></td>
</tr>
<tr>
<td>- No criteria for presentation check / package selection evolved</td>
<td></td>
</tr>
<tr>
<td>- IT department not involved in ERP decision or package evaluation</td>
<td></td>
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</tbody>
</table>

**IQ2: The problems started from the word go, as even during process mapping the teams did not have the proper guidance… VP & ERP project leader**

The above evidence shows that H1a is negated by the evidence from the content analysis and also from the Interview Evidence IQ1- IQ2.

H1b: The support of the dominant coalition and top management was obtained before starting the ERP implementation

Test of Hypothesis H1b:

**IQ3: Our CEO nominated some people from the core team and I was asked to head it….I asked why me, I am not an IT person. I was told… no, no the whole thing has to be user driven, that is why we want users who have had broad experience VP & ERP project leader**

Evidence from IQ3 and Table CA1, shows that there was no attempt to create a dominant coalition, before start of project. Even the IT department was kept out of the decision.

H2: Project Management of the various activities in the ERP implementation was adequate:

**H2a: Adequate resources were provided for the project**

Test of Hypothesis 2a: Table CA2

| - Very few full time members                                           | MS                |
| - Part time members busy with routine work                             |                   |
| - Business functional knowledge not available with team except in SD module |                   |
| - Technical knowledge poor including with consultants                 |                   |
| - Performance not measured against tangible targets – company culture  | NS                |
| - CEO acts as project champion-no other project sponsor at senior executive level | NS                |

**IQ4: “Even the plant head here… would say I cannot spare my DGM for days altogether… he has to do his work for four hours every day… that’s how it went… we would spend time after 4.00 pm everyday working on ERP. One manager had a small kid and**
he was sick for sometime... so the three months were very exhausting and tough”

IQ5: “The problems started from the word go, as even during process mapping the teams did not have the proper guidance... The personnel sent over by the implementation partner, were themselves in the learning phase... customization was thusa ‘learn some, implement some’ process... Neither the consultants or the managers knew of the range of options and choices available”

IQ6: “functional consultants in the teams kept on leaving and migrating to the US at regular intervals. .... teams were plagued by inconsistent and incomplete information and guidance; also the FI module leader had to look after tax liaison and was often away for most of the day, further delaying the project.”

IQ7: “I had tried to get the configuration for a finite capacity option... the consultant was probably not sure of how to get this done...You know how it was in those days... any change you ask for and the standard answer would be... it requires a source code change....” PP module leader

Evidence from Table CA2 and IQ4, 5 and 6, suggests that Hypothesis 2a is not supported by data. Thus adequate resources were not available for the project.

H2b: The breakup, specification and scheduling of activities for the project was such that adequate time was available to complete each activity.

Test of Hypothesis 2b:

Evidence from IQ4, 5, 6, 7 and Table CA2 shows that breakup and specification of every activity was not done adequately. Thus Hypothesis H2b is not supported by data.

H3a: High IT domain knowledge base of the firm, does not allow consultants to indulge in opportunism and to avoid transfer of knowledge to client

Test of Hypothesis 3a:

IQ 2, 5, 6 and 7 show that consultants did not transfer knowledge satisfactorily. Also fresher consultants were posted at client site an act of opportunism, hence knowledge transfer did not occur.

H3b: In case the IT knowledge base of the firm is low, a strong contractual commitment is required to promote knowledge transfer from consultant to the client

IQ8: In phase II, the functional and system administration consultants were supposed to have backups. In phase III we changed consultants and everything went as per schedule”

Test of Hypothesis H3b: As is clear from IQ8 and IQ6 better contracts help in ensuring less opportunism by consultants.

H4: Was the ERP system beneficial to the organization so that the ERP implementation can it be considered a success?

Table CA3:

<table>
<thead>
<tr>
<th>Change in information flow: inter and intra department level</th>
<th>SS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coordination improved across departments</td>
<td>WS</td>
</tr>
<tr>
<td>Coordination improved between plants</td>
<td>MS</td>
</tr>
<tr>
<td>Improvement in accuracy of inventory figures</td>
<td>Accuracy - SS</td>
</tr>
<tr>
<td>Improvement in availability of inventory figures</td>
<td>Availability - SS</td>
</tr>
<tr>
<td>Availability and accuracy of costing data</td>
<td>Availability - SS</td>
</tr>
<tr>
<td>Data easier to get (less time)</td>
<td>SS</td>
</tr>
</tbody>
</table>

Test of Hypothesis 4: Available evidence in Table CA3 shows that ERP implementation is moderately successful. However visibility of orders on shop floor is not available.

6.0: Conclusion and further work: The evidence shows that the implementation did not adhere to suggested directions given in literature for a successful implementation. Therefore implementation may at best be described as moderately successful. The evidence also suggests some benefits, but these were limited by lack of organizational knowledge and consultant knowledge transfer.
(References available on request by email at : professor.skumar@gmail.com)