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The Impact of Organization Size on ERP Implementation in Indian Industries

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Abstract - *Nowadays, Indian Industries have invested enormous resources for the implementation of Enterprise Resource Planning (ERP) systems. This paper attempts to describe this phenomenon through a series of case studies and a survey. Manufacturing companies ranging in size from a few lakhs in annual revenues to over crore are included in this study. The key finding from this study is that companies of different sizes implements ERP systems differently. Also, the benefits differ by company size. Larger companies report benefits in financial measures whereas smaller companies report better results in manufacturing and product life cycle management.*

Key Words: **Enterprise resource planning, Operation systems, Organizational size, business performance, Survey Methodology.**

1. INTRODUCTION

The use of enterprise resource planning (ERP) software has become gradually more common in a lot of today's production. ERP is the process of integrating entire business functions and processes in an organization to attain various benefits. The use of enterprise resource planning (ERP) software has become more common in a lot of today's businesses. It is adopted for improving business performance.

ERP systems, which evolved from Materials Requirements Planning (MRP) and Manufacturing Resource Planning (MRP II) systems, are expected to provide, integration of processes across functional areas with improved work flow, standardization of various business processes, improved order management, accurate accounting of inventory, and better supply chain management.

The primary objective of this case study and the consultant interviews was to obtain reliable and detailed information of ERP practice and implementations in the Indian manufacturing industries.

Two key issues are found from this phase of the project. First, companies of different sizes tended to do different things in their implementations. In particular, there were distinct differences between small and large companies over a range of issues. These differences included: (1) the motivation to go with an ERP system; (2) the different systems adopted; (3) the implementation strategies; (4) the degree of reengineering and customization of the base system. And second, there were differences in the outcomes and benefits attained. While this case study proved useful in understanding the general nature of these differences. To confirm our initial findings, a survey of a larger sample of companies was undertaken in the second phase of the project in order to obtain a broader perspective of ERP practice and experiences relating to adoption, selection of systems, and customization, costs, and performance, and success factors across different sized companies. More specifically, the primary objective of this project is to study the impact of the organization size on ERP adoption and implementation.

In the Operations area, several studies of manufacturing firms indicate that organization size plays a critical role in terms of the level of adoption and use of technologies. These findings show that in general small manufacturers tend to lag behind large manufacturers in implementing new technologies, plus employ different practices. ERP implementations have followed similar trends. While larger companies were the first movers to ERP systems in the mid-1990s, today smaller companies view this approach as an important management tool.

2. CASE STUDIES

For the case study phase, 6 manufacturing companies and two consulting firms were contacted to be part of the project. Of these, six of the manufacturing companies and all six of the consulting firms agreed to be in our study. The manufacturing companies are located in Shiroli, Gokul Shirgaon & Kagal, Kolhapur. The size of these companies ranged from 10 crore in annual revenues to over billions. A detailed questionnaire was sent to the companies in advance of the interviews. All interviews were conducted at a company site by at least two interviewers. These interviews were all done during the November of 2018. At least one key executive, one member of the implementation team and one key user were interviewed. All data were reviewed and authenticated by all interviewers before any information or data was used. The primary objective of this study was to compare ERP initiatives and experiences as implemented by manufacturing. The

interviews were exploratory in nature and designed to provide insight into the following set of research questions:

1. What motivates a manufacturing company to implement an ERP package?
2. Which ERP packages do manufacturing companies implement and how are they selected?
3. What is the configuration of the systems implemented?
4. Which implementation strategies do manufacturing companies utilize?
5. What degree of customization occurs in manufacturing ERP implementations and are there some modules/processes that are customized more than others?
6. What does it cost to implement an ERP system and are the major cost categories influenced by type of implementation or implementation strategy?
7. Does return on investment play a major role in the decision to implement?
8. What are the benefits the companies expect as a result of implementing an ERP system?

Companies adopted ERP systems for a variety of reasons. These included replacing legacy systems, system simplification and improvement, process and operations improvement, reducing costs of information systems, and competitive pressures.

- Most companies performed ROI analysis to justify adopting ERP systems.
- The configurations of systems implemented varied. Some companies implemented a single ERP package while others selected modules from different ERP packages (Best-of-Breed approach). One even developed a totally home grown system.
- Several implementation strategies were used. These included implementing all key modules at once (The Big-Bang approach), phasing in modules one or a few at a time (The Phased-In-By-Module approach), implemented a sub-set of modules all at one time (The Mini Big-Bang), and modules phased in by divisions, plants, business units or geographies (The Phased-In-By-Site approach).
- All companies stressed the importance of planning and implementation. However, the degree of planning varied across companies.
- Most companies customized the base system but the degree of customization varied from very minor modifications to major rewrites of code for certain functionalities. Any major modifications added significantly to both costs and implementation time.
- Most companies undertook some reengineering of processes. A few did major reengineering upfront while most deferred it to after the system had been implemented.
- The benefits and returns expected varied significantly across companies.

The key difference is that companies of different sizes tend to do different things in their implementations across a range of issues. For example, smaller companies are more likely to change their processes to fit the system whereas larger companies are more likely to customize the system. Any changes to the system can have major implications.

Generally, modifications lead to higher investments with longer implementation time. Also, it will become more complicated to implement. Other differences in the smaller and larger include the motivation to go for an ERP system, the implementation strategies, type of systems adopted, the extent of modifications to the base system, and they didn't confident about benefits from ERP.

Organization size is defined on the basis of number of employees or by revenues. We chose to use annual revenues for classifying the companies for this survey as follows: companies with annual revenues of 25 Lakh to 5 crore are classified as small, those between 5 Crore to 10 Crore are classified as medium, and those with more than 10 crore are classified as large. With this classification, the key differences from companies of different sizes in the case studies are stated in the form of the following propositions:

Proposition 1: Large companies adopt ERP systems for strategic needs whereas smaller companies adopt ERP system for their tactical needs.

Proposition 2: Larger companies implement more ERP functionality than small companies.

Proposition 3: Large companies customize ERP software more while small companies adopt business processes within ERP systems more.

Proposition 4: Large companies use an incremental implementation approach by phasing in the systems while smaller companies uses more progressive implementation approaches such as implementing the entire system or some of major modules at the same time (like the Big-Bang or the Mini Big-Bang approach).

Proposition 5: Large companies report greater benefits in the financial areas, while small companies report more benefits from manufacturing and logistics.

3. SURVEY METHODOLOGY

The survey questionnaire was prepared which include questions on company and respondent demographics, adoption and selection of a system, implementation, customization, costs and benefits, and post-implementation plans. This questionnaire was designed as an exploratory instrument to collect information about these phases of an ERP project.

The responses were encoded and a Likert scale with measures from 1 to 5. The motivational and benefits responses were encoded using the Likert scale because respondents were generally good at determining relative measurements for these kinds of questions.

Proposition 1: Motivational factors

The questions relating to motivational factors employed a five point Likert scale (five being very important and one being unimportant) to measure their importance. The responses were analyzed as follows: a response of 4 or 5 was considered positive, a 1 or 2 as negative and a 3 as neutral. The neutral responses were not included in the analysis.

Table -1: Summary responses for motivational factors

Motivation factors	Small firms (%)	Medium firms (%)	Large firms (%)
Replace legacy systems	88.7	76.8	90.5
Ease of upgrading systems	31.8	43.5	55.7
Simplify & standardize systems	70.3	84.6	96.8
Improve interactions & communications with suppliers and customers	68.3	83.2	75.2

Proposition 2: Implementation strategies

The strategy used for the implementation is one of the most important factors in assessing the impact of an ERP system on an organization. Strategies can range from a single go-live date for all modules (Big-Bang) to single go-live date for a subset of modules (Mini Big-Bang) to phasing in by module and/or site. While the Big-Bang approach usually results in the shortest implementation time, it is also the riskiest approach because it can expose the entire stability of a company in case of any problems.

Differences in strategies between both large and small companies, and large and medium companies were statistically significant. There was no statistical difference between small and medium companies. Manufacturing companies prefer selective in which modules/functionalities to implement. The results show that five modules/functionalities (Financial Accounting/ Control, Materials Management, Order Entry, Production Planning, and Purchasing) have been installed in reporting companies.

Table -2: Implementation Strategies

Implementation strategies	Small firms (%)	Medium firms (%)	Large firms (%)
Big-Bang	43.23	49.00	16.03
Mini Big-Bang	24.71	17.10	8.68
Phased-In by Module	18.45	11.15	21.00
Phased-In by Site	8.43	26.00	51.34

Proposition 3: Customization of packages

Customization refers to modifying the package through code re-writes, changes or additions. Because of the integrative architecture of ERP systems, customizations can be prohibitively expensive. The common hypothesis is that companies are generally more willing to change their operating processes than customizing the package. Our survey results, however, indicate that almost all companies went through some form of customization.

The degree of customization varies significantly across size of company. Larger companies customize more. There are significant differences between small and large companies between medium and large companies The survey results show that over 50% of the large companies did either significant or major modifications whereas most small companies only made minor modifications. For the large companies, it may not be possible to avoid customization.

Their complex operations and organizational structure tends to increase the pressure for more custom-build processes and reports. An interesting observation from this study was that companies who started their implementations earlier tended to customize more.

Table -3: Degree of Customization

Overall customization	Small firms (%)	Medium firms (%)	Large firms (%)
Minor	72.86	62.00	46.67
Major	2.86	12.00	10.00
Other	1.43	2.00	1.67
Significant	22.86	24.00	41.67

Proposition 4: Package adoption and configuration

The issue of which ERP package to implement is an important decision for any company not only for functionality and ease of implementation but also for future upgrades and for using other specialized packages with the ERP system Table 4 and 5 present company based data for adoption of different ERP packages. Table 4 summarizes the adoption by package breakdowns across all companies and then by size of company, with Table 5 providing data on how the packages are implemented.

Large companies are more likely to have more global operations, more sites and generally more complex operations. Even then ERP systems by themselves may not be able to provide the functionality required to manage complex enterprises. To remedy such shortcomings, companies are increasingly using either self-contained add-on ERP modules or extension systems for such functions as demand planning, order tracking, warehouse management, supply chain management, customer relationship management, on-line collaboration, e-procurement and online business-to-business transactions. Not every ERP system can support these specialized add-ons. Thus, the use of these specialized packages then becomes a key decision factor for not only which system is adopted, but also for how the package is implemented, and future enhancements and upgrades.

Table -4: Summary responses for package adoption

ERP package	Small firms (%)	Medium firms (%)	Large firms (%)
SAP	10.5	25.5	41.5
Oracle	11.8	19.6	13.8
Others/multiple	44.6	25.5	23.1

Table -5: Summary responses for package implementation

Approach	Small firms (%)	Medium firms (%)	Large firms (%)
Single ERP package	56.6	33.3	27.7
Best-of-Breed from different packages	1.3	2.0	9.2
Single ERP package with other systems	36.8	60.8	52.3
Multiple ERP packages with other systems	4.9	2.2	11.2

Proposition 5: Costs and Benefits

The implementation costs reported in the survey part were very similar to the case studies. As expected, implementations at larger companies generally cost much more than at smaller companies. The cost of the software at smaller companies was higher as a percentage of overall cost than at medium or large companies. Surprisingly, the consulting and the training costs are very similar across all forms.

Getting a measure of success and contribution for an ERP implementation is difficult, given the scope, complexity and timing of this type of project. Many of these systems have been implemented only recently so it may be too early to judge the full impact of an ERP package at this stage Table 6 summarizes the impact of ERP systems on the performance measures of key operating areas. The most improvements are in "Increased Interaction across the Enterprise", and "Quicker Response Times for Information".

There are also improvements in order management, on-time deliveries, customer interaction and financial close cycles. The least improvements are in traditional cost measures such as direct operating costs, inventory levels and cash management. These pair-wise comparisons were analyzed using categorical analysis. Larger companies report better improvements in the financial close cycle.

On the other hand, smaller companies have more improvements in order management, on-time deliveries and customer interactions. Table 7 summarizes the areas benefiting the most from ERP systems. As expected, integration of business processes, availability of information and quality of information are the area's most positively impacted. The areas benefiting the least are the costs of information technology and personnel management. There are also several differences here between companies of different sizes. More large companies report benefits in financial management and personnel management than small companies. On the other hand, small companies report higher benefits than large in inventory management and procurement.

Table -6: Summary responses for performance measures

Outcomes	Small firms (%)	Medium firms (%)	Large firms (%)
Reduced direct operating costs	22.9	19.3	21.0
Quickened information response time	77.8	71.9	80.7
Improved order management/order cycle	74.0	55.8	63.4
Lowered inventory levels	37.7	33.7	39.6
Increased interaction across the enterprise	76.0	78.3	89.0
Decreased financial close cycle	49.3	58.6	79.8
Improved interaction with suppliers	42.0	57.2	36.9
Improved interaction with customers	61.0	58.7	31.3

Table -7: Summary responses for areas benefiting

Outcomes	Small firms (%)	Medium firms (%)	Large firms (%)
Integration of business operations/processes	74.3	85.6	88.0
Availability of information	88.2	69.3	94.5
Quality of information	75.6	67.4	89.0
Financial management	53.1	46.0	85.0
Inventory management	77.2	61.3	53.3
Supplier management/procurement	58.4	61.2	39.4

3. CONCLUSIONS

This study provides insights into the implementation and use of ERP systems in the Indian manufacturing industries. Our initial case studies suggested that enterprise size played an important role in ERP implementations on several key dimensions. This was later confirmed through an extensive survey. This research shows that size is again a key factor in the implementation approach for company-wide systems. This may have implications for manufacturing companies as they move to implement the next wave of enterprise systems such as supply chain management and customer relationship management systems.

While this study covered all aspects of an ERP implementation, it was not designed to study such issues as the rationale for doing things in certain ways or to determine exact outcome relationships. For example, one key question that our study could not answer definitively is the cost and benefit relationship. Another issue that needs to be studied is whether early adopters or late adopters received the better returns. While early adopters may have received some competitive advantages, late adopters generally benefited from upgraded systems and a better implementation knowledge base. This raises the issue of the optimal time to start an implementation of a large system.

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