A Study of the Factors Affecting Design and Choice of ERP Systems in Indian Organizations

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Abstract— This paper examines what are the factors that facilitate ERP better working and have impact on ERP system design and choice. It uses a case study methodology to study background of macro level organizations and implementation and use of ERP in them. Views of Engineers and managers business executives of various organizations are collected after doing personal interviews. Collected data is analyzed using binomial testing method to see impact of various factors taken in study. Among various factors studied only flexibility, cost of product minimization and centralized control of organization are found to be very effective on design and choice of ERP systems.

Index Terms: ERP, ERP systems, Design of ERP System, Choice of ERP system, Flexibility of ERP, SPSS, Binomial Testing

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NOMENCLATURE

Greek Symbols	Description
α	Level of significance.
$\alpha 2$	Cronback alpha.
U	Any Company taken for example.
14a	One factor taken for example.

1. INTRODUCTION

Every Organization has a proper infrastructure consisting of several departments working together to give desired outputs for the betterment of the organization efficiency. Earlier before 1960s, all departments of any organization worked manually and today also there are various organizations where work is done manually. To increase profit there are few common methods like to reduce man power, to introduce transparency, to increase productivity of organization at greater pace, a software known as ENTERPRISE RESOURCE PLANNING package came into existence. It is a combination of business management practices and information technology practice. ERP systems have one single database, one single application and one single interface across whole of organization so that each employee can make best use of it.

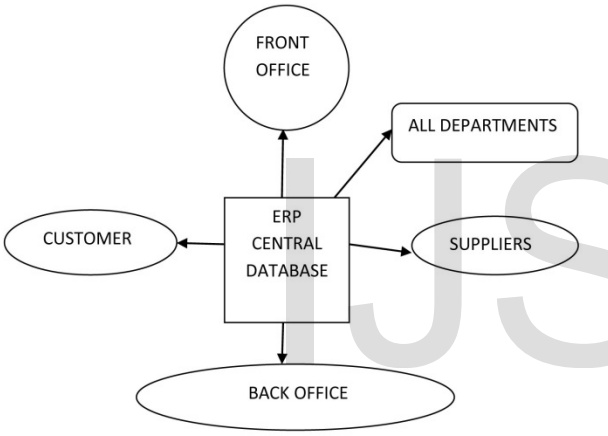

Fig.1: Common ERP Systems Diagram

General practice of implementing the ERP package is; it is sold by vendors in standard form without any changes and customizes it according to the need and buying capacity of the organization.[4]

Besides very useful and good results of ERP systems there are many drawbacks of it, ERP projects are painful for requiring a long time approximately 2-3 years for planning, purchasing and implementing it successfully and a lot of sum of money approximately $100 million for whole process starting from purchasing to implementing yet there is no guarantee of success. [6]

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Thus keeping above issues in mind, it is very important to identify and understand the factors that impact design and choice of ERP packages heavily leading to its successful choice which leads to successful implementation giving best results and not failures.

ERP best practices are not applicable everywhere in each organization and organizations tend to change the ERP package according to their needs. Many organizations now go to software developers to build ERP as per their requirements instead of buying whole of ERP package which costs comparatively less. Many factors which have strong impact on design and choice of ERP packages considered by customers are as controlling cost of , products, centralized control of organization, overall efficiency increase, standardization of organization, formalization of organizations, support for specialized operations, module and features able to handle high complexity of work flow in business operations, minimization of product cost, long term sale forecasting, organizational and inter organizational increase in efficiency, controlling and monitoring for day to day operations, module to consider need of keeping pace with market changes, increase flexibility, arrangement to enhance and support research and development activities.

The Current Status of ERP systems across any type of organization is still very complex to use and bring a lot of changes to organization working methods, which employees still resist due to which efficiency is low. ERP packages are still taking much time in implementation and very costly due to which small organizations buy and implement only few modules.

The identification of affecting factors is mostly based on the live experiences of professionals, business executives and senior managers who have been involved in ERP implementation and working after implementation in their respective organizations. Many times it happens that the end user do not show interest to use the ERP system despite of its successful implementation. In such cases where user is not using ERP system besides its implementation for which the organization initially bought it, is considered as unsuccessful implementation. Considering all such reasons this study focused majorly on analyzing the ERP success from the combined point of view of implementation project which is affected by certain group of factors and factors which impacted user adoption.

2.0 RESEARCH METHODOLOGY:

For finding the impact of factors on design and choice of ERP system Total Nineteen macro level organizations from all sectors including public sector

as well as private organizations are selected where ERP was implemented and working properly. The questionnaire was filled with support and help of various organization's business executives and engineers by means of personal interviews. The collected data was given suitable codes and statistical analysis was done with SPSS (Statistics Program for Social Sciences). Keeping the organization profile in mind following steps was followed:

2.1 Questionnaire Development:

Firstly in the study we developed a questionnaire, containing factors that have to be studied. Each question has one variable (factor) and has at least two questions related to it for reliability purposes. The interviews also enquired about various other facts that are supposed to be effective on ERP systems success such as:

- Internal support that involves organizations employees support and corporation towards implementation of ERP systems
- Proper project planning of ERP and participation of workers and employees in it.
- Proper training of employees and workers about how to work while it is being ERP is implemented and after its implementation.

Sr. No.	Statements	What an ERP package (from vendor) has to offer Qa		What are the expectations from ERP package (by the organization) Qb	
		High	Low	High	Low
1	ERP helps in controlling cost of the product				
2	ERP technology helps in increase in overall efficiency of the organization				
3	ERP helps in standardization of organization				
4	Degree of formalization increased				
5	ERP supports centralized control of organization				
6	ERP implementation support specialized operations				
7	ERP is able to handle high complexity of work flow in business operation				
8	ERP monitors and control the day to day operations				
9	ERP system increases the organizational and inter organizational efficiency of the business				
10	ERP system supports helps to minimize the product cost				
11	ERP system efficiently manage the long term sale forecast				
12	Organization able to keep pace with the major changes in the market with ERP implementation				
13	Flexibility of the organization is increased after ERP implementation				
Sr. No.	Statements	What an ERP package has to offer		What are the expectations from ERP package	
		High	Low	High	Low
14	Decision making can be more quick and effective due to ERP implementation				
15	ERP system enhance the research and development activities				
16	ERP system with CRM module interface in able to provide enriching customer experience				

Fig.2: Sample Questionnaire Design.

2.2 Sample Design:

Total Nineteen macro organizations are interviewed from all sectors including public sector as well as private organizations working in various fields from three cities of India which are as follows:

City	No of Companies (Names)
X	2 (M, I)
Y	11 (H, O, T, Q, A, N, C, P, L, R, S)
Z	6 (B, D, E, F, Z, K)

Tab.1: City Name and respective companies Name

Following are the list of respondent's profiles according to the respective companies and departments:

Company name	Total work experience	Department
COMPANY M	6	IS &T
COMPANY I	8	IT
COMPANY H	14	IT
COMPANY O	7	IT
COMPANY T	8	IT
COMPANY Q.	7	IS &T
COMPANY A	8	IT
COMPANY N	11	IT
COMPANY C	9	IT
COMPANY P	8	IT
COMPANY L.	5	IT
COMPANY R	8	IT
COMPANY S	12	IT
COMPANY B	7	IT
COMPANY D	15	IT
COMPANY E	6	IS &T
COMPANY F	9	IT
COMPANY Z	11.5	IT
COMPANY K	8	IT

Tab.2: Respondent Profile and respective companies

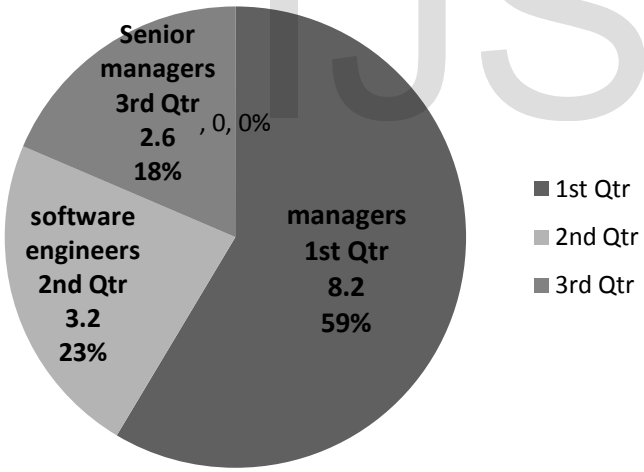

Fig.3: Pie chart for percentage of interviewed Persons profiles

2.3 Data Collection:

Personal interviews I the most effective method of data collection that was taken to carry out this study. In this regards interviews of business executives, software engineers, managers and senior managers were taken and questions were also asked about their respective organizations strategy ,culture ,business partners, mode of functioning, mode of transactions , branches, number of employees, yearly turnovers, product type they produce, market pattern they follow and all questions mentioned in questionnaire.

2.4 Data Interpretation:

After doing data collection the important task is to convert qualitative entities in to the quantitative format that is most required this for analysis as we have taken combination of close ended and open ended questions sets for this all open ended question responses had converted in to the quantitative format after giving some specific codes ranges 3 to 10.

2.5 Analysis:

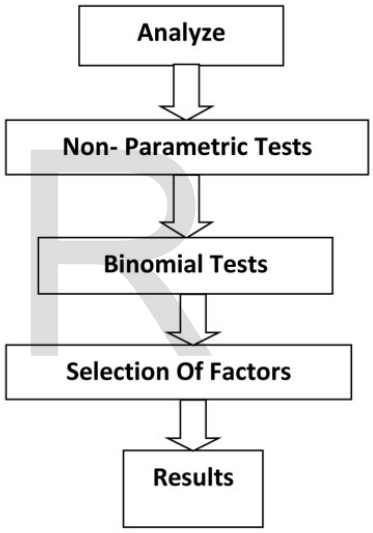

Fig. 4: Flow diagram of testing method employed in this research.

An example to show process of analysis in very simple understandable way is shown below with example of analysis of only one factor (14a).

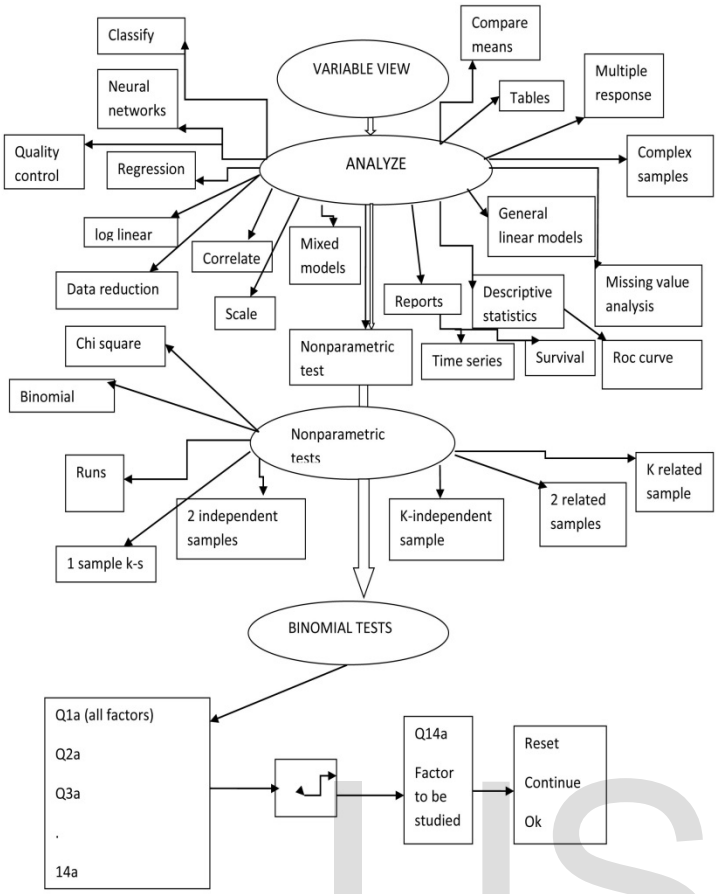

Fig.5: Steps of Analysis of One Factor.

3. RESULTS:

After data was analyzed, three important factors were found to be most demanded by the customers, ERP package buyers and also considered by software developers, such as Quick Solutions Organization. The three factors are as follows:

3.1 Flexibility:

This factor played dominant role in customer's choice towards ERP; all of the 19 organization employees graded this factor very high and most desirous.

3.2 Centralized Control in Organizations:

This factor was also found to be very affective as all of the 19 organizations tend towards centralized control as it helps in proper functioning of organization.

3.3 Minimization of Cost of Product:

Cost control factor is favorite among all 19 organizations as every organization is more concerned with least money spend giving good quality products as well as have high efficiency.

All the answers after binomial tests were checked for reliability and validity by value of α 2 which refers Cronback Alpha.

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
q2a	19	1.68	.478	1	2
q5a	19	1.37	.496	1	2
q6a	19	1.16	.375	1	2
q7a	19	1.63	.496	1	2
q8a	19	1.37	.496	1	2
q10a	19	1.26	.452	1	2
q11a	19	1.79	.419	1	2
q13a	19	1.42	.507	1	2
q14a	19	1.16	.375	1	2
q16a	19	1.63	.496	1	2

Tab. 3: Results in above case, giving values of exact significance, level of significance (α) and mean deviations

Binomial Test

		Category	N	Observed Prop.	Test Prop.	Exact Sig. (2-tailed)
q2a	Group 1	high	6	.32	.50	.167
	Group 2	low	13	.68		
	Total		19	1.00		
q5a	Group 1	high	12	.63	.50	.359
	Group 2	low	7	.37		
	Total		19	1.00		
q6a	Group 1	high	16	.84	.50	.004
	Group 2	low	3	.16		
	Total		19	1.00		
q7a	Group 1	high	7	.37	.50	.359
	Group 2	low	12	.63		
	Total		19	1.00		
q8a	Group 1	high	12	.63	.50	.359
	Group 2	low	7	.37		
	Total		19	1.00		
q10a	Group 1	high	14	.74	.50	.064
	Group 2	low	5	.26		
	Total		19	1.00		
q11a	Group 1	low	15	.79	.50	.019
	Group 2	high	4	.21		
	Total		19	1.00		
q13a	Group 1	low	8	.42	.50	.648
	Group 2	high	11	.58		
	Total		19	1.00		
q14a	Group 1	low	3	.16	.50	.004
	Group 2	high	16	.84		
	Total		19	1.00		
q16a	Group 1	high	7	.37	.50	.359
	Group 2	low	12	.63		
	Total		19	1.00		

Tab.4: Values obtained after Binomial Test

CENTRALIZED CONTROL FACTOR Q6a

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	high	16	84.2	84.2	84.2
	low	3	15.8	15.8	100.0
	Total	19	100.0	100.0	

Tab: 5. Results Of Q6a

PIE CHART SHOWING CENTRALIZED CONTROL FACTOR

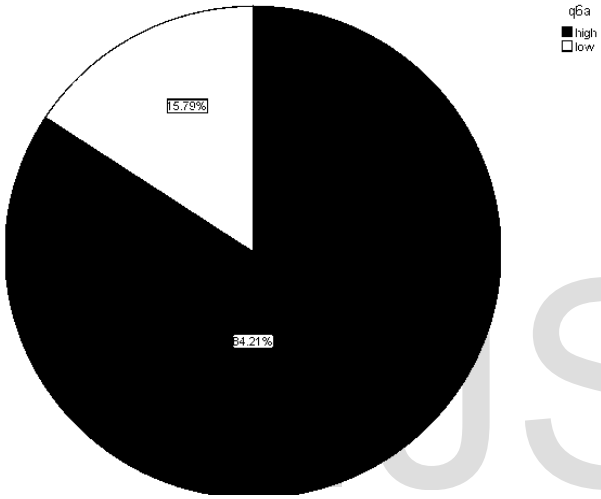

Fig: 6. Pie Chart Showing % Of Minimization Of Product Cost Factor

PRODUCT COST FACTOR Q11a

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	high	4	21.1	21.1	21.1
	low	15	78.9	78.9	100.0
	Total	19	100.0	100.0	

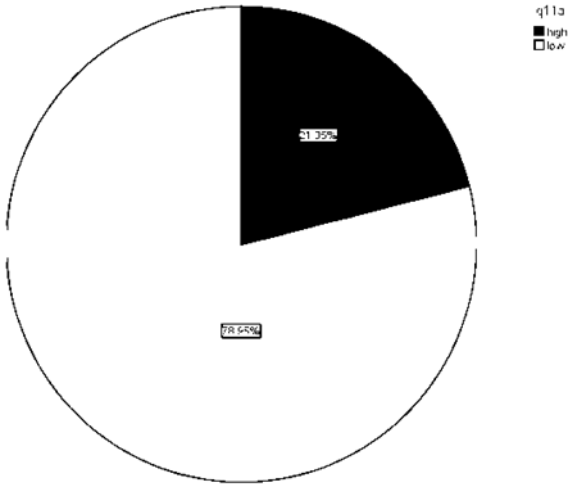

Fig: 7. Pie Chart Showing % of Minimization Of Product Cost Factor

3.4 Result of Q14a (factor of flexibility of organizations):

E. S. = 0.04 < 0.05

i.e high proportion ≠ low proportion.

Thus we can generalize this factor as good and effective as observed from frequency

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FLEXIBILITY FACTOR Q14a

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	high	16	84.2	84.2	84.2
	low	3	15.8	15.8	100.0
	Total	19	100.0	100.0	

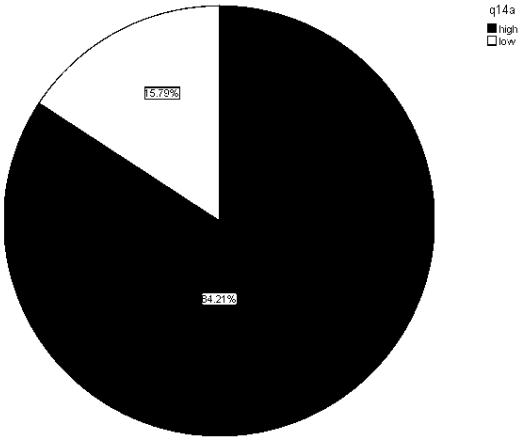

Fig: 8. Pie chart showing percentage of organizations regarding flexibility factor

4. CONCLUSIONS:

After the rigorous study we found that Organizations go for customization and following are the three major factors which impact design and choice of ERP systems :

- Flexibility
- Centralized Control.
- Minimization of cost of product.

Above are the factors which affect the overall efficiency of organization as well as affect design of ERP software and choice of consumers(organizations) as well as developers thus impact design and choice of ERP systems. This work may be studied further in future to enhance functionality of flexibility module by making provisions for sending of whole day working data sheet to higher officials of organization through SMS on mobile phones.

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