

# Proposing Enterprise Wide Information Systems Business Performance Model

Vineet Kansal

**Abstract**—Enterprise Wide Information Systems (EWIS) implementation involves the entire business and will require changes throughout the firm. Because of the scope, complexity and continuous nature of ERP, the project-based approach to managing the implementation process resulted in failure rates of between 60% and 80%. In recent years ERP systems have received much attention. The organizational relevance and risk of ERP projects make it important for organizations to focus on ways to make ERP implementation successful. Once these systems are in place, however, their performance depends on the identified macro variables viz. 'Business Process', 'Decision Making' and 'Individual / Group working'. The questionnaire was designed and administered. The responses from 92 organizations were compiled. The relationship of these variables with EWIS performance is analyzed using inferential statistical measurements. The study helps to understand the performance of model presented. The study suggested in keeping away from the calamities and thereby giving the necessary competitive edge. Whenever some discrepancy is identified during the process of performance appraisal care has to be taken to draft necessary preventive measures. If all these measures are taken care off then the EWIS performance will definitely deliver the results.

**Keywords**— Enterprise Systems, performance, technology

## I. INTRODUCTION

ENTERPRISE Wide Information Systems (EWIS) allow companies to replace their existing information systems, which are often incompatible with one another; with a single, integrated system. In addition, it is increasingly the case that organizations are seeking to embed much of their organizational knowledge in complex information systems [5], [14], [25]. Adopting this perspective, these systems are presented as more effective and efficient ways of representing the knowledge necessary to manage the contemporary organizations [4]. Thus, they tend to impose a specific logic of doing business, which is particularly shaped by the "best practice" that EWIS seek to bring with them [22]. However, actually implementing and using such best practices within the adopting organizations has turned out to be major challenge [7].

Author of this working paper is with Business Faculty at Arab Open University, Kuwait (e-mail: kansalvineet@hotmail.com).

The present study undertaken helps to obtain a better understanding of the factors, and their dynamics, which influences the EWIS performance and usage of such large organization wide systems. The work helps organizations to better plan for, manage and increase organizational performance through EWIS projects.

## II. LITERATURE REVIEW

[9] builds an integrated theoretical model to investigate and explain the impact of ERP implementation on business performance. The study builds on past research, which pointed out that ERP had tangible and intangible results, by establishing a comprehensive structure of how ERP implementation affects the company. [26] studied for proposal for an active ERP implementation management perspective to manage ERP risks based on Real Options theory, which addresses uncertainties over time, resolves uncertainties in changing environments that cannot be predefined. It has also been observed that streamlining the business process [6], [19], satisfaction with business process [15], overall organizational performance, flexibility in decision making [21], coordination between managers, improved forecasting, reduced information delay, decision process, saving end user time, simplified user task, reduced paper work, availability of information, feeling of ownership, inter-departmental relation, control over information, individual and group productivity are the variables used to measure performance of information systems [2].

Further, it was also identified that EWIS Performance can be measured in terms of cycle time, customer service, lead time, cost, throughput, sales volume, inventory, error in ordering, competitive position, communication etc. [1], [10], [17], [20]. Based on the researches, the identified variables have been clustered into macro variables. It has been identified that 'business processes', 'decision making' and 'individual / group working' are the macro variables which are needed to address EWIS performance.

These macro variables are as explained in following discussion. Business process is comprised of the people who conduct it, the tools they use to assist them, the procedure they follow and the flows of material and information between various people, groups and sub-activities [21]. The issues such as streamlining of business process, satisfaction with business processes and overall organizational performance were taken

to observe the effect of EWIS on business processes [13, [15], [19]. Decision-making is an important macro variable, which affects EWIS performance. The variables such as flexibility in decision-making, time frame for decision-making, coordination between managers, forecasting, information delay and decision process were taken to observe the influence of EWIS on decision making [23]. Individual / Group Working is another important macro variable identified affecting the performance of EWIS in an organization. The sub-variables, especially, simplified use task, end use time, paper work, availability of information, feeling of ownership, inter-departmental relations, control over the information and individual and group productivity were also considered to be influencing the individual / group working [18], [24].

The research problem chosen for this study is to identify whether or not the micro variables identified (viz. streamline the business process, satisfaction with business processes, overall organizational process; flexibility, forecasting, coordination, time frame, decision process, information delay; control on information, inter-departmental relation, feeling of ownership, group / departmental productivity, information availability, paper work, user task, end user time, and individual productivity) influence the macro variables (viz. the 'business process', 'decision making' and 'individual / group working') and how it leads to EWIS performance in the organization. This is examined through inferential statistics.

### III. RESEARCH MODEL

Based on these variables, the research model has been defined. The research questions, as well as the research hypotheses are framed along with the design of the questionnaire. This survey had implemented EWIS in the last two years has been conducted. The organizations were selected from a list provided by vendors that had implemented EWIS over the last one year and had gone live. This analysis uses a subset of the data used in the larger survey. A model showing the relationships among the macro variables given in Figure 1 has been considered the best fit to examine the effects of these factors on the performance of EWIS. It is contemplated that EWIS Performance is dependent on 'business processes', 'decision making' and 'individual / group working'.

The three guiding hypotheses for the study are:

- The business processes affect EWIS performance.
- The decision-making influences EWIS performance.
- The work culture has an impact on EWIS performance.

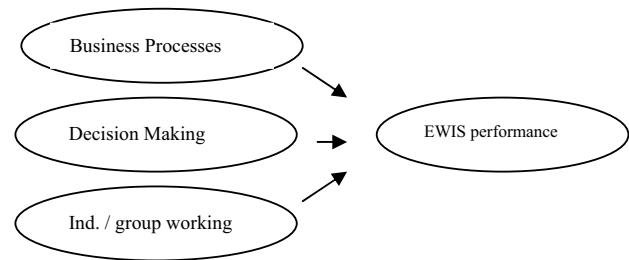


Fig. 1 Research Model

### IV. FINDINGS & DISCUSSION

Owing to multi-dimensional nature of EWIS performance two-pronged data collection methodology has been used. The way the ERP project is taken over and its impacts related data have been collected through survey questionnaire, one to one interview has been employed in order to understand the issues involved and corporate learning while dealing with ERP in the organization. These two approaches have been complementing each other in terms of validating the findings. The unit of analysis in the questionnaire was individual decision makers at middle or top management levels. The data were collected from 92 organizations. The multivariate technique that has been used to test the macro hypotheses is the regression analysis. It presented the large amount of data in a more simplified and meaningful form. The purpose of performing regression analysis was to examine the statistical significance of the model showing relationships of the macro variables presented earlier in Figure 1.0.

#### A. Business process and EWIS Performance

Table 1.1 shows that 28.7% variation in EWIS performance is explained altogether by 'streamlined business processes', 'increased overall satisfaction with business process' and 'improved organizational processes on the whole'. The degree of association with dependent variable is 0.212, 0.159 and 0.259 with 'streamlined business processes', 'increased overall satisfaction with business processes' and 'improved organizational processes on the whole' respectively. The 't' value shows relative strength of the variables as predictor. The F value 4.994 (3,88 degree of freedom) shows a highly significant relationship and depicts that three independent variables help to explain the variation in EWIS performance. Table 1.2 shows that F value has been found statistically significant.

The relative importance of the regressor is normally assessed by the standardized regression coefficient ( $\beta$ ). It can be observed that 'reduced cycle time' has relatively more impact on dependent variable followed by 'improved the organizational process on the whole', 'streamline the business process' and 'Increased overall satisfaction with business processes' respectively. The statistical evidences support for hypothesis 'A'; 'the business processes affect EWIS performance'.

TABLE I REGRESSION ANALYSIS OF BUSINESS PROCESS AND EWIS PERFORMANCE

Model	R Square	Adjusted R Square	Std. Error of the estimate	$\beta$ Coefficient	t	Sig.
Constant					17.14	0.000
Streamline the business process	0.287	0.257	0.2487	0.212	2.073	0.041
Increased overall satisfaction with						
Business processes				0.159	1.797	0.048
Improved the organizational process on the whole				0.259	2.296	0.024

TABLE II ANOVA FOR BUSINESS PROCESS AND EWIS PERFORMANCE

Model	Sum of Squares	Df	Mean Square	F	Sig.
Regression	1.236	3	0.309		
Residual	5.382	88	0.068	4.996	0.000
Total	6.618	91			

### B. Decision making and EWIS performance

Table 1.3 shows that 21.0% variation in EWIS performance is explained altogether by 'increased flexibility in decision making', 'reduction in time frame for decision making', 'better coordination in between managers', 'improved forecasting', 'reduced information delay' and 'better overall decision making'. The degree of association with dependent variable is 0.216, 0.265, 0.246, 0.261, 0.320 and 0.286 with 'increased flexibility in decision making', 'reduction in time frame for decision making', 'better coordination between managers', 'improved forecasting', 'reduced information delay' and 'better overall decision making' respectively. The 't' value shows relative strength of the variables as predictor.

TABLE III REGRESSION ANALYSIS OF DECISION MAKING AND EWIS PERFORMANCE

Model	R Square	Adjusted R Square	Std. Error of the estimate	$\beta$ Coefficient	T	Sig.
Constant					5.836	0.000
Increased flexibility in decision making	0.210	0.154	0.249	0.216	2.949	0.018
Reduction in time frame for decision making				0.265	3.645	0.006
Better coordination in between managers				0.246	3.210	0.010
Improved forecasting				0.261	3.587	0.006
Reduced information delay				0.320	4.284	0.001
Better overall decision making				0.286	3.914	0.003

TABLE IV ANOVA FOR DECISION MAKING AND EWIS PERFORMANCE

Model	Sum of Squares	Df	Mean Square	F	Sig.
Regression	5.322	6	2.964		
Residual	19.365	86	0.062	3.536	0.001
Total	24.687	92			

### C. Individual / Group Working and EWIS Performance

Table 1.5 shows that 26.9% variation in EWIS performance is explained altogether by 'EWIS helped in saving end user time', 'EWIS simplified user task', 'paper has been reduced in the organization', 'information available over the system', 'feeling of ownership improved among the functional heads and users', 'interdepartmental relation improved', 'control of

TABLE V REGRESSION ANALYSIS OF INDIVIDUAL / GROUP WORKING AND EWIS PERFORMANCE

Model	R Square	Adjusted R Square	Std. Error of the estimate	$\beta$ Coefficient	T	Sig.
Constant					17.284	0.000
EWIS helped in saving end user time	0.269	0.189	0.243	0.197	2.138	0.015
EWIS simplified user task				0.173	2.102	0.017
Paper has been reduced in the organization				0.209	2.564	0.011
Information available over the system				0.245	2.876	0.010
Feeling of ownership improved among the functional heads				-0.137	-1.489	0.024
Interdepartmental relation improved				0.278	3.104	0.008
Control of few over the information lessened				0.426	4.322	0.000
Individual productivity increased				0.329	3.871	0.002
Group / departmental productivity improved				0.316	3.514	0.005

TABLE VI ANOVA FOR INDIVIDUAL / GROUP WORKING AND EWIS PERFORMANCE

Model	Sum of Squares	Df	Mean Square	F	Sig.
Regression	1.779	9	0.198	3.35	0.000
Residual	4.838	82	0.059		
Total	6.617	91			

The degree of association with dependent variable is 0.197, 0.173, 0.209, 0.245, 0.137, 0.278, 0.426, 0.329 and 0.316 with 'EWIS helped in saving end user time', 'EWIS simplified user task', 'paper has been reduced in the organization', 'information available over the system', 'feeling of ownership improved among the functional heads and users', 'interdepartmental relation improved', 'control of few over the information lessened', 'individual productivity increased' and 'group / departmental productivity improved' respectively. The 't' value shows relative strength of the variables as predictor. It statistically verifies hypothesis 'C'; 'the work culture has an impact on EWIS performance'. The F value 3.35 (9, 82 degree of freedom) shows a highly significant relationship and depicts that nine independent variables help to explain the variation in EWIS performance.

Table 1.6 shows that F value has been found statistically significant. The relative importance of the regressor is normally assessed by the standardized regression coefficient ( $\beta$ ). It can be observed that 'control of few over the information lessened' has relatively more impact on dependent variable followed by 'individual productivity increased', 'group / departmental productivity improved', 'interdepartmental relation improved', 'information available over the system', 'paper has been reduced in the organization', 'EWIS helped in saving end user time', 'EWIS simplified user task' and 'feeling of ownership improved among the functional heads and users' respectively.

### V. CONCLUSIONS

On the basis of the above analysis it can be inferred that increased level of satisfaction with business processes improves feeling of ownership. The lower control of few over information streamlines business process. The streamlined business processes save end user time and simplify user tasks. The information availability over the system streamlines the business processes. The improved organization processes on the whole reduces paper work in the organizations, improves inter-departmental relations and group / department productivity. The simplified user task results in improved overall decision process. The reduced paper work in the organization reduces information delay [8]. The availability of information over system improves forecasting process and information delay. The better coordination improves inter-departmental relations. The reduction in end user time improves flexibility in decision-making. The faster decision-making improves group / departmental productivity. The 'less paper work' improves coordination between managers. The lesser control of few over information also increases flexibility in decision-making. The streamlined business process reduces time for decision-making. The improved

organizational processes result in better decision making. The better coordination between managers increases overall satisfaction. The streamlining of business process improves forecasting [27].

The study in hand helped to understand the influence of measuring parameters on EWIS performance. EWIS performance evaluation is an important step that helps in analyzing the contribution of EWIS to an Organization. However this process of assessment itself poses many problems. Normally organizations have the tendency to perform this process in a professional manner so that it would yield the results. They tend to lose focus as the whole process gets into action. It is geared with great enthusiasm but confusions develop and mar things. Many Companies get everything done at the right time with regards to EWIS right from software selection to customization to training and Implementation. They take all measures to provide the necessary impetus and investing in huge volumes even if it is pinching monetarily. They are more particular about the benefits and are hence unmindful of the costs and investments. What happens thereafter is something to be worried and corrected. After going all the way and that too in the right manner, companies don't bother to review the working pattern of EWIS. Unless they understand this it is not possible to achieve the benefit of EWIS.

#### ACKNOWLEDGEMENTS

The author wishes to thank the Arab Open University (AOU), the AOU Planning Research and Development Office, and the AOU – Kuwait, for their continuous support.

#### REFERENCES

- [1] Akkermans, H. and Helden, K., "Vicious and virtuous cycles in ERP implementation: A case study of interrelation between critical success factors", *European Journal of Information Systems*, 11(1), 2002, 35 – 46
- [2] Al-Mashari, M., Zairi, M. and Okazawa, K., "Enterprise resource planning (ERP) implementation: a useful road map", *International Journal of Management and Enterprise Development*, 3(1/2), 2006, 169-180.
- [3] Aloini, D., Dulmin, R. and Mininno, V. "Risk management in ERP project introduction: Review of the literature", *Information and Management* 44(6), September 2007, 547-567.
- [4] Davenport, T.H., Harris, J. G. and Cantrell, S., "Enterprise systems and ongoing process change", *Business Process Management Journal*, 10(1), 2004, 16-26.
- [5] Ehie, I.C. & Madsen, M., "Identifying critical issues in Enterprise Resource Planning (ERP) implementation", *Computers in Industry*, 56(6), 2005, 545-557.
- [6] Esteves, J. M. and Pastor, J. A., "Applying grounded theory to create a unified critical success factors model for ERP implementations", Report Number: LSI-00-58-R, 2000 ([www.lsi.upc.es/dept/techreps/html/R00-58.html](http://www.lsi.upc.es/dept/techreps/html/R00-58.html))
- [7] Gargeya, V.B. & Brady, C., "Success and failure factors of adopting SAP in ERP system implementation", *Business Process Management Journal*, 11(5), 2005, 501-516
- [8] Holland, C. P. and Light, B., "A stage maturity model for enterprise resource planning systems use", *Database for Advances in Information Systems*, 32(2), 2001, 34 - 45
- [9] Huang, S.Y., Lin, C.W., Wong, S.L. and Tsai, M.C., "The impact of ERP implementation on business performance an integrated investigation model", *International Journal of Manufacturing Technology and Management*, 12(4), May 2007, 342-359
- [10] Hunton, J., Wright, A., and Wright, S., "Business and audit risks associated with ERP systems: knowledge differences between information systems audit specialists and financial auditors", in *proceedings of 8<sup>th</sup> European conference on accounting information systems (ECAIS)*, May 2001
- [11] Ifinedo, P., "Investigating the relationships among erp systems success dimensions: a structural equation model", *Issues in Information Systems*, 8(2), 2007, 399-405
- [12] Kocakülâh, M.C., Embry, J.S. and Albin, M. "Enterprise Resource planning (ERP): managing the paradigm shift for success", *International Journal of Information and Operations Management Education*, 1(2), 2006, 125-139
- [13] Kraemmerand, P., Moller, C. and Boer, H. "ERP implementation: an integrated process of radical change and continuous learning," *Production Planning & Control*, 14(4), 2003, 338-348
- [14] Laudon and Laudon, *Management Information Systems: Managing the Digital Firm*. Prentice Hall, New Jersey, 2007
- [15] Markus, M., Tanis, C., Fenema, P., "Multisite ERP implementation", *Communication of the ACM*, 43, 2000, 42–46
- [16] Motwani J., Mirchandani D., Madan, M. and Gunasekaran, A. "Successful implementation of ERP projects: Evidence from two case studies," *International Journal of Production Economics*, 75(1), 2002, 83-96
- [17] Nah, F.F., Zuckweiler, K.M. and Lau, J.L. "ERP implementation: chief information officers' perceptions of critical success factors," *International Journal of Human Computer Interaction*, 16(1), 2003, 5-22
- [18] Niccolai, J. and M. LaMonica, "The ABC's of ERP's", *Info World*, November 1999, 3
- [19] Shang, S. and Seddon, B.P., "Assessing and managing the benefits of enterprise systems: the business manager's perspective", *Information Systems Journal*, Vol. 12, 2002, 271-99
- [20] Somers, T.M. and Nelson, K.G., "A Taxonomy of players and activities across the ERP project life cycle," *Information & Management* (41), 2004, 257-278
- [21] Tjaden, G., Narasimhan, S., and Mitra S., "Structural effectiveness metrics for business processes", working paper, the center for enterprise systems, Georgia Institute of Technology, 1996
- [22] Wagner, E.L. and Newell, S., "Best' for whom? The tension between 'best practice' ERP packages and diverse epistemic cultures in a university context", *Journal of Strategic Information Systems*, 13(4), 2004, 305-328
- [23] Wah, L., "Give ERP a chance", *Management Review*, 89(3), 2000, 20-24
- [24] Welti, N., *Successful Sap R/3 Implementation: Practical Management of ERP Projects*, Addison-Wesley Longman Publishing Co, MA, USA, 1999
- [25] Wu, J. and Wang Y., "Measuring ERP success: The key-users' viewpoint of the ERP to produce a viable IS in the organization", *Computers in Human behavior*, 23(3), May 2007, 1582-1596
- [26] Wu, L.C., Ong, C.S. and Hsu, Y.W., "Active ERP implementation management: A real perspective", *Journal of Systems and Software*, 81(6), June 2008, 1039-1050
- [27] Yusuf, Y., Gunasekaran, A. & Wu, C. *Implementation of enterprise resource planning in China*, Technovation, 2006.