

Analysis the Impact of Enterprise Resource Planning Systems on Organizational Effectiveness

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Abstract: Enterprise Resource Planning (ERP) Systems exist to create effectiveness organizations but measurement of this is so difficult. Effectiveness is multiconcept. Three variables affect organizational effectiveness such as defined casual, intervening and end-result. In this article at the first, we review measurement methods that have a full fitness with these variables. After that, we try to use this variables and ERPs benefit to study differential impact of these systems on effectiveness. In addition, we investigate the effectiveness measurement methods that calculating the affects of ERPs on organizational effectiveness and introduce the appropriate methods that adjust better with these systems. At the last, we suggest the management guideline for implementing ERPs.

Keywords: Enterprise Resource Planning, Organizational Effectiveness, Casual, Intervening and End Result Variables

1 Introduction

The waves of change brought by ERPs have begun to be felt and appreciated by organizations worldwide (Siriginidi Subba Rao, 2000). ERP systems are beneficial in providing support for all variations of best business practices, in enabling the implementation of these practices with a view towards enhancing productivity. ERP combines both organizational business process and total organizational IT into one integrated system. (Al Mashari, 2002). Much of the published research on ERP has been about the specific benefits of the technology or particular features of their implementation in individual organizations (Sarah Cadili, et al, 2005). ERP systems have a high degree of integration and information commonality. By streamlining data flows throughout an organization, this commercial software, offered by vendors like SAP, promise dramatic gains in a company's efficiency and bottom line (Ulf Melin, 2003). But who can guarantee the positive effect of erp systems on organization aspects (structure, communication, objectives)? Does an erp system give the same implementation benefits in all organizations? Does this system help the organization to gain their goals? The only thing known for certain is that implementation is very resource-consuming and the impact and benefit of implementation is unclear. The response to these questions could be finding in effectiveness concept. ERP systems are by many regarded as a dream

come true and are in most cases implemented in order to improve organizational effectiveness (Cameron, K.S., 1999). Studies show improved organizational effectiveness such as business process improvement, increased productivity and improved integration between business units (Purnendu Mandal, et al, 2003).

Evaluation the impact of ERP systems on organizational effectiveness is so difficult. Some of the famous problems are the complexity and comprehensiveness of ERP systems, the lack of empirical research on the impact of ERP systems on organizational effectiveness, and the shortcomings of traditional multivariate methods (such as factor analysis) for solving problems related to organizational effectiveness (Campbell, 1977). Gaps between effectiveness expectations and actual performance improvements with respect to employee work satisfaction, efficient resourcing, and customer interaction are reinforced in erp. ERP implementation increasingly identified people and organizational issues as critical features to be addressed for successful systems integration (C.G. Ash, J.M. Burn, 2003).

2 literature review

2.1 Effectiveness

Numerous writers, including economists, consultants, professional managers, entrepreneurs, business professors and researchers, politicians and constituencies, have paid a great deal of attention to the issue of organizational effectiveness

organizational effectiveness is defined as the extent to which an organization, by the use of certain resources, fulfils its objectives without depleting its resources and without placing undue strain on its members and/or society (Mary S. Thibodeaux, et al, 1996). The degree to which program or system objectives are being achieved (Robins, 1983) .The extent to which the goals of the system are attained or the degree to which a system can be elected to achieve a set of specific mission requirements (Daft, 2003). Contextual measurement of constituent preferences for performance and environmental constraints on performance from an external environmental perspective (Zammuto, 1982). Effectiveness evaluates the performance of business units' efforts with respect to strategic goals, and serves as a critical component in the management planning and control processes (Griffin, 1987). The organization' s bargaining position in the ability of the organization in either absolute or relative terms to exploit its environment in the acquisition of scarce and valued resources (Yuchtman,et al,1987). Whereas effectiveness is often equated with the proper selection of the activities or "doing the right things" (Drucker, 1977; Anthony et al, 1989).

Organizational effectiveness can also be defined in terms of the effectiveness of internal processes. In this area an effective organization might be defined as one in which there is a low level of internal strain, where everything runs smoothly (Redshaw, 2000). Effectiveness also used against the efficiency. Efficiency means the resources that consumed for producing goods or delivering services. Another meaning of efficiency is that associated with performing activities as well as possible or "doing things right". But sometimes efficiency doesn' t result to success. It may be possible that organization present high efficiency but couldn't gain their objectives. For example it would be arising from manufacturing the product without attention to consumers (Daft, 2003).

Evaluation of effectiveness is so difficult.

Campbell also has listed 10 concepts underlying organizational effectiveness. They are listed and defined as follows:

- 1 Conflict is the ability of the organization's members to work together, communicate fully and openly and co-ordinate their work efforts given conflicting demands.
- 2 The customer is the individual and/or company that are the owner and/or user of the organization's primary product or service.
- 3 Flexibility/adaptation is the ability of an organization to alter its method of operation to meet its needs both internally and externally.

4 Information management and communication is the completeness, efficiency and accuracy in the distribution and analysis of information.

5 Morale is the group phenomenon involving extra effort, goal communalities, commitment and feelings of belonging.

Planning and goal setting encapsulate the manner in which an organization systematically plans its future steps and provides a forum to develop explicit mission and goals.

Productivity is the quantity or volume of the major product or service that the organization provides.

Quality is the level of client or customer acceptance of an organization's primary product or service.

9 Urgency is the prompt capability of an organization to perform tasks that require change primarily because of the market place.

10 Value of human resources is the emphasis an organization places on the recognition of individuals for their talents and contributions to the organization both real and potential (Campbell, J.P., 1977). However there are several models to evaluate effectiveness. They are summarized in table 1.

2.2 Effectiveness and Enterprise Resource Planning Systems

ERP software integrates information used by the accounting, manufacturing, distribution, and human resources departments into a seamless computing system (Jaidep Motwani, et al 2005). The business world's embrace of enterprise systems may in fact be the most important development in the corporate use of information technology in the 1990s (T.Davenport, 1998). ERP systems specifically address the need for integration of application programs for various business functions or processes in a manufacturing firm, such as sales, accounting and manufacturing. Different business applications can all use a common database that serves as the integrating mechanism (John Olhager, et al, 2003).

ERP systems are expected to provide at least in theory, seamless integration of processes across functional areas with improved workflow, standardization of various business practices, improved order management, accurate accounting of inventory, and better supply chain management (Mabert, et al, 2000). ERP arrived at a time when process improvement and accuracy of information became critical strategic issues. The emphasis on supply chain management and the advancement of information technology created a need for enterprise- wide integration. In the past few years, ERP has become a "must have" system for almost every firm to improve competitiveness. Today, over 60% of companies have installed or plan to

install a packaged ERP system (Hsiuju Rebecca Yen, Chewn Sheu, 2003).

Evidence from a survey on companies who have adopted ERP systems and their impact on management practice confirms a number of such benefits. The most highly-rated perceived benefits involve increased flexibility in information generation, improved quality of reports, increased integration of accounts applications and improved decisions based on timely and reliable accounting information. Evidence suggests that businesses expect ERP systems to deliver improved company performance (Charalambos Spathis, et al, 2005) Therefore, it is highly unlikely that any two implementations will have identical requirements or consequences, even if they are based on the same generic software packages. While the potential benefits might be articulated, determination of the actual benefits from implementing an ERP system is difficult to foresee. Many managers doubt to gaining value and competitive advantages from erp systems (Keng Siau, 2002).

The main reason of organizations is objectives and acquires effectiveness (Daft, 2003) . ERP systems are by many regarded as a dream come true and are in most cases implemented in order to improve organizational effectiveness (T.Davenport, 2000). Some studies also described cases where the implementation failed and the impact had the opposite affect on organizational effectiveness. However, erp systems are huge and complex and have a different implementation results. In the other hand, the effectiveness is multiconcept and complicated to measurement. (S.C. Lenny Koh, 2006).It includes strategic, operational, human resource and structural properties of organization. So find the comprehensive model that comprises all directions is so difficult.

Table 1- Description Effectiveness Evaluation Methods

Evaluation Method	Description	Criteria	Reference
Goal Approach	In this method, the goals should be set and then measure the organization goal achievements.	-Profitability -Growth -Market Share -Efficiency	-Resource Protection -Social Responsibility -Research and development -Financial Consistency Robins,1983
System Resource Approach	Which Organization could be remain in effectiveness situation that succeed in gathering necessary resources and protect them.	Power of organization to employ environment and valuable resources -Protect daily activities inside of organization - Power of organization to act environmental variation properly	Daft,2003
Internal Process Approach	Base on human resource satisfaction and organization work with concurrent resources. The internal health of organization is so important to get effectiveness	-Powerful organization culture -Cooperation morale and liability to group -Confidence, Certainty and mutual understanding -Powerful link in horizontal and vertical levels -Giving rewards to managers accordance with their performance	Daft,2003
Stakeholder Approach	Satisfy all of the stakeholders like shareholders, employees, customers, government, and society	-Shareholders (financial efficiency) -employees (satisfaction, salary, rewards, behaviors) - Customers(high quality and services) -Government(respect to rules)	Robins,1983
Systematic Approach	Effectiveness gets through effective communication with environment.	-Return on investment -Cash flow period	-Market Share -Demand Level Robins,1983
Competing Values	Effectiveness is conceptual and analyst selects the objectives by personal values and preferences.	-Flexible in control -Coordination and information management -Morale and adhesion -Human resource development -Innovation and conformity	Jalali et al. 2005

Evaluation Method	Description	Criteria	Reference	Evaluation Method
Legislation	The conceptual criteria that show the main organization function and boundaries from outside perspective	-Conflict control -Customer oriented -Flexibility	-Team building morale -Planning and goal setting	Mary S.Thibodeaux, et al, 1996
Organization improvement	This model evaluates the organization ability as a workgroup to achieve member's requirements.	-Supervisor behaviors -Mutual confidence	-Management freedom in goal setting -Team building	Koolobandi,1995
Function-Structure	This model evaluates the usefulness of organization activities for social groups.	-Flexibility -Security -Responsibility -User friendly services -Quick services -Real-time services		Farahmand,2000

Hedman in his studies by Competing Values model identified that erp systems most effect on operational outlook and less attention to human resources (Jonas Hedman, 2000). Paradoxically, ERP projects are often considered to be strategic imperatives, but are usually justified using operational factors (Murphy and Simon, 2002). In another studies that occur in 2005, the researcher brake erp effectiveness evaluation in three phases, before implementation, implementation and post implementation. Finding of this study display that senior manager agreement, suitable IT knowledge by CIO 's and communicate to other managers in organization could be effect of these systems. Also another result show that 25 percent of investments wasted and 20 percent of projects stopped in post implementation phase. The researcher concluded that it was happen by the lack of effectiveness (Chian-Son Yu, 2005)

3 Research Framework

Today's all of the managers agree to use the multiobjective indicators in effectiveness evaluation (Robins, 2004). Likert indicate three group of variables that define as casual, intervening and end-result. These variables form the effectiveness smoothly. Casual variables appear in internal development, results, and relate to management decisions. These independent variables could be change and control by top managers or managerial board like Strategies, skills and behaviors of leadership, management decisions, policies and organization structure.

Strategies, management skills and other casual

variables that effect human resource define as intervening variable. As the likert pointed, intervening variables describe the current situation of organizations and indicate themselves in motivation, power of decision making, communication, responsibility and skills. The last group of effectiveness variables that show the organization results named as end result like Production capacity, Market Share, Return on investment and quality level. Most of the managers (over 90%) in effectiveness evaluation paid attention only to end results (Hersi, Blanchard, 1982).

We could imagine the relationship between these variables as effectors (casual variables) that effect on organisms (intervening variables) and give us some responses (end result variables). Intervening variables focused on large time objectives in comparison with the end result variables that most focused on short time objectives. Pay more attention than necessary on end results could be harm human resources and make critical conditions.

Between effectiveness evaluations method which is more valuable that could be cover three groups of variables equally. So for the better analysis of enterprise resource planning effect on effectiveness and to find more valuable methods, the analysis session divide to three sections.

- Comparison of Effectiveness Evaluation Methods by coverage power
- Analysis the effect of enterprise resource planning systems by triple variables
- Comparison care rate of effectiveness evaluation methods to measure enterprise resource planning effectiveness

4 Evaluation&Analysis

4.1 Comparison of Effectiveness Evaluation Methods

In Figure 1, indicators (table 1) compare by power of coverage triple variables. As showed in this figure, methods like goal oriented and systematic approach only cover efficiency dimension. In another situation methods like internal process oriented exist that only point intervening dimension. In another hand, there are two dimension methods like stakeholders, resource supply and organization improvement. Only Three

remained methods, legitimacy, Competency values and task-structure cover the whole variables. So in this article, discussion continues with that methods and another methods omitted.

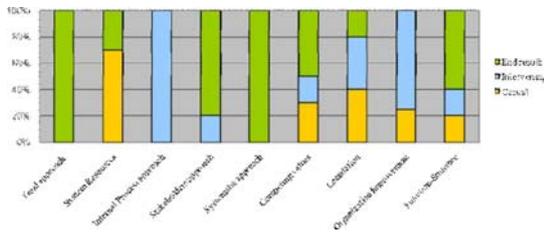


Fig.1- Comparison of Effectiveness Evaluation Methods by triple variables

4.2 Analysis the effect of Enterprise resource planning systems on organization effectiveness

Right evaluation needs right tools. At first, we need to see some of system output. So the research in scientific resource focused on benefits and effects of implementing enterprise resource planning in organizations. The research output that summarized in table 2 covers different fields like human resource, organization structure, decision making and organization efficiency. Research output group by variables in three sections. The result present in last column of table 2.

Table 2- Present benefits of implementing enterprise resource planning systems with references and variable types

	Li-Lin et al.2004	Charalambos Spathis, et al.2003	Clyde W. Holsapple, et al. 2003	Jan Ollager, et al.2003	Elliot Bendoly, et al.2005	Charalambos Spathis, et al.2005	Vale rize Bottu, et al.2005	Variable Type
Support Production Capacity	✓							Casual
Planning								
Provide Market Demand Forecast	✓							Casual
Facilitate Mass Customization and improve manufacturing flexibility	✓							End-result
Increase Inventory Turn over Rate	✓	✓						End-result
Decrease Inventory level and cost	✓			✓			✓	End-result
Control and improve product quality	✓							End-result
Speed up new product development cycle and time to market	✓							End-result
Reduce the cycle time of order fulfillment	✓			✓				End-result
Achieve Operational Excellence	✓					✓		End-result
Allocate enterprise resource better	✓							Casual
Increase communication among departments	✓	✓	✓	✓			✓	Intervening
Integrate information across the enterprise	✓					✓		Intervening
Increase the availability of critical operational and decision support information to provide visibility of enterprise planning activities	✓						✓	Intervening
Access to real-time business intelligence	✓		✓					Intervening
Improve information flow among departments	✓							End-result
Improve response time to customer order	✓							End-result
Improve service quality	✓						✓	End-result
Improve customer satisfaction and loyalty	✓							End-result

Table 1-continue

	Li-Lin et al.2004	Charalambos Spathis et al.2003	Clyde W. Holsapple, et al. 2003	Jan Ohlager, et al.2003	Elliot Bendoly, et al.2005	Charalambos Spathis, et al.2005	Vale rie Botz, et al.2005	Variable Type
Growing purchase from customers	✓							End-result
Increase Flexibility in information generation		✓	✓			✓		Casual
Improve quality of reports		✓				✓		End-result
Increase integration of applications		✓						Intervening
Easy maintenance of databases		✓						End-result
Increase user friendliness of information systems		✓						Intervening
Reduction of time for transaction processing		✓						End-result
Improve decision making process		✓	✓			✓		Casual
Reduction in errors in logistic		✓					✓	End-result
Reduction of total operating and administration costs		✓		✓			✓	End-result
Better knowledge processing			✓					End-result
Better cope with large complex problems			✓					End-result
Better coordination			✓					Intervening
Greater satisfaction			✓					Intervening
Decisional empowerment			✓					Intervening
Improve relationship with suppliers			✓	✓		✓	✓	End-result
Increase competitive advantages			✓					End-result
Decentralization			✓					Casual
Improve interaction with customers				✓			✓	End-result
Improved cash management				✓		✓		End-result
Bottleneck reduction					✓			End-result
Waste reduction					✓			End-result
Improved exploitation of financial resources							✓	Casual

Table2-continue

	Li-Lin et al.2004	Charalambos Spathis, et al.2003	Clyde W. Holsapple, et al. 2003	Jan Ohlager, et al.2003	Elliot Bendoly, et al.2005	Charalambos Spathis, et al.2005	Vale rie Botz, et al.2005	Variable Type
Increased effectiveness of internal control							✓	End-result
Increased clarity of financial management							✓	End-result
Less time for document entry							✓	End-result
Fewer errors on data entry							✓	End-result
Less time for annual closing of accounts							✓	End-result
Improved communication between employees and management							✓	Intervening
Improved document circulation							✓	End-result

After organize the benefits of erp systems, the below results determined.

- ERP systems tend to end result variables and paid less attention to intervening and casual variables.
- End result consideration lead to short-time objectives. Thus ERP systems help to organizations that follow quick improvements. These systems don't impress any things that guarantee performance improvement in future.
- Lack of tendency to intervening variables result in human resource dissatisfaction and decrease in personal efficiency.
- Lack of tendency to casual variables show that erp systems don't succeed to help top managers adopting direct strategies.

4.3 Compare the accuracy of Effectiveness evaluation methods in erp systems

In section 4-1, we showed that only legislation, Competing values and function-structure methods might be cover triple variables. After that we investigate that erp systems tend to end result variables and short time objectives. So in this section, we try to choose best method by comparison selected methods from section 4-1. In this comparison, the table2 was the reference

model. By this comparison (figure 3), the below results conclude.

- Function-structure method is the best method to evaluate erp systems effectiveness.
- After the function-structure method, the competing values method receptacle more adoption.
- The legislation method rely on intervening variables and doesn't suitable for erp effectiveness evaluation.

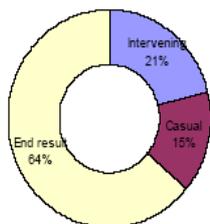


Fig. 2- Cover rate of triple variables in enterprise resource planning systems

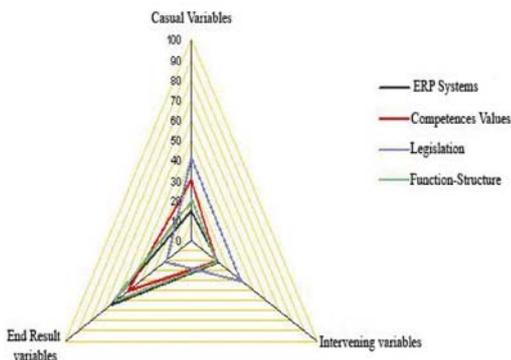


Fig .3- Comparison of methods accuracy to evaluate enterprise resource planning systems effectiveness

5 Conclusion

ERP is probably the most rapidly growing system area in operations today. Thousands of companies have implemented or are in the process of implementing an ERP system (ZheZang, etal, 2004). Implementation of enterprise resource planning systems improves organization effectiveness (T.Davenport, 1998) but complexity and intangible benefits makes difficult to evaluation the effectiveness (Jen-Her Wu, 2006). Measurement of ERP effectiveness is process that could be guidelines for managers to find weakness and

optimal use of system to alignment with organizational objectives. Many methods presented for measurement of organization effectiveness but a few of them contain suitable indicators because evaluation of effectiveness needs to multiple gauges to completely underneath organization different outlooks.

Likert offered three groups of variable that impress effectiveness and define them as casual, intervening and end result. Casual variables change by managers; intervening variables indicate internal organization hygiene and end results show operational situations. In this article, we try to use these variables in erp effectiveness evaluation. At the first, it should be select the methods that could be appropriate to declare entire directions of organizations. So legislation, competing values and structure-function methods select as the best choices. They could be completely cover requested elements.

The second analysis regards to measure the impacts of enterprise resource planning systems on effectiveness. It demonstrates that erp systems paid less attention to casual and intervening variables. They focus on end results and vendors attempt to satisfy managers by quick outcomes. Therefore these systems are useful for companies that concentrate to improve short term objectives but don't guarantee proper achievement of large term objectives. At the other side, the lack of consideration to intervening variables causes to decrease job satisfaction between employees in long term. The third part focused to select proper erp evaluation method. The results demonstrate that function-structure method give the best and suitable output in erp effectiveness measurement.

At last, we can conclude that if the managers want to improve their performance in long term, consider the casual and intervening factors in selecting erp application and vendors. Also the vendors should develop the application and tools that regard to set strategies and objectives and consider Human resource motivation and morale.

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