Gaps Between Ideal and Actual Most Common Performance Enhancement Factors in ERP Projects

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Submitted in partial fulfillment of requirements for the
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FORWARDING SHEET

The thesis entitled "Gaps between Ideal (expected) and Actual most common Performance Enhancement factors in ERP Projects: Exploration of gap between the Actual and Ideal common performance enhancement factors' application in ERP Projects in Public Sector Organizations of Pakistan" submitted by Malik Faisal Azeem in partial fulfillment of M.S. degree in Management Sciences with specialization in Technology Management, has been completed under my guidance and supervision. I am satisfied with the quality of student's research work and allow him to submit this thesis for further process as per IIU rules & regulations.

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IN THE NAME OF

ALLAH, THE MOST GRACIOUS AND MERCIFUL

"To

My loving parents, without their love, unending support, encouragement and generosity I could not have been where I am."

ABSTRACT

The need of ERP when evolved in the current century with different viewpoints so researchers have viewed and defined it in different ways i.e. commercial software package and off the shelf software suits which facilitate organizations in optimization of their process flow, business processes & functions and provide real time data. Though most of the public sector organizations claim to have a successful ERP implementation but the level of success remains un-measureable so that performance of the system could be enhanced. In order to go for enterprise system performance enhancement, first the gaps between common but critical performance enhancement factors are to be identified. Once the gap is identified further steps can be taken for performance improvements. The current study proposes the conceptual model to explore the gaps between the actual and expected most common performance enhancement factors' application in ERP projects in six public sector organizations of Pakistan. The study also intends to analyze the moderating role of vendor support and service which could minimize the gaps between the two scenarios which ultimately will result in better performance of ERP. Performance Enhancement factors that affect the performance of the ERP are "Time, Functionality, User Friendliness, System Flexibility, Reliability and Technology Capability". In order to enhance enterprise system performance organization have to have a gap measurement between what was expected and what is the real output. The findings exhibit the gap between the two scenarios, moderating impact of vendor support and the variation, that comes in expected outcomes through the actual outputs.

Keywords: Performance enhancement factors, Functionality, User Friendliness, Flexibility, Reliability, ERP and Public Sector Organizations.

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DECLARATION

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Malik Faisal Azeem

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List of Abbreviations

ERP: Enterprise Resource Planning

SAP: Systems Applications and Products

PE: Performance Enhancement

PIs: Performance Indicators

IS: Information System

UF: User Friendliness

TC: Technology Capability

CVR: Content Validity Ratio

MC: Module Completion

FF: Functionality Fitness

SC: System Completeness

GTP: Global Task Performance

DWS: Degree of Workflow Support

PSF: Parameter Setting Functions

DBP: Database Protection

PM: Permission Management

EO: Ease of Operation

EI: Ease of Integration

EL: Ease of Learning

UG: Upgradeability

EID: Ease of In-house Development

NADRA: National Database & Registration Authority

OGDCL: Oil and Gas Development Authority limited

PIFRA: Project for Improvement in Financial Reporting and Auditing

HEC: Higher Education Commission

NLC: National Logistic Cell

SBP: State Bank of Pakistan

VSS: Vendor Support & Service

BOM: Bill of Materials

MRP: Material Requirements Planning

Chapter 1

INTRODUCTION

1.1 Background of Enterprise Resource Planning (ERP)

LAW and Nagi (2007) elucidated about ERPs evolution since 1990s as Bill of Material (BOM) till its extended form in 2000s that Wright and Wright (2002) explicated as an instant replacement of the legacy systems and operating processes. According to Markus et al. (2003), any ERP package implementation requires extensive Business Process Reengineering and Alignment (BPR & A) thus the gap of expected and actual happenings may be reduced. Many well known ERP systems like SAP, Oracle, People Soft, JD Edwards and BAAN have made their way into the market because of their extensive features and potential market needs. But Wright and Wright (2002) made clear that ERP systems always bear high risk due to its cross functional inter-relationship with business processes . This relationship if not clearly defined and communicated amongst all the stake holders, can cause intricacies that may lead the project towards failure or below expectations.

ERP systems' implementations are made in order to reap extra-ordinary business benefits but these carry high risks in parallel. The study realizes that ERP benefits the organizations by faster product or service quality, saving money and time, automating processes, faster access to the accounts details, lowing paper and processing costs, management improvements, producing more innovative reports for management, strongly integrating organizational wide processes, providing easy access to trend data for the purpose of forecasting and empowering departments in their decision making.. As researched by Shanks et al. (2003), ERP

enables the organizations in improving communication and the information exchange between their departments because of the same or one single system usage. ERP implementation results in drastic organizational changes which carries a lot of risk and inflexibility with it. Wright and Wright (2002) investigated about the strong linkages and interdependencies amongst varying business processes, and database components, which carries great risk with it.

Phenomenon of ERP has been initiated in 1960's and passed through different evolutionary stages as the varying needs of the organizations were required to be addressed. Overall history has been explained earlier by Muhammad et al. (2008) as stated in Fig 1.1

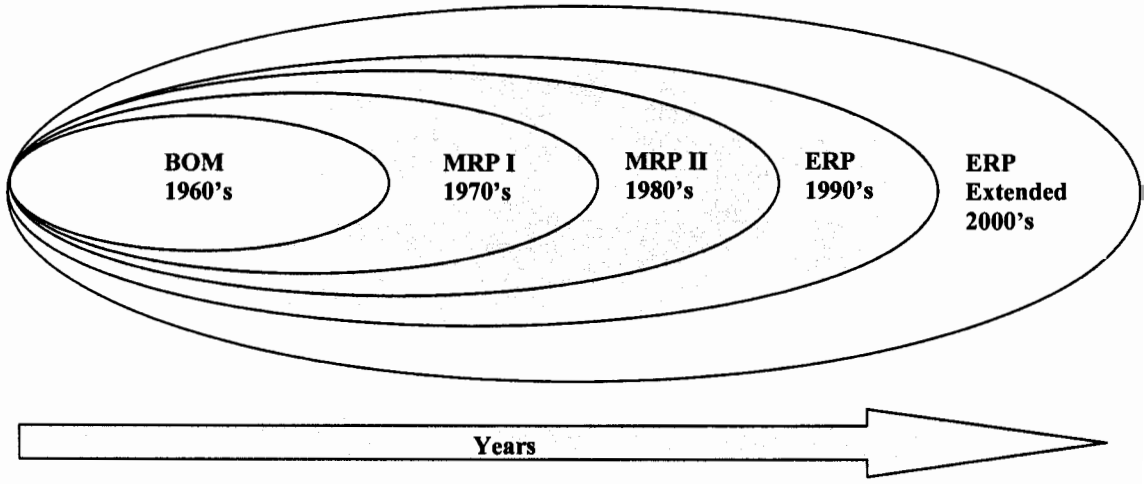

Figure 1.1: The Evolution of ERP, Muhammad et al. (2008)

1.2 Definition of ERP

According to Markus et al. (2003), ERP's real myth comes up with the view of definitions as ERP systems being a commercial software packages, facilitate the integration of transaction-oriented data and business processes right through an organization. Another definition by Holsapple and Sena (2002) evolved as ERP is the core reason of continuing cost reduction and detailed reports provision for all

the large scale organization's stake holders in a timely manner. Need of ERP when evolved in the current century with different viewpoints so researchers have viewed and defined it in different ways. Shanks et al. (2003) defined ERP as a commercial software package that help organization in automation of their business processes. According to LAW and Nagi (2007) a business perspective of ERP systems, categorically defined it as off the shelf software suits which facilitate organizations in optimization of their process flow, business processes & functions and provide real time data. The study analyzes that the ERP is known as an integrated solution, which shares a centralized database, reduces cost and minimizes errors, time & labor especially for reports, analysis and planning. It also provides innovative means of problem solving and interaction with organization's stakeholders including customers etc.

1.3 Definitions of Ideal (Expected) and Actual

Ultimate objective of the study is to explore the said factors' application in public sector organization(s) with ERP implemented. So the Actual application of the said factors will be explored (Actual application reflects as current scenario of these factors' application in the said organization(s) with the support of existing literature. Actual application of the said factors has been explored through the questionnaires, informal discussion with the respondents and the literature review. Expected in general is defined as "a conception, that one hopes to attain". Holsapple and Sena. (2002) narrated that the Ideal theoretical concept of ERP for large scale organizations is to reduce costs along with the detailed results provision to the shareholders in a timely manner in addition to the on-going struggles. In relation with this, the study used the term ideal in the context of expected which is what the expectation are of the internal stakeholders of the said

six public sector organizations, which may or may not be same as actual.

1.4 Defining Performance Enhancement

As stated in the Oxford English Dictionary (OED), "the term performance is used in the contexts of carrying out, fulfillment of a command, duty, promise, purpose, responsibility etc". The term performance is most often used in contextual use. As in the literature it is used in relation with different issues as management, evaluation, measurement, assessment and enhancement. According to business dictionary it is defined as 'accomplishment of an assigned task that is measured against preset standards of accuracy, completeness, speed and cost'. Performance is also used in the context of fulfillment of an obligation in general. If machine performance is defined, it is the manner and/or quality of functioning. In most of the business environments it is used considering its contexts of doing something successfully using a knowledge base, a recognized accomplishment.

1.5 ERP Implementations in Public Sector Organizations of Pakistan

ERP systems implementation and performance enhancement in public sector organizations is a critical concept due to its varied nature from private concerns. In public sector it is about attaining perceived or at least better outcomes for efficient and effective public service. In Pakistan though late but public sector innovation has been started in late 90s and is in a process of hi-fi technology applications' implementations in its various departments. A few ERP implementations have been successfully made in a few public sector organizations i.e. National Database & Registration Authority (NADRA) with Oracle Financials, Higher Education Commission (HEC) with SAP, Oil and Gas Development Authority limited (OGDCL) with Oracle Financials, Project for

Improvement in Financial Reporting and Auditing (PIFRA) with SAP, National Logistic Cell (NLC) with Oracle Financials and State Bank of Pakistan (SBP) with Oracle Financials. Though these organizations are enjoying the success of their ERP but the below stated questions are still to be analyzed i.e.

1. What were their Expected ERP implementation goals/objectives?
2. What are their Actual ERP implementation outputs?
3. Is there any gap between the two if so, what is that?
4. Does Vendor Support and Services affect the relationship of ideal and expected

1.6 Companies Background

1.6.1 National Database and Registration Authority (NADRA)

National Database Registration Authority (NADRA) initiated its activities towards civil registration in March 2000. It is considered one of the best hi-tech public sector organizations who have developed out class Data warehouse, Largest Database, Network Infrastructure, and interactive data acquisition systems in order to issue Computerized National Identity Cards (CNICs). NADRA claimed highly skilled workforce of around 11,000 technical and management personnel who performed their best to register more than 92 million citizens and printed around 62 million CNICs till Feb, 2008. In order to achieve their ultimate goals NADRA registered the citizens of distant physical locations through 189 mobile vans and establishment of 365 Multi-biometric Interactive Registration Centers. Data warehouse with storage capacity of 60 TB, automated Finger Print Identification System (AFIS) of 16.5 matches per second and a Facial Recognition Engine. (www.nadra.gov.pk). NADRA major solutions include "Identity Card Personalization, e-Drivers' license, e-vehicle Identification and Monitoring, e-

Tolling and e-Fuelling Dispensing, Multi Biometric Border Control, Arms' license, Access Control i.e. Facial, Iris and Fingerprints etc, Kiosk – Electronic Point of Sale (PoS) and e- commerce platforms and services include Data Warehousing & Data Center, Network Infrastructure Development, Project Management, Disaster Recovery and Backups, Software Integration and Development and Data Acquisition" (www.nadra.gov.pk). ERP implementation was being considered quite critical in NADRA because of its organizational and the nature of work to be accomplished. A large scale implementation of Oracle ERP Suite developed in NADRA in addition to a largest Business Process Management platform i.e. Ultimus. Though Nayer Abbas Kazmi narrated in his paper "Competitive Constructs of ERP Implementation in Public Sector in Pakistan" that NADRA achieved its business objectives in terms of accuracy, reliability and timeliness after ERP implementation but it is yet to be analyzed that whether NADRA achieved all expected business goals from ERP implementation or not and how NADRA can enhance ERP performance to get maximum out of it. According to NADRA officials ERP was chosen because it already possessed trained staff that was aware of Oracle technology. According to NADRA's official website, total number of employees in NADRA is around 11000 and ERP users including technical staff and project team members are in the range of 1200-1400.

1.6.2 Higher Education Commission (HEC)

Higher Education Commission (HEC) formerly University Grants Commission (UGC) is currently a prime regulator of Higher education in Pakistan. HEC provides its services in HR development which includes scholarship programs, faculty hiring, provision of authentic supervisors for upcoming researchers, provision of foreign experts to Pakistani education industry, and scholarship

management programs. In addition to that it provides its services for higher education quality assurance, R & D, Technological reforms within HEC and in higher education institutions of Pakistan. For HEC's large number of financial activities, it has complete Finance Planning and development departments.

Organization	Department	No of employees	Modules implemented
Higher Education Commission (HEC) Vendor: Siemens ERP: SAP	Finance	30-42	1. FI Financial Accounting 2. PS Project System 3. PA Personnel Administration 4. PY Payroll
	HRD	50	1. FI Financial Accounting 2. PS Project System 3. PA Personnel Administration 4. PY Payroll
	LI	15	1. FI Financial Accounting 2. PS Project System 3. PA Personnel Administration 4. PY Payroll
	Academics	17	1. FI Financial Accounting 2. PS Project System 3. PA Personnel Administration 4. PY Payroll
	SAP Office	50-100	1. FI Financial Accounting 2.CO Controlling 3.PS Project System 4. PA Personnel Administration 5. PT Personnel Time Management 6. PY Payroll 7. MM Materials Management
	R&D	30-50	1. FI Financial Accounting 2. CO Controlling 3. PS Project System

Table 1.1: HEC's View, ERP & HR department, HEC

Higher Education Commission (HEC) of Pakistan honored ERP implementation contract to the Siemens Pakistan Engineering Company in 2006 for mySAP based modules implementations i.e. FI/CO (Finance and Controlling), MM (Material Management), HR (Human Resource Management) and HEC Project System. HEC eagerly demonstrated interest in skill development through SAP modules training to its employees for making the ERP project successful. According to the HEC officials from HR and ERP departments details as on 03-05-2010 the total

number of employee are 900 out of which licensed users are 75 and alternate ERP users are 123.

1.6.3 Oil and Gas Development Company Limited (OGDCL)

Oil and Gas Development Company (OGDC) emerged as petroleum exploration company in Pakistan founded by Pakistan Petroleum Company Ltd (PPL) and Pakistan Oilfields Ltd (POL) in 29th Sep, 1961 in order to pursue a long term loan agreement between Pakistan and USSR in order to financially assist equipment and exploration services to the USSR experts against a huge amount of twenty seven million Rubles under Pakistan's government supervision (www.ogdcl.org.pk). In July, 1989 government of Pakistan declared it a self generating company due to its extra ordinary performance and it started working as statutory corporation with the name OGDC (Oil & Gas Development Corporation). Stated on its official website, in 23rd Oct, 1997 it has been incorporated as public limited company and known as OGDCL (Oil & Gas Development Corporation Ltd) and then listed in London Stock Exchange on December 06, 2006. OGDCL being an early Oracle Financials adopter in public sector of Pakistan, they have raised their annual sale growth up to Rs.100.26 billion (2006-2007). Ora-Tech an ERP vendor implemented Oracle ERP in OGDCL in order to integrate their internal process which ultimately resulted in marginal operational efficiency. According to the ora-tech's official website, "OGDCL is experiencing Oracle Financials' Inventory, Purchasing, HR and Payroll, Public Sector Budgeting, Oracle Treasury, Internal Control Manager, Oracle Business Intelligence and Oracle Enterprise Planning & Budgeting Modules". According to the OGDCL officials and stated on its official website that there are around 11000 employees working in OGDCL out of which around

600 ERP users are rendering their services for the efficiency and effectiveness of the whole organization.

1.6.4 National Logistic Cell (NLC)

National Logistic Cell (NLC) founded in August 06, 1978 as one of the freight handlers in the whole region. According to their official website (www.nlc.com.pk) and the middle management of NLC, their services include Crisis Management, Transportation, Engineering, Fleet logistics, NLC operations include management of Dry Ports, Highway construction, Tolling Services and maintenance activities. The contract of a whole fleet management system had been awarded to Si3 in 2004. Furthermore Si3 has also been looking after the overall IT support of NLC working closely with NLS IT and business team. NLC is the pioneer to have fully networked IT enabled services in their service areas. In continuation of minimizing operational lapses and enhance the quality of service they implemented ERP i.e. SAP in 2006. According to NLC officials and stated on its official website that the total number of employees are approximately 8000 and ERP users are around 77-80 out of which 30 reside in Karachi, 30 are in its headquarter in Rawalpindi, 12 in Gujranwala and 05-08 are implementers i.e. ERP project team.

1.6.5 Project for Improvement in Financial Reporting and Auditing (PIFRA)

In order to address the deficiencies in the financial reporting system, the Auditor General of Pakistan (AGP) in coordination with IMF and World Bank initiated Project for Improvement Financial Reporting and Auditing (PIFRA) in 1994 with the core objective to automate the Accounts, Payroll, and Budget activities of the Government of Pakistan and broadly the computerization of the whole accounting and auditing system of the country. SAP R/3 release 4.6c implementation project

in PIFRA has been initiated in Aug 2001 by Siemens Pakistan in a two stage bid process through International Competitive Bidding with the total cost of PIFRA-I US$ 37.2 M and PIFRA-II US$ 93 M. Department involved in the project are Planning Division, Ministry of Finance, AGP, Provincial Finance Departments, NRB (National, Reconstruction Bureau) and Provincial Local Government Departments. SAP Modules in operation now are Basis (System Administration) Module, Financial Module, Human Resource (HR) Module, Budget Availability Check (FI Module) and Budget Availability Check (FI Module). Estimated ERP users in PIFRA are 500-600.

1.6.6 State Bank of Pakistan (SBP)

State Bank of Pakistan (SBP), the central bank of Pakistan started computerization in order to transform itself towards paperless environment and to achieve operational excellence. Initiation of its Information Strategy Plan under the assistance of World Bank in September 18, 2000 by awarding a contract of around Rs. 38.9 million with the core objectives of system automation, strong network development within and outside the organization, establishment of ERP, development of data warehouse, and development of complete MIS. This software solution component of the same project included Globus Banking System. Enterprise System i.e. Oracle Application and development of a strong and reliable data warehouse should provide the bank with security and required system access control. In order to enhance its internal focus the bank initially started improving its business processes. In continuation of it, the bank implemented Oracle applications in July 2002 in its accounts, procurement and HR departments. According to the official website of SBP (www.sbp.org.pk), initially implemented modules are General Ledger (GL), Fixed Assets (FA) and Accounts

Payable (AP) in accounts and PO and Inventory in its distribution department. After the above stated successful implementations, SBP had HRMS modules for employee information & assignments, leave management, recruitment, policies maintenance and for its non payroll compensation and benefits practices. According to SBP officials exclusively the recruitment function that was automated by Oracle Financials compacted the application processing time from one hundred and twenty (120) days to thirty (30) days. Now all the offices of State Bank in Pakistan its business applications in order to make productive use of more than 2500 nodes. HR profile of SBP according to the report i.e. State Bank of Pakistan Annual Performance Review 2007, Chapter No. 6, total number of employees are 1340 and this number has grown up to 1600 (apx) now out of which around 500-600 are ERP users.

1.7 Statement of Research Problem

"Gaps between Ideal (expected) and Actual most common PE factors in ERP Projects: Exploration of gaps between Actual and Ideal (expected) PE factors' application in ERP projects in public sector organizations of Pakistan". PE Factors have been investigated in bits and pieces by some of the early researchers as Parthasarathy et al. (2006) worked with the title as 'An Exploratory Case Study on Performance Enhancement of ERP Projects'. Mohamed and McLaren (2009) researched the gaps between ERP Education and ERP implementation success factors. Carton and Adam (2008) threw light on how integrated systems fail to provide control. Lee (2000) narrated about the factors that can improve ERP performance and/or affect the ERP implementation(s).

The research would be using the keywords i.e. Performance enhancement factors, performance, Time, Functionality, User Friendliness, System Flexibility,

Reliability, Technology Capability, Vendor Support and Service, expected, actual, gap, ERP, Public Sector Organization(s). Frequent use of these words in the thesis would be because of their importance and focus of the researcher and Research. Performance enhancement factors, ERP performance and the gap will be discussed throughout because of its importance in the study.

1.8 Objective of the Research

This research study explores the gap between the actual and ideal (expected) PE factors' application in ERP projects in public sector organizations of Pakistan. ERP systems implementation is considered as one of the most critical sources of technological change in large-scale organizations. These changes when become unavoidable, public sector organizations also need to upgrade themselves in order to be part of technology development process in the market. Thus, objective of the research is to explore the gaps between benchmarking the expected factors' application and what is in reality.

This research study will find out the following avenues:

- To explore the common factors which have impact on ERP performance in public sector organizations of Pakistan.
- To provide a conceptual framework that should facilitate them in identifying gaps between the expected and actual ERP performance enhancement factors' application.
- Whether Vendor Support influences the relationship (gaps) between Actual and Ideal (Expected) PE factors' application.
- To find out whether the gaps between said PE factors are significant or not.
- The research study will provide guidelines to the Public sectors' Top Management, regulatory bodies & ERP vendors to focus upon the said factors in

order to minimize gaps between their actual and expected application for future ERP programs / Implementations.

1.9 Summary

Since ERP evolution in 1990's from Bill of Material (BOM) to the Extended ERP in current decade has been changing its focus in order to achieve business goals. Business performance because of their dynamism required maximum out of ERP. ERP performance enhancement is necessary for all the organizations with ERP implemented. Companies like OGDCL, HEC and NADRA though claim their ERPs success but the question of what they were really expecting and what they really gained is still answerable. This gap identification is quiet important for these three public sector organizations in order to get more out of their ERP whether it is SAP or Oracle Financial. The study explores the gap between the actual and expected application of the said factors.

Chapter 2

LITERATURE REVIEW AND VARIABLES SELECTION

2.1 Background of ERP in Public Sector Organizations

Davenport (1998) looked into earlier studies and revealed critical intricacies and risk factors in Enterprise systems accomplishment. The most critical reason of these failures is broad range of ERP issues that need to offer consistent path towards successful enterprise system performance achievement. According to Brown and Vessey (1999), ERP systems have not yet been critically theorized from its important complexities perceptively in a sufficient manner by the researchers for ongoing ERP systems implementations. Fiona and Janet (2001) narrated ERP systems, as a source of successful information management tool which helped organizations to drastically change the way they utilize their resources with a novel and interlinked applications solution i.e. ERP across each sector of the organization. Fiona and Janet (2001) also investigated that ERP systems facilitate organizations in understanding the process view of their businesses to develop standardized processes. Hammer and Champy (2001) explored that the suggestions are given for re-examining all the processes of business when ERP intended to be implemented. Parr and Shanks (2000) stated that ERP system implementation projects have always been considered as the most critical and risky ones for businesses that intend to adopt it because of its width of complexities that eventually result in impact on business performance. ERP issues have been argued by Parr and Shanks (2000) and Markus et al. (2000) but pragmatic studies have yet to be made by the researchers.

Use of ERP systems initiated in both public & private sector organizations, which have primarily been driven mainly for efficiency gains. Both the sectors i.e. public and private are speedily adopting ERP to as an expected substitute of their legacy systems. Peristeras and Tarabanis (2000) analyzed that private sector induced public sector to made use of state of the art practices (methods & techniques) as it reaped a lot from CRM or ERP. Blick et al. (1999) explored that ERP implementation approaches by and large adopted in both private and public sector organizations should be in accordance with their cultures and regulations.

Deloitte (2002) research exhibited that although private sector implementations boosted ERP market, the public sector also showed its deep interest for an improved and complete organizational system which ultimately responded in the form of public sector specific functionalities by ERP vendors.

A survey conducted by Rabaa'I (2009) was presented in Association for Information Systems, which in its first section identified general ERP project characteristics along with 116 (including sixty two from twenty eight public sector organizations, fifty four from twenty private organizations) respondents who were involved in ERP implementation process in Jordan. Post implementation performance was undecided which resulted in organizational performance has increased, decreased or remained same. Results drawn from that survey are summarized as shown in table 2.1

Package Implemented	SAP		PeopleSoft		Oracle		SAP & PeopleSoft		Oracle & PeopleSoft	
	N	%	n	%	N	%	N	%	n	%
Public	10	16.13	1	1.61	23	10	16.13	1	1.61	23
Private	4	7.41	8	14.81	13	4	7.41	8	14.81	13

Overall Implementation	Successful		Fairly Successful		Unsuccessful	
	N	%	n	%	n	%
Public	25	40.32	19	25	40.32	19
Private	20	37.04	17	20	37.04	17

Post Implementation Performance	Slightly Increased		Same		Increased		Decreased	
	N	%	N	%	n	%	n	%
Public	11	17.74	16	25.81	11	17.74	16	25.81
Public	9	16.76	16	29.63	9	16.76	16	29.63

Implementation Time	On Time		Earlier		1-6 month Late		6 months- 1 year late		Over 1 year late	
	N	%	N	%	n	%	n	%	n	%
Public	6	9.68	2	3.23	26	41.94	26	41.9	2	3.23
Private	7	12.96	0	-	20	37.04	25	46.30	2	3.70

ERP System Usage	1-6 months		6 months-1 year		1 year-2years		More than 2 years	
	N	%	N	%	n	%	n	%
Public	6	9.68	21	33.87	6	9.68	21	33.87
Private	1	1.85	13	24.07	1	1.85	13	24.07

Implementation Budget	On budget		1%-25% over budget		25%-50% over budget		More than 2 years	
	N	%	N	%	n	%	n	%
Public	5	8.06	20	32.26	5	8.06	20	32.26
Private	5	9.26	24	44.44	5	9.26	24	44.44

Table 2.1: Overall project characteristics by sector, Rabaa'I (2009)

2.2 ERP Performance Enhancement (PE)

Gulledge and Simon (2005) researched that the firms which are aggressively using IT applications are bound to keep an eye on ERP sellers' activities, with a view that only adoption of an ERP doesn't lead the organization towards better performance.

2.3 Performance Indicators (PIs) for ERPs

Wei (2008) drilled down the Performance Indicators (PIs) that affect the performance of the ERP are "Implementation time, Functionality, User Friendliness, System Flexibility, Reliability and Technology Capability". Sedera et al. (2001) examined that performance evaluation has been made by governments and its agencies for evaluation of their enterprise system (SAP) by following Balance Scorecard (BSC) approach. He also scrutinized that in order to get ultimate benefits from the enterprise application for the business, the government of Queensland used three "tools" i.e. clear vision of strategic management plan, a BSC and a benefit realization plan. In addition to that he stated that BSC approach was considered appropriate for enterprise system performance evaluation for both public and private sectors. Their research further narrates that BSC method associates strategic objectives and performance measures. ERP success model (Fig 2.1) reflects its net benefits by incorporation of the causal explanation with the help of 11 criteria.

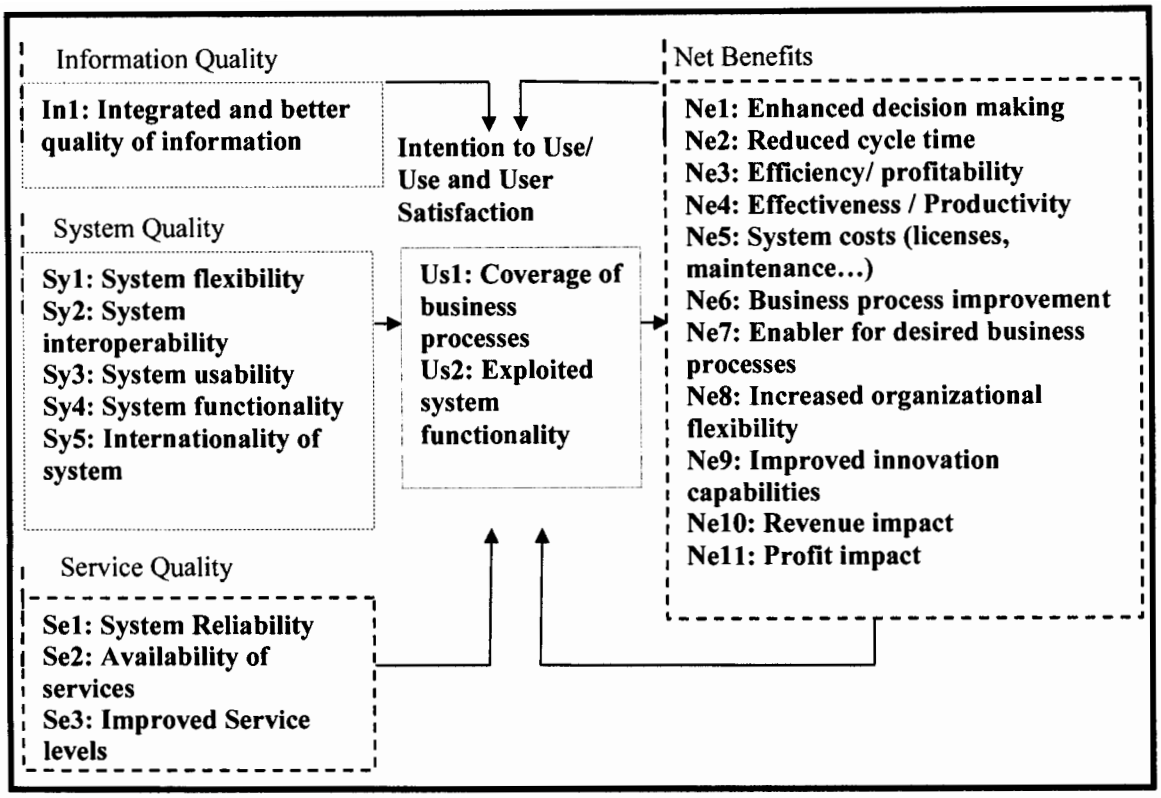

Fig 2.1: IS success model by DeLone et al. (2003)

DeLone and McLean (1992) understood that at the end, these net benefits are revealed as the reason of negative & positive impacts of the system. At a later stage in an exploratory factor analysis of 21 factors by Bernroider and Mitlöhner (2005) updated this model. When Ahmed (2009) explored the performance evaluation and enhancement, he found that most appropriately re-engineered processes present marginal improvements in performance which ultimately provide breakthroughs in customer value addition. Chien and Tsaur (2007) stated that DeLone and McLean (1992) evaluated IS success by using six dimensions of IS success model i.e. Success Quality, Information Quality, Information Use, User Satisfaction, Individual and Organizational Impact. The said six components have been described and explained by both DeLone and McLean (1992). They stated as "System Quality" specifies system performance i.e. data accuracy, efficiency of

the system and 'system response time' etc. Then the "Information Quality" which includes the quality of IS products like relevance, reliability and completeness etc. The third dimension i.e. "Use" which stands for frequency of access and the connecting time efficiency. The fourth one is "User Satisfaction" which signifies system users' satisfaction level, over all user satisfaction and interface satisfaction by the users. The second last dimension narrated and explored was individual impact which symbolizes system impact on individuals, modifications in efficiency, decision model and decision making. The last dimension covered for IS success model is "Organizational Impact" which eventually requires the assessment of the alterations caused by IS to that specific organization implementing enterprise system. Chien and Tsaur (2007) also stated that D & M IS success model also designates information as an output of the system which can be measured at personal, technical, semantic and effectiveness levels along with the involvement of all the relevant stakeholders (Fig.2.2.a). Research conducted by Seddon (1997) after DeLone and McLean (1992) narrated that in later studies recommendations of replacing 'use' with 'usefulness' has been provided. Seddon (1996) said that when this model was revised, placement of 'use' was on its outside because of its impression of element of more of a user behavior then system success (Fig. 2.2.b). Different early studies i.e. B. Ives et al. (1983), Bailey and Pearson (1983), Stone (1990) and Bacon (1992) came up with the relationship of IS and qualitative measures i.e. Change, flexibility, efficiency, coordination, responsiveness, improved decision making and organization's structure. Net benefits if are on positive side may contribute towards the use of the ERP system which may result in increased user satisfaction. If negative that may result in vise versa. Chien and Tsaur (2007) showed in his model (Fig 2.2.c) that

contains many dimensions which are also interrelated backed by a research study which concluded that positive benefits from an ERP system can be derived though automation, process re-design and increased timeliness.

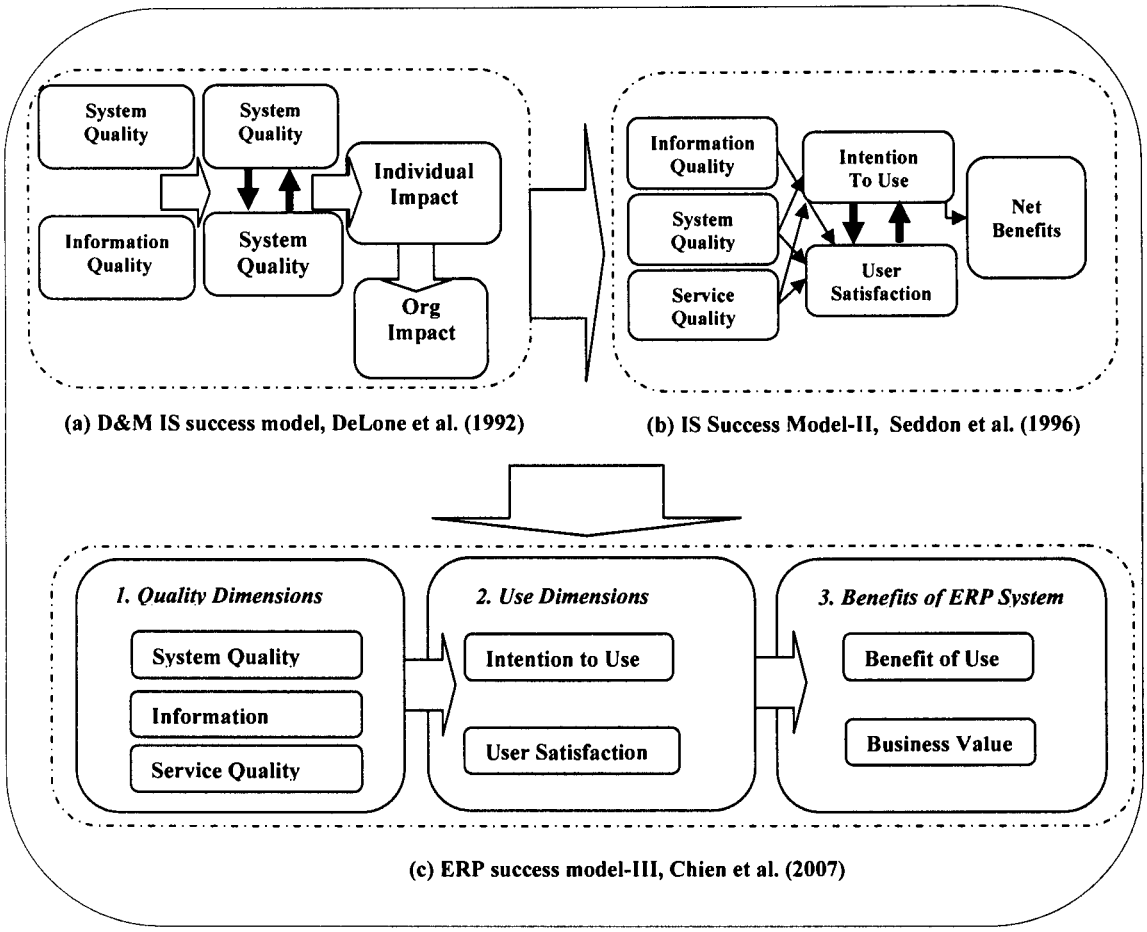

Fig 2.2: IS Success models, Chien and Tsaur (2007)

Respondents of Chien and Tsaur (2007) for the said survey were 204 in numbers with gender ratio 0.9:1 (male Vs female) with around 77% of total possessed at least bachelor's degree indicating the importance of education for employment in high-tech industry and 34%, 30%, 19 % and 6% were working in finance & accounting, production, MIS and in HR & Sales departments respectively. The conclusion drawn from IS success analysis shows that technological up gradation has been the most important factor in system quality determination. System

quality, i.e. performance, flexibility of changes, response time, and ease of use, is a technical issue. This result confirmed conventional wisdom that the pursuit of state-of-the art technology is a risky proposition.

Wei (2007) drilled down the measurement method of ERP objectives by proposing a framework for performance assessment of an adopted ERP system through an empirical case study in Taiwan. Wei (2008) also quoted that Lawshe (1975) extracted key Performance indicators by undertaking 'Quantitative content validity method' in order to modify PI set by getting filled a three point scale of 'not relevant', 'important but not essential' and 'essential' from the team members. Content Validity Ratios (CVRs) of all explored PIs by Wei (2008) were derived as a result of survey first calculated and later on confirmed with a cut value i.e. calculated according to α=0.05. PIs below the cut value were eliminated in order to positively measure implementation objectives. Table 2.2 reflects proper alignment of all the PIs with the goals of Enterprise system implementation project from the CVR.

S. No	Performance Indicator	Main Objective	CVRs (Content Validity Ratio) CVR =(n-N/2) / (N/2)
1.	Gap between the schedule and real time taken	Time	1.00
2.	Degree of customization		0.75
3.	Degree of employee cooperation		0.50
4.	System completeness	Functionality	1.00
5.	Global task performance		1.00
6.	System and database protection		1.00
7.	Parameter setting functions		0.75
8.	Degree of workflow support		1.00
9.	Permission management		0.75
10.	Ease of operation	User Friendliness	1.00
11.	E-guidebook usefulness		0.75
12.	Step-by-step guiding		0.50
13.	Online learning		0.75
14.	Online help		0.75
15.	Upgrade technology support	Flexibility	0.75
16.	Upgrade service performance		1.00
17.	Ease of integration with other systems		1.00
18.	Ease of communication with other platform		1.00
19.	Ease of maintenance		1.00
20.	Ease of modification		0.75
21.	Minimum of system break down	Reliability	1.00
22.	System maturity		0.75
23.	Recovery ability		1.00
24.	Automatic data backup ability		1.00
25.	Technology development	Technology capability	1.00
26.	Diverse product introduction		0.75
27.	Engineer stability and experience enhancement		0.50
28.	Effective training lessons	Service	1.00
29.	Sufficient training time		0.50
30.	Online service		0.75
31.	Solving problem ability		1.00
32.	Consultant service ability		1.00
33.	Service speed		1.00
34.	Warranty satisfaction		1.00

Table 2.2: Performance Indicators and PE factors, Wei (2008)

2.4 Performance enhancement factors

Wei (2008) analyzed Performance Indicators (PIs) in table 2.2 for performance indication in ERP projects. As tested and proved PIs, these factors indicated the

success of the whole enterprise system and if addressed properly, have a great positively impact on the performance of ERP projects. He also narrated that main PIs for enterprise system performance measurement and enhancement factors are Implementation time, Functionality, User Friendliness (UF), System Flexibility, Reliability and Technology Capability (TC) etc. Six factors in the study to explore the gaps between their expected and actual application for ultimate enterprise systems' performance enhancement have been weighted on the basis of their CVRs, their common citations in early studies and their feasible application in our public sector organizations which are being researched from their enterprise system perspectives. As Wei (2008) explored that The first major and most critical is 'Time', which is primarily measured by schedule control by measuring the gap between the scheduled & real time taken and degree of customization. The second major and most common PI is 'Functionality' which has been subdivided into three broad categories i.e. Module Completion (MC), Functionality Fitness (FF) and security. The first one is measured through the measurement of System Completeness (SC) and Global Task Performance (GTP). Functionality Fitness (FF) is assessed through Degree of Workflow Support (DWS) and Parameter Setting Functions (PSF) for performance measurement and enhancement. Third sub-head that contribute in performance measurement by adding into 'Functionality', is security which itself is measured through system and Database Protection (DBP) and Permission Management (PM). The third major PI i.e. 'User friendliness' covers Ease of Operation (EO) which is subdivided into ease of operation & e-guidebook usefulness and ease of learning which has the components of online learning and online help. The fourth main PI for ERP performance measurement is 'Flexibility' which is sub-divided into upgrade

ability, Ease of Integration (EI) and Ease of In-house Development (EID) which are measured through up gradation of technology support, up gradation of service performance, ease of integration with other systems, ease of communication with other platform, ease of maintenance and ease of modification. In continuation of flexibility another common but most critical performance indicator is 'Reliability' that includes stability and recovery ability. Stability is affected by minimum of system break down and system maturity and recovery ability includes automatic data backup ability to have an impact on performance. The last independent variable i.e. 'Technology Capability' has been taken as performance enhancement factor which is measured in terms of technology support. Technology up gradation, capability to handle diverse product introduction and engineers stability when identified and improved, the overall system performance will be positively enhanced which would ensure that technology capability has to be given more focus.

Usually teams of ERP vendors with ERP implementation experience provide their support for the technical performance of the system. Ram and Swatman (2008) narrate about the performance of the organizations with ERP implemented have been contributed to a great extend by the user satisfaction and Business Process Improvement (BPI). Ram (2008) also examined that most of the literature divulged the financial perspective remained on the top from many of the ERP's performance impacts. According to Ram (2008) operational performance improvements have also been noticed in both pre and post implementation scenarios keeping in view the multi directional impacts of ERP. In consideration of association of the implementation factors with their performance impacts, Nicolaou (2004) researched that a study resulted in the realization of performance

impacts of vendor selection, implementation objectives, time and scope on ERP implementation endeavors and ultimately on the firm. Ram (2008) described about the degree of consensus related to the organizational goals and severe competitive pressure was found directly associated with organizational performance. Furthermore Ram (2008) reported that ERP implementing firms by and large realize the performance impacts of ERP in its later years of implementation. Kumar et al. (2003) explained that organizations reported about their development of new business performance and control measures to get better outputs/results. Kumar et al. (2003) also uncovered a study that shows that Infrastructure (hardware) investments are required for performance tuning in any ERP implemented organization. Plant and Willcocks (2007) reported about a longitudinal study which resulted in proof of both direct and indirect success factors' inter-dependencies with mutual influences on each other in the same direction for better or the poor performance.

Topic i.e. "Exploration of gaps between the Actual and Ideal (Expected) most common performance enhancement factors' application of ERP Projects in Public Sector Organizations of Pakistan" focuses upon analysis of application of six PE factors in six public sector organizations of Pakistan. Studies have been conducted on Critical Success Factors (CSFs) in various areas of ERP i.e. Strategic, Managerial, technical and Contextual factors etc but PE factors have a nominally been focused. Adopted PE factors that may result in impact on ERP performance as a whole though have been researched but a shortage of analysis of these and gap amongst the said factors have been observed especially in large scale public sector organizations especially in developing countries like Pakistan.

ERP PE factors though have been identified and worked upon in early studies in

the world but these studies are a few in order to benefit the industry with a solution to get the maximum out of ERP. In order to rightly assess the most common factors that may enhance ERP performance, explored and tested in order to find out the gaps between the actual and expected scenarios are as followed:

- Time
- Functionality
- User Friendliness
- Flexibility
- Reliability
- Technology Capability
- Vendor Support and Service

2.5 Variables Development

2.5.1 Time and Performance Enhancement (PE) of ERP

Time compression is directly linked with performance enhancement of an enterprise system. Schedule control confirms the time compression as a whole for better system performance.

2.5.1.1 Schedule Control (SC)

Gap between the schedule and real time taken is to be measured in order to examine SC. The lesser the gap is, the more control would be there which ultimately ensures the time taken by the activities. Gaps, once identified, can be reduced by taking different SC measures that ultimately lead the system towards enhanced performance. O'Leary (2000) reported that ERP systems are built based on the finest industry practices but not essentially suits every organization's business processes. Identical ERP products may result differently in similar organizations in the similarly industry even. A process-system mismatch is

avoided through software customization or process reengineering. Jarrar et al. (2000) explored that ERP unlike other information systems or m failure software reposition its implementing company and transform business practices. He also takes down that organizations either go for change in business processes to be aligned with the ERP packages customization is made. According to Davenport (1999) this may result in increased cost and longer time for its implementation. Organizations with ERP implementation in progress focus on BPR by reformulating their exiting processes towards the standardized ones. Zhang (2002) explored that organizational readiness for the change in business processes guarantees the successful accomplishment of BPR that eventually take it towards ERP system success. According to Bhatti (2005), more often organizations are required to change their businesses to accommodate ERP software in order to minimize the degree of customization needed. Degree of customization assessment in a right manner leads the enterprise system towards performance enhancement.

2.5.2 Functionality and Performance Enhancement (PE) of ERP

Shehab et al. (2004) justified that major ERP vendors are consistently putting their experience, skills and efforts towards their performance enhancement through enhanced functionality in their products in order to benefit themselves, the market and their customers.

2.5.2.1 Module Completion (MC)

Wei (2008) stated that ERP MC ensures required functionality for ERP performance enhancement. In order to enhance the performance of the system, system completeness and its performance in the whole network is to be ensured.

2.5.2.2 Functionality Fitness (FF)

Wei (2008) explained about FF which includes the degree of workflow support & Parameter setting functions for ERP. For the purpose of ERP performance enhancement, FF should be measured and improved.

2.5.2.3 Security

Wei (2008) wrote about the system and database protection and permission management are if consistently measures and controlled, security of the overall system will benefit the organization by ensuring any unwanted intrusion by any of the ends and performance of the whole system stabilizes.

2.5.3 User friendliness (UF) and Performance Enhancement (PE) of ERP

2.5.3.1 Ease of operation (EO)

Wei (2008) research showed that EO of an enterprise system vitally enhances system performance through a UF graphic interface and step by step command system. UF is ensured through ease of performance, which leads enterprise system towards better performance.

2.5.3.2 Ease of Learning (EL)

Research made by Wei (2008) also showed that measurement and analysis of EL includes provision of guidebook, online help & learning for UF creation which later on enhances enterprise system performance.

2.5.4 Flexibility and Performance Enhancement (PE) of ERP

Stedman (1999) defended flexibility by referring it to the degree to which an ERP system may be upgradable in order to classify advance business processes. Keller and Teufel, (1998) rationalized that balance between flexibility & standardization has to be considered at the time of enterprise system package selection, based upon real organizational and industrial needs. Akkermans et al. (2003) analyzed that ERP systems bear high risk especially in terms of high cost as millions of

dollars its purchase and its implementation but mostly avoid spending even a small portion of it on investigation of the best suited one from different available options. The available options when analyzed, found that some ERPs may have certain limitations and portfolios which may be industry specific or rigid etc. According to Gattiker and CFPI (2002), organizations should go for the ERP systems/software keeping their hardware/software infrastructure, its databases and its operations in consideration. Shehab et al. (2004) threw light upon the same as vendor use relational database in enterprise systems due to the need of flexibility in terms of business logic and overall structure of the data in order to support business practices. The basic need of analysis is software/hardware compatibility and application flexibility assurance in case customization is required. In addition to that once the product is decided, have to investigate further about the software versions and modules that best suit the organization. Janson and Subramanian (1996) & Gattiker and CFPIM (2002) stated that a wrong assessment in this regard may result in both high risk of time and cost overrun. Grady & Caswell (1999) and Welti (1999) narrated that despite having a track of right package selection, which should be intertwining organizational needs, is quite critical but ensures relatively greater chances of project success and process improvement.

2.5.4.1 Upgradeability (UG)

According to Wei (2008) for ERP's PE, continuous up gradation and maintenance are key drivers. He also states that up gradation of technology support and service performance are always required by the organizations because of the varying business needs. The upgradeability with the technology support and service performance must be ensured before the product selection and must also be revised in order to proactively plan future up gradation for better system

performance.

2.5.4.2 Ease of Integration (EI)

Wei (2008) and Cumbie et al (2005) state that basic myth of ERP is Integration. EI should be the prime feature of an ERP which is considered as truly enterprise wide system. Wei (2008) also opines that ease of integration with other systems and Ease of communication with other platform conforms enterprise system flexibility.

2.5.4.3 Ease of in-house development (EID)

ERP systems are known for their complexity and risk. Shehab et al. (2004) narrates as ERP adoption for a company may take a number of months with no modification and may get prolonged up to several years if there is any major modification is required. Wei (2008) explored that ease of maintenance & Ease of modification facilitate organizations in better performance of their ERP system.

2.5.5 Reliability and Performance Enhancement (PE) of ERP

According to Chien and Tsaur (2007), Enterprise system quality is examined in terms of system reliability, system flexibility, system functionality, system data quality, and integration of ERP. In order to enhance system performance, system stability and recovery ability make the whole more reliable.

2.5.5.1 Stability

According to Yu (2005), the system stability is generally affected by the number of changes in business goals during the course of ERP implementation process. Mirchandani, Mirchandani and Motwani. (2001); Umble et al. (2002); Al-Mashari et al. (2003) and Soliman et al. (2001) state that ERP systems' effectiveness for performance enhancement is generally measured through system stability which ultimately adds into the reliability of the enterprise system by enabling it perform

better.

2.5.5.2 Recovery ability (RA)

Wei (2008) researched that high system reliability depends upon stability and recovery ability and automatic data backup ability. Enhancement of recovery ability makes the whole system more reliable and ultimately enhances enterprise system performance.

2.5.6 Technology Capability (TC) and Performance Enhancement (PE) of ERP

Technology Capability (TC), one of the major objectives amongst all the major performance indicators with the fundamental objective of the ideally required technology support through diverse product introduction has been measured by Wie (2008) being an independent performance indicator, if put in comparison between the actual and the expected application, the gap will be measured and minimize for the benchmarked enterprise system objectives.

2.5.7 Vendor Support & Service (VSS) and Performance Enhancement (PE) of ERP

As Chang et al. (2004) narrated that Enterprise System vendors seek out remedial measures against negative perceptions of their real & potential customers regarding ERP cost and time management and improvement in customer support and satisfaction. Software vendors play their role as implementation partner with their clients by making comparison of ERP system and clients' needs. VSS is surely required across all the stages of ERP life cycle. Khan (2002) stated whether it is database management, functionality or any other ERP performance enhancement factor, vendor support and services plays a moderating role in the relationship of all the factors that enhance system performance and performance

enhancement itself. Selection of a vendor in ERP projects plays important role because of the services, which fills the gap by confirming its timely expertise application and out of the box thinking. In order to minimize the risk of failure and assess the right vendor, services of capable consultants are required. The studies i.e. Thong et al. (1994); Janson and Subramanian (1996); Willcocks and Sykes (2000) explored that in order to pull off success in ERP projects, IT consultant is employed moreover they investigated that it is a complicated exercise of selection of a quality consultant most often paves the way for the consultant to have project ownership that eventually is like aids for the ERP implemented company. Markus and Tanis (2000) explained that in past years as study explores that most of the organizations with ERP implementation, due to poor quality of consultants which ultimately resulted in project and organization collapse. Skok and Legge. (2002) stated that having a quality consultant doesn't mean to hand over project ownership to it but their skills and knowledge is utilized to the full because it costs very high to the business. Software vendors and consultants both equally play their role in the growth of ERP market size by providing enhanced benefits to the client. According to Bhatti (2005), most ERP success stories are cited with regard to the strong partnership of ERP implementing firms and ERP vendors support and services. Mabert et al. (2001) and Shehab et al. (2004) narrated about "Big five" out of top 100 ERP vendors that have approximately 70% of the global ERP market with the growth rate of 61%. Being different from in-house development, ERP systems consistently need vendor support and services for up gradation & problem resolution in order to enhance system performance. ERP vendors' support and services are critical because of the continuous changing business needs require parallel system

changes for its performance enhancement. Thus Vendor support may is used as independent as well as moderating variable in the study.

2.6 Summary of Literature Review

According to Wei (2008), ERP systems' implementations are made in order to reap extra-ordinary business benefits but these carry high risks in parallel. "Exploration of gaps between the Actual and Expected most common performance enhancement factors' application in ERP Projects in Public Sector Organizations of Pakistan" focuses upon analysis of application of seven most common performance enhancement factors in three large public sector organizations of Pakistan. PE factors that affect the performance of the ERP are "Implementation time, Functionality, User Friendliness, System Flexibility, Reliability and Technology Capability". In order to enhance enterprise system performance organization have to have a gap measurement between what was expected and what is the real output.

Chapter 3

RSEARCH METHODOLOGY

A quantitative approach has been used to analyze six public sector organizations of Pakistan in order to exhibit the gaps between the two scenarios. The purpose is to examine in details that to what extent the said organizations which represent the whole public sector of Pakistan by defining a conceptual model of gaps identification of most common performance enhancement factors. The selection of the said six public sector organizations is based upon the need to collect detailed data about what they actually achieved from ERP implementation in their organization and what they didn't. The selected organizations have been considered because of their size, type and the claim of being successful in their ERP system implementation efforts. Initially the informal interviews were conducted from some of the Top management personals.

3.1 Theoretical Frame Work

3.1.1 Performance Enhancement Conceptual Model

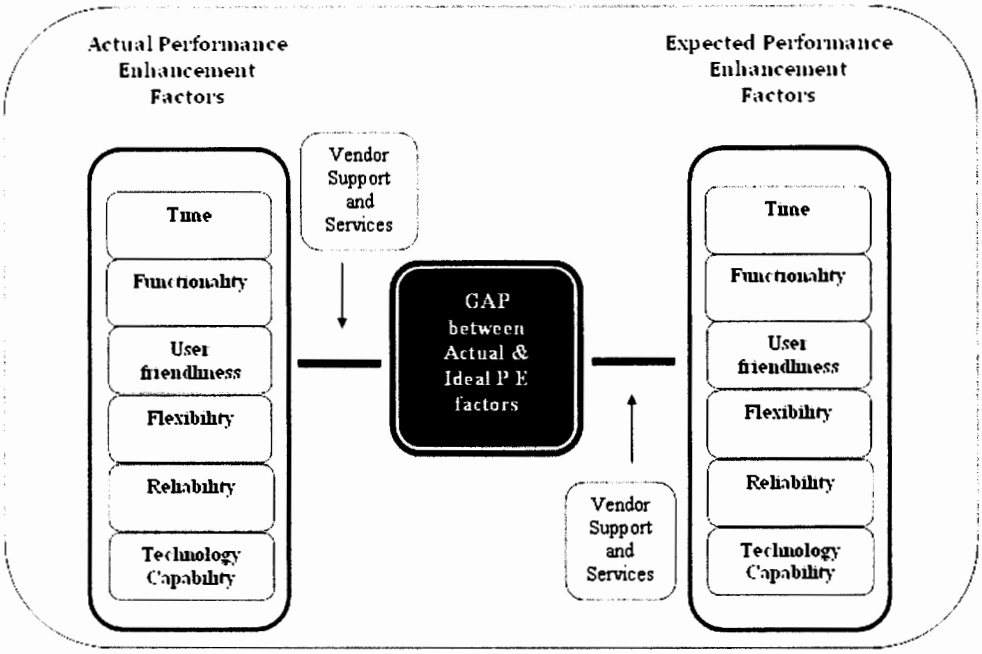

Figure 3.1: Conceptual Model (Theoretical Framework) of "Gap between Actual and Ideal (Expected) ERP performance enhancement factor's application" where Actual PE factors are Independent and Expected PE factors are dependent.

"Time, Functionality, User Friendliness (UF), System Flexibility, Reliability and Technology Capability (TC)" are independent variables and "gap between actual and expected ERP performance" is dependent variable where a moderating variable i.e. Vendor Support and Service (VSS).

3.1.1.1 Model Description

The study aims to find out the gap between the Actual and Expected common performance enhancement factors' application in ERP Projects in Public Sector Organizations of Pakistan. The research includes six independent variables i.e. Implementation time, Functionality, User Friendliness, System Flexibility, Reliability and Technology Capability and a moderating variable i.e. Vendor

Support and Service in order to find out the gaps between the actual and expected performance enhancement factors. The operational definitions of the selected factors have been defined in chapter two.

3.2 Hypothesis

Hypothesis 1 (H_1): There is a significant gap between actual and ideal (expected) time.

Hypothesis 2 (H_2): There is a significant gap between actual and ideal (expected) functionality.

Hypothesis 3 (H_3): There is a significant gap between actual and ideal (expected) User friendliness.

Hypothesis 4 (H_4): There is a significant gap between actual and ideal (expected) flexibility.

Hypothesis 5 (H_5): There is a significant gap between actual and ideal (expected) reliability.

Hypothesis 6 (H_6): There is a significant gap between actual and ideal (expected) Technology Capability.

Hypothesis 7 (H_7): Vendor support will moderate the relationship between actual PE factors application and expected PE factors application.

3.3 Type of study

The research includes a field study in organizational settings. For the purpose of this study "cross sectional survey" research method was used for data collection.

3.4 Population and Sample Size

The target population for the study was ERP users (from line, middle and top level), technical staff and/or ERP project team members working in the said public sector organizations of Pakistan. The sample is collected on the basis of simple random sampling. Total population (respondents) in the selected organizations has been totaled. As out of total 11,000 employees in NADRA, ERP users including technical staff and project team members are in the range of 1200-1400. In HEC the total number of employee are 900 out of which licensed users are 75 and alternate ERP users are 123. In OGDCL out of around 11000 employees 600 ERP users are contributing towards their ERP. In NLC, out of approximately 8000 employees, ERP users are around 77-80 out of which 30 reside in Karachi, 30 are in its headquarter in Rawalpindi, 12 in Gujranwala and 05-08 are implementers i.e. ERP project team. ERP users in PIFRA are around 600. In State Bank of Pakistan the total number of employees are 1340 and this number has grown up to 1600 (apx) now out of which around 500-600 are ERP users. Thus the total population for the study is around 3500 and as Uma Sakaran (2003) stated that Krejcie and Morgan (1970) to a great extent abridged sample decisions by providing a table which shows different sample sizes for different population sizes. The sample size (n) included in this study was drawn from the same table as it was around 346 where N=3500.

3.5 Methodology

Prime objective of the study is to explore the gaps between the 'Actual' an 'Expected' most common performance enhancement performance enhancement factors' application of ERP Projects in Public Sector Organizations of Pakistan. A quantitative approach has been used to analyze six public sector organizations of

Pakistan in order to exhibit the gaps between the two scenarios. The purpose is to examine in details that to what extent the said organizations which represent the whole public sector of Pakistan by defining a conceptual model of gaps identification of most common performance enhancement factors. The selection of the said six public sector organizations is based upon the need to collect detailed data about what they actually achieved from ERP implementation in their organization and what they didn't. The selected organizations have been selected because of their size, type and the claim of being successful in their ERP system implementation efforts. Initially the informal interviews were conducted from some of the middle management personals.

3.6 Description of the Instrument

To measure success of information system, Manikas, et al. (2010), Li (1997) and Skok, et al. (2001) used 5-point, 7-point and 9-point likert scale respectively. The study includes two self developed questionnaires, selecting the most common PIs Wei (2008) and used these as performance enhancement factors. Initially 30 questions were included in each questionnaire. Pilot study conducted on 55 respondents from the said public sector organizations and due to the reliability issues 9 questions were excluded from the questionnaires.

3.6.1 Time:

The adapted scale consists of three items. An example item is "In my organization module wise ERP implementation has been made by the vendor as scheduled" Responses were measured by using 05 point Likert scale where "1= strongly disagree to 5=strongly agree".

3.6.2 Functionality:

In order to measure "Functionality" three items were included. Examples item is "ERP users don't feel comfortable because of checks placed in ERP in order to perform their job" and "Level of workflow support in our ERP completely meets our organizational objectives as planned before ERP implementation". Responses were measured by using 05 point Likert type scale where "1= strongly disagree to 5=strongly agree".

3.6.3 User Friendliness:

For measuring the variable i.e. "user friendliness" the 3 items scale was developed. An example item is "Because of the user friendliness our ERP users get a lot of benefits from ERP online help". Responses were measured by using 05 point Likert type scale where "1= strongly disagree to 5=strongly agree".

3.6.4 Flexibility:

For the purpose of measuring "Flexibility" the 3 items scale developed. An example item is "Our ERP is quite flexible and can easily be integrated with other systems". Responses were measured by using 05 point Likert type scale where "1= strongly disagree to 5=strongly agree".

3.6.5 Reliability:

To measure "Reliability" the 3 items scale developed in the study. An example item is "We have minimum of system break down in our organization". Responses were measured by using 05 point Likert type scale where "1= strongly disagree to 5=strongly agree". Responses were measured by using 05 point Likert type scale where "1= strongly disagree to 5=strongly agree".

3.6.6 Technology Capability

To measure "Technology Capability" the three items scale developed in the study. An example item is "We have a strong pool of experienced system

engineers/technical staff (For overall company's technology infrastructure support) to better run this ERP". Responses were measured by using 05 point Likert type scale where "1= strongly disagree and 5=strongly agree".

3.6.7 Vendor Support and Service

To measure "Vendor Support and Service" the three items scale developed in the study. An example item is "We have a complete support of our ERP vendor regarding post -sales services as committed in the beginning of the project." Responses were measured by using 5 point Likert type scale where "1= strongly disagree to 5=strongly agree".

3.7 Data Collection

Having feedback from these informal discussions about their ERP expectations and real achievements about ERP performance a questionnaire survey was thus conducted. The questionnaires were first designed having close ended questions using five point likert scale (1 for Strongly Disagree) and (5 for Strongly Agree) and then pilot tested according to the framework and then delivered to the said six public sector organizations. In this survey, 82 questionnaires were sent to each of the said organizations to be filled in by the employees who are ERP users (from line, middle and top level), technical staff and/or ERP project team. By having frequent visits in said organizations on average 65 questionnaires were answered and collected back. The response rate reads 79.2%. After the exclusion of unanswered questionnaires, total 347 questionnaires left for analysis. The effective return rate drops slightly to 70.5%.

Organizations	HEC	NADRA	OGDCL	NLC	PIFRA	SBP	TOTAL
Questionnaires Distributed	82	82	82	82	82	82	492
Questionnaires Received (fit for analysis)	65	75	63	47	61	36	347
Questionnaires Unanswered	17	1	19	41	21	46	145

Table 3.1: Data Collection (Frequency of the questionnaires)

3.8 Statistical Analysis

After collection of data first of all the reliability of data was tested through Cronbach-α. For the purpose of testing the hypotheses, Ordinary least squares (OLS) regression and Bivariate analysis were used to make out the effect of all independent variables i.e. "Time (Implementation time), Functionality, User Friendliness (UF), System Flexibility, Reliability and Technology Capability (TC)" on dependent variables i.e. "Expected PE factors performance" and effect of moderating variables VSS (Vendor support & Service) on association of the both independent and dependent variables. A correlation matrix was used to unearth the association amongst variables. All statistical results have been calculated by using SPSS.

Chapter 4

DATA ANALYSIS AND INTERPRETATION

EMPIRICAL RESULTS OF ERP PERFORMANCE ENHANCEMENT FACTORS' APPLICATION

4.1 Mean, Standard Deviation and Reliability test

Cronbach's α has been taken up in order to test the reliability of the instrument which in early researches is calculated. The α in the study indicated that "Cronbach's alpha is used to measure reliability that ranges from 0 to 1, with values of 0.60 to 0.70 deemed as the lower limit of acceptability."

S. No.	Variable	Actual PE Factors' Cronbach's α
1.	Time	0.762
2.	Functionality	0.723
3.	User Friendliness	0.716
4.	Flexibility	0.851
5.	Reliability	0.831
6.	Technology Capability	0.739
7.	Vendor Support	0.738
8.	Model	0.714

Table 4.1: Reliability (Cronbach's α) of Actual PE Factors

The cronbach's alpha of all the variables is given in table 4.1 i.e. actual PE factors. As shown in the above stated table, cronbach's alpha of all the actual

performance enhancement factors' application is above 0.70 (70%). The model's reliability which is 0.714 (71%) is also in the acceptable range of cronbach's alpha i.e. (> 0.70). Therefore the reliability of all the variables is acceptable

S. No.	Variable	Expected PE Factors' Cronbach's α
1.	Time	0.704
2.	Functionality	0.699
3.	User Friendliness	0.816
4.	Flexibility	0.863
5.	Reliability	0644.
6.	Technology Capability	0.705
7.	Vendor Support	0.676
8.	Model	0.689

Table 4.2: Reliability (Cronbach's α) of Expected PE Factors

The table 4.2 (Expected PE Factors) illustrates that the cronbach's alpha of 5 Expected performance enhancement factors' application is above 0.70 (70%) and the three factors are in the acceptable range of (0.6 – 0.7) i.e. Functionality = 0.699, Reliability = 0.644 and Vendor Support = .676. The model's reliability which is .689 (closer to 0.7) and is also in the acceptable range of cronbach's alpha i.e. (0.60 - 0.70). Therefore the reliability of all the variables is acceptable.

S. No.	Variable	Mean
1.	Time	3.7605
2.	Functionality	3.8670
3.	User Friendliness	3.6931
4.	Flexibility	2.9515
5.	Reliability	3.2571
6.	Technology Capability	3.6727
7.	Vendor Support	3.6563
8.	Actual PE Factors' application	3.4461

Table 4.3: Mean of Actual PE Factors

The mean value of all the actual PE factors is stated in the table 4.3 which reflects the average response of the respondents for the questions in respective variables. For Time, Functionality, User Friendliness, Technology Capability, Vendor Support and Expected Performance, the respondent are more towards "strongly agree" statement in the actual PE factors' questionnaire. In "Flexibility" and "Reliability" factors average response rate is around third point of the scale which is uncertain.

S. No.	Variable	Mean
1.	Time	3.7428
2.	Functionality	3.7524
3.	User Friendliness	3.2409
4.	Flexibility	3.0360
5.	Reliability	3.8936
6.	Technology Capability	4.0203
7.	Vendor Support	3.9613
8.	Expected PE Factors application	3.4461

Table 4.4: Mean of Expected PE Factors

The mean value of all the Expected PE factors is affirmed in the table 4.4 that reveals the average response of the respondents for the questions in respective variables. For Time and Functionality the average response rate was more towards "agree" statement in the questionnaire. User Friendliness and Flexibility are on "uncertain" Reliability, Technology Capability and Vendor Support were averaged on fourth point i.e. "agree" and in Expected Performance the respondents are in between 3-4 i.e. uncertain to agree.

S. No.	Variable	Standard Deviation
1.	Time	0.93928
2.	Functionality	0.80918
3.	User Friendliness	0.80103
4.	Flexibility	1.05042
5.	Reliability	1.00720
6.	Technology Capability	0.84865
7.	Vendor Support	0.78996
8.	Actual PE Factors' Application	0.51365

Table 4.5: Standard Deviation of Actual PE Factors

Table 4.5 exposed the standard deviation of the actual PE factors are as time (S.D = 0.939), Functionality (S.D = 0.0.809), User Friendliness (S.D = 0.801), Flexibility (S.D = 0.1.05), Reliability (S.D = 0.1.007), Technology Capability (S.D = 0.848) and Vendor Support (S.D = 0.789). Standard Deviation of actual Performance was 0.513.

S. No.	Variable	Standard Deviation
1.	Time	0.77222
2.	Functionality	0.79540
3.	User Friendliness	1.02209
4.	Flexibility	1.07389
5.	Reliability	0.71814
6.	Technology Capability	0.68550
7.	Vendor Support	0.71296
8.	Expected PE Factors' Application	0.47658

Table 4.6: Standard Deviation of Expected PE Factors

Table 4.6 uncovered the standard deviation of the Expected PE factors as time (S.D = 0772), Functionality (S.D = 0.0.794), User Friendliness (S.D = 1.022), Flexibility (S.D =1.073), Reliability (S.D = 0.718), Technology Capability (S.D = 0.685) and Vendor Support (S.D = 0.712). Standard Deviation of Expected Performance was 0.476.

4.2 Management levels and ERP users' bifurcation

S. No	Management Level	Respondents Break up	ERP Users Breakup
1.	Top Level Managers	02	SAP Users : 01 Oracle Users : 01
2.	Middle Level Managers	61	SAP Users : 25 Oracle Users : 36
3.	Line Professional	124	SAP Users : 45 Oracle Users : 79
4.	Did not disclose IDs (DNDs)	160	SAP Users : 55 Oracle Users : 105
	Total	347	SAP Users : 126 Oracle Users : 221

Table 4.7: Frequency of management levels of ERP users (participants)

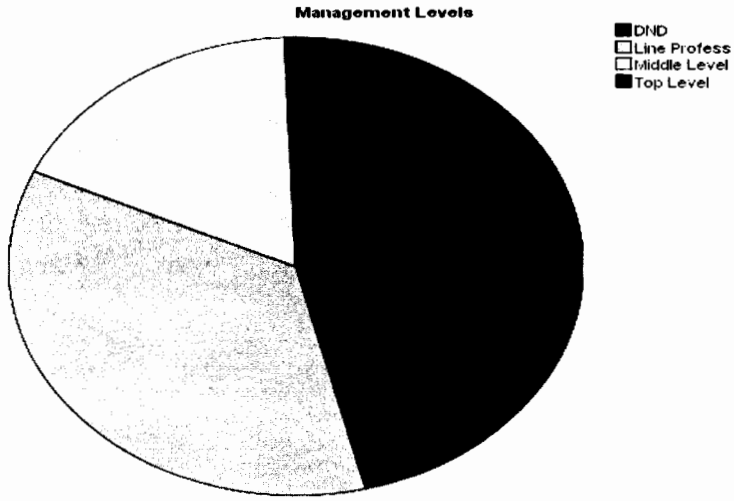

Fig. 4.1: Management Levels Split

Table 4.7 shows that out of total 347 respondents, 02 respondents were from the top level management, out of which one was SAP user and one was ERP user, 61 respondents were from the middle level management out of which 25 were SAP users and 36 were Oracle users. 124 respondents were from the lower level, out of

which 45 were SAP users and rest 79 were Oracle users. 160 respondents did not disclose their designations (DND) out of which were from the middle level out of which 55 were SAP users and 105 were Oracle users. Figure 4.1 i.e. Management Levels Split also indicates the breakup of ERP users in the said organizations.

4.3 Frequencies

4.3.1 Organizations

S. No	Organization	Type	Frequency	Percentage
1.	HEC	Education	65	18.73%
2.	NADRA	CNIC Registration Services	81	23.34%
3.	OGDCL	Oil & Gas	63	18.15%
4.	NLC	Construction	41	11.81%
5.	PIFRA	Financial Reporting & Auditing	61	17.57%
6.	SBP	Banking	36	10.37%
	Total		347	100%

Table 4.8 Organizations of the participants

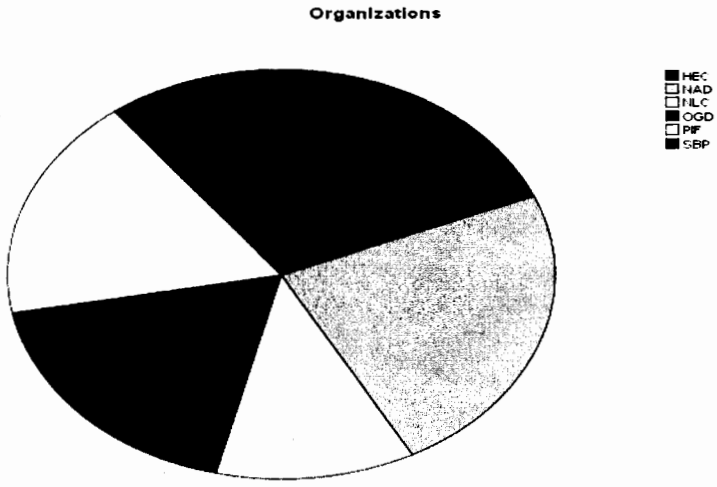

Fig 4.2: Organizations' frequencies

Table 4.8 and Figure 4.2 show that Out of total 347 respondents 65 respondents were from HEC who are i.e. 18.73 % of the total sample size, 81 i.e. 23.34% of the sample, were from NADRA, 63 i.e. 18.15% from OGDCL, 41 i.e. 11.81% from NLC, 61 i.e. 17.57 from PIFRA and 36 i.e. 10.37 were from SBP.

4.3.2 Organizations' Vendors

S. No	Organization	Vendor	ERP
1	HEC	Siemens	SAP
2.	NADRA	A F Fergusson	Oracle Financials
3.	OGDCL	Ora-tech	Oracle Financials
4.	NLC	Si-3 Pvt. Ltd	Oracle Financials
5.	PIFRA	Siemens	SAP
6.	SBP	Ora-tech	Oracle Financials
	Total		

Table 4.9: Organizations' vendors and ERP implemented

		Frequency	Percent	Cumulative Percent
Valid	A F Fergusson	81	23.3	23.3
	Ora-tech	99	28.5	51.9
	Si-3 Pvt. Ltd	41	11.8	63.7
	Siemens	126	36.3	100.0
	Total	347	100.0	

Table 4.10: Organizations' vendors Response Rate

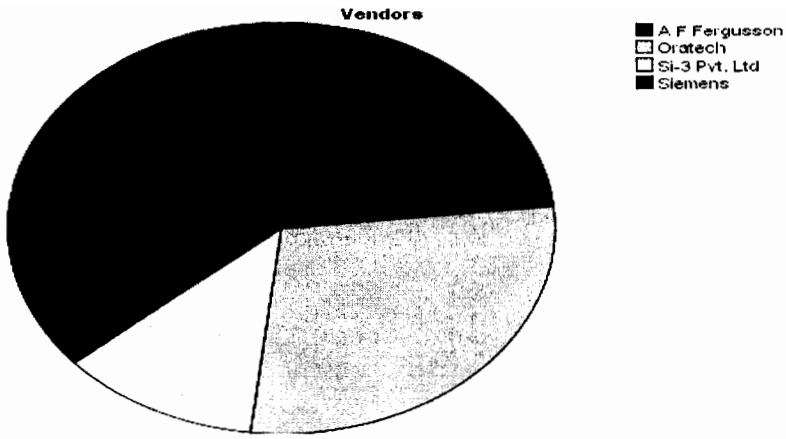

Fig 4.3: Organizations' Vendors breakup

Table 4.9 and Fig 4.3 show that out of 06 selected organizations, ERP implemented in two organizations i.e. HEC and PIFRA by a single vendor Siemens Pakistan. Two other organizations i.e. OGDCL and SBP took ERP implementation services of Ora-tech and the remaining two organizations i.e. NADRA & NLC chose A E Fergusson & Si-3 Pvt. Ltd respectively. However Table 4.10 shows the response rate of the vendors.

4.3.3 Frequency of ERPs

ERP	Frequency	Percent	Cumulative Percent
Oracle Financials	221	63.7	63.7
SAP	126	36.3	100.0
Total	347	100.0	

Table 4.11: ERPs' frequency

Table 4.11 shows that Oracle Financials' in all six organizations are serve about 63.7% and SAP contributes 36.3% towards over all public sector of Pakistan.

4.4 Descriptive Statistics

4.4.1 Actual PE Factors

S No.	Variables	Mean	S.D	Variance	Range
1.	Time	3.7605	0.93928	0.882	2.8 - 4.71
2.	Functionality	3.8670	0.80918	0.655	3.0 - 4.72
3.	User friendliness	3.6931	0.80103	0.642	2.9 - 4.494
4.	Flexibility	2.9515	1.05042	1.103	1.9 - 4.001
5.	Reliability	3.2571	1.00720	1.014	2.25 - 4.264
6.	Technology capability	3.6727	0.84865	0.720	2.8 - 4.521
7.	Vendor support	3.6563	0.78996	0.624	2.8 - 4.446
8.	Actual PE Factors' application	3.6344	0.51365	0.264	3.12 - 4.148

Table 4.12: Descriptive Statistics of Actual PE Factors

As shown in Table 4.12, the average response on the scale (1 indicates 'strongly disagree', 2 indicates 'disagree', 3 indicates 'uncertain', 4 indicates 'agree' and 5 indicates 'strongly agree') for "Time" was (3.76) which showed that the respondents were agreed to the questions that were asked about time in the questionnaire. Moreover the standard deviation for "Time" was (0.939), which reflected as the deviation from the mean (3.76). The respective figures also demonstrate the level of S.D from mean i.e. (2.8) to (4.7) which explained that the response for Time was from uncertain to strongly agree. As Stated in Table 8.1, the average response for "Functionality" was (3.867.) which showed that the respondents were almost agreed upon the questions that were asked about "Functionality" in the questionnaire. The standard deviation for "Functionality" was (0.809), which reflected as the deviation from the mean (3.86). The respective

figures also demonstrate the level of S.D from mean i.e.(3.0) to (4.7) which explained that the response for Functionality was from uncertain to strongly agree. The average response for "User friendliness" was (3.69.) which showed that the respondents were agreed about the questions that were asked about "User friendliness" in the questionnaire. The standard deviation for "User friendliness" was (0.801), which means that the level of S.D from mean was (2.9) to (4.9) that showed the response for User friendliness was from uncertain to strongly agree. The average response for "Flexibility" was (2.95.) which showed that the respondents were uncertain about the questions that were asked in the questionnaire. The standard deviation for "Flexibility" was (1.050), which means that the level of S.D from mean is (1.9) to (4.0) that showed the response for Flexibility was from disagree to agree. The average response for "Reliability" was (3.25.) which showed that the respondents were agreed to the questions that were asked about "Reliability" in the questionnaire. The standard deviation for "Reliability" was (1.007), which means that the level of S.D from mean is (2.2) to (4.2) that showed the response for "Reliability" was from disagree to strongly agree. The average response for "Technology Capability" was (3.67.) which showed that the respondents were agreed upon the questions that were asked about "Tech capability" in the questionnaire. The standard deviation for "Technology Capability" was (0.848), which means that the level of S.D from mean is (2.8) to (4.5) which showed the response for "Technology Capability" was from uncertain to strongly agree. The average response for "Vendor Support" was (3.65.) which showed that the respondents were agreed upon the questions that were asked about "Vendor Support" in the questionnaire. The standard deviation for "Vendor Support" was (0.789), which means that the level of S.D from mean is (2.8) to

(4.4) which showed the response for "Vendor Support" was from uncertain to strongly agree. The average response for "Actual Performance" was (3.63.) which showed that the respondents were agreed upon the questions about 'Expected Performance' in the questionnaire. The standard deviation for "Actual Performance" was (0.513), which means that the level of S.D from mean is (3.1) to (4.1) which showed the response for "Actual Performance" was from uncertain to agree.

4.4.2 Expected PE Factors

S No.	Variables	Mean	S.D	Variance	Range
1.	Time	3.7428	0.77222	0.596	2.97 - 4.515
2.	Functionality	3.7524	0.79540	0.633	2.95- 4.547
3.	User Friendliness	3.2409	1.02209	1.045	2.21 - 4.262
4.	Flexibility	3.0360	1.07389	1.153	1.96 - 4.109
5.	Reliability	3.8936	0.71814	0.516	3.17 - 4.611
6.	Technology Capability	4.0203	0.68550	0.470	3.334 - 4.705
7.	Vendor Support	3.9613	0.71296	0.508	3.24 - 4.674
8.	Expected PE Factors' application	3.4461	0.47658	0.227	3.0 - 3.922

Table 4.13: Descriptive Statistics of Expected PE Factors

As shown in Table 4.13, the average response on the scale (1 indicates strongly disagree, 2 indicates disagree, 3 indicates uncertain, 4 indicates agree and 5 indicates strongly agree) for "Time" was (3.74) which showed that respondents were agreed to the questions which were asked about time in the questionnaire. Moreover the standard deviation for "Time" was (0.772) that reflected as the deviation from the mean (3.74). The respective figures also demonstrate the level

of S.D from mean i.e. (2.9) to (4.5) which explained that the response for Time was from uncertain to strongly agree. As stated in Table 4.13, average response for "Functionality" was (3.75.) which showed that the respondents were almost agreed upon the questions that were asked about "Functionality" in the questionnaire. The standard deviation for "Functionality" was (0.795), which reflected as the deviation from the mean (3.75). The respective figures also demonstrate the level of S.D from mean i.e. (2.9) to (4.5) which explained that the response for Functionality was from uncertain to strongly agree. The average response for "User friendliness" was (3.24.) which showed that the respondents were agreed about the questions that were asked about "User friendliness" in the questionnaire. The standard deviation for "User friendliness" was (1.02), which means that the level of S.D from mean was (2.2) to (4.2) that showed the response for User friendliness was from disagree to agree. Average response for "Flexibility" was (3.03) which showed that the respondents were uncertain about the questions that were asked in the questionnaire. Standard deviation for "Flexibility" was (1.073), which means that the level of S.D from mean is (1.96) to (4.10) that showed the response for Flexibility was from disagree to agree. The average response for "Reliability" was (3.89.) which showed that the respondents were agreed to the questions that were asked about "Reliability" in the questionnaire. The standard deviation for "Reliability" was (0.718), which means that the level of S.D from mean is (3.17) to (4.6) that showed the response for "Reliability" was from uncertain to strongly agree. The average response for "Tech capability" was (4.02.) which showed that the respondents were agreed upon the questions that were asked about "Technology capability" in the questionnaire. The standard deviation for "Technology capability" was (0.685),

which means that the level of S.D from mean is (3.33) to (4.7) which showed the response for "Technology capability" was from uncertain to strongly agree. The average response for "Vendor Support" was (3.96.) which showed that the respondents were agreed upon the questions that were asked about "vendor support" in the questionnaire. The standard deviation for "Vendor support" was (0.712), which means that the level of S.D from mean is (3.24) to (4.67) which showed the response for "Vendor support" was from uncertain to strongly agree. The average response for "Expected Performance" was (3.44.) which showed that the respondents were agreed upon the questions about 'Expected Performance in the questionnaire. The standard deviation for "Expected Performance" was (0.476) which means that the level of S.D from mean is (3.0) to (3.9) which showed the response for "Expected Performance" was from uncertain to agree.

4.5 Control Variables

Management Levels, Vendors, and ERPs were taken as control variables because these factors can affect differently in two different scenarios (Actual and Expected) and can affect the results.

4.6 Correlation

S. No.	Variable	Pearson Correlation (Actual PE Factors) (r)	Pearson Correlation (Expected PE Factors) (r)
1.	Time	1	0.260**
2.	Functionality	1	0.119*
3.	User Friendliness	1	-0.225**
4.	Flexibility	1	0.838**
5.	Reliability	1	-0.085
6.	Technology Capability	1	0.126*
7.	Vendor Support	1	0.512**
8.	Actual PE Factors' Application	1	0.401**

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Table 4.14 Correlation Matrix between Actual and Ideal (Expected) PE Factors' Application

Table 4.14 presents the association amongst all the actual factors' application for their ideal (expected) PE Factors' application, from the table it is exposed that actual time has a positive association with expected time (Implementation time) as ($r = 0.260$, $p < 0.01$), actual functionality with expected functionality is ($r = 0.119$, $p < 0.05$), actual user friendliness with expected user friendliness ($r = -0.225$, $p < .01$) i.e. negative association, actual flexibility with ideal flexibility ($r = 0.838$, $p < .01$) actual reliability with expected reliability ($r = -0.085$, $p < .01$) i.e. negative association, actual technology capability with expected technology capability ($r = 0.126$, $p < .05$), actual vendor support with expected vendor support ($r = 0.512$, $p < .01$) and actual PE factors' application with ideal PE factors' application is ($r = 0.401$, $p < .01$).

4.7 Mean Difference (Expected - Actual)

S No.	Variables	Mean Difference (Expected - Actual)
1.	Time	-0.0177
2.	Functionality	-0.1146
3.	User friendliness	-0.4522
4.	Flexibility	0.0845
5.	Reliability	0.6365
6.	Technology capability	0.3476
7.	Vendor support	0.305
8.	Expected PE Factors	0.1883

Table 4.15: Mean Difference between Expected and Actual PE Factors

Table 4.15 reveals that there is a negative mean differences i.e. -0.017, -0.114 and -0.4522 in expected and actual time, functionality and user friendliness

respectively. Mean differences between expected and actual flexibility, reliability, technology capability and vendor support are positive.

4.8 Level of Significance

One way ANOVA was performed in order to testify the level of significance. The results revealed that there was significant mean difference between actual and expected time i.e. ($F = 4.589$, $p < 0.001$).

The results of one way ANOVA revealed that there was insignificant mean difference between actual and expected functionality i.e. ($F = 1.571$, $p = 0.098$ i.e. $p > 0.001$). One way ANOVA results between actual and expected user friendliness revealed that there was significant mean difference i.e. ($F = 2.427$, $p < 0.01$). In continuation of this when significance tested between actual and expected flexibility, it revealed that there was significant mean difference i.e. ($F = 68.459$, $p < 0.001$), between actual and expected reliability, showed insignificant mean difference i.e. ($F = 1.256$, $p = 0.236$ i.e. $p > 0.001$), between actual and expected technology capability, indicated significant mean difference i.e. ($F = 3.220$, $p < 0.001$), between actual and expected vendor support, showed significant mean difference i.e. ($F = 13.313$, $p < 0.001$) and between actual and expected 'PE Factors' as a whole, showed significant mean difference i.e. ($F = 3.759$, $p < 0.001$) which ensures its significance.

4.9.8 Moderation

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
	R Square Change	F Change	df1	df2	Sig. F Change	R Square Change	F Change	df1	df2
1.	.546(a)	.298	.294	.43153	.298	73.106	2	344	.000
2.	.595(b)	.354	.349	.41458	.056	29.709	1	343	.000

a. Predictors: (Constant), Actual PE Factors' application, Vendor Support Expected

b. Predictors: (Constant), Actual PE Factors' application, Vendor Support Expected, Interaction

Table 4.16.1: Model Summary of Moderation

Coefficients (a)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta	B	Std. Error
1.	(Constant)	1.653	.181		9.153	.000
	Vendor Support Expected	.300	.037	.416	8.211	.000
	Actual PE Factors application	.223	.054	.211	4.167	.000
2.	(Constant)	1.094	.202		5.431	.000
	Vendor Support Expected	.369	.037	.513	9.893	.000
	Actual PE Factors application	.506	.073	.479	6.923	.000
	Interaction	-.055	.010	-.400	-5.451	.000

a. Dependent Variable: Expected PE Factors Application

Table 4.16.2: Moderation Coefficients (a)

In order to test the hypothesis of moderating effect of vender support in the relationship between actual PE factors and expected PE factors, the study used the method suggested by Baron and Kenny (1986). In order to see the moderating effect, vendor support and actual PE factors have been entered in the first equation and then entered the interaction term i.e. vendor support * actual PE factors in the second step. It was noted that actual PE factors have been affected by Vendor support and services with (Beta -0.400 & $p < 0.001$) which indicates that vendor support significantly moderates the relationship between actual PE factor application and expected PE Factor application.

4.9.9 Open Item Analysis

4.9.9.1 Do you think that the actual output of performance enhancement factors really affected your expectations after ERP implementation in your organization? (Time, Functionality, User Friendliness, System Flexibility, Reliability, Technology Capability, Vendor Support and Service)

The majority of the responses regarding time, functionality and user friendliness

were more or less same. The actual performance regarding these factors surpassed as it was expected. It is reflected as the actual application of these factors outperformed the expectations. In other words it shows that either expectations of the respondents were not realistic or the actual performance of enterprise system was more than the required level. The reason for the actual performance exceeds the expectation might be that the expected performance regarding these factors was underestimated or the system really produced the extraordinary results. The majority of responses regarding System Flexibility, Reliability, Technology Capability, Vendor Support and Service were somewhat alike. The actual performance regarding these factors was less as it was perceived. The actual application of these factors underperformed than the expectations. In other words it shows that either expectations of the respondents were not realistic or the actual performance of enterprise system was less than the required level. The reason for the actual performance behind the expectation might be that the expected performance regarding these factors was overestimated or the system could not be able to produce the expected results.

4.9.9.2 Do you think that the Performance of ERP can be enhanced if these factors are rightly focused?

The majority of responses for the enhancement of ERP regarding the selected PE factors were positive especially for User friendliness, System Flexibility, Reliability, Technology Capability and Vendor Support and Service. The respondents provided their view point keeping in view their own experiences, skills they possessed and their participation in the whole implementation process. According to the respondents, out of these PE factors most critical are User friendliness, system flexibility, technology capability and Vendor support and

service.

4.9.9.3 In your opinion, what other factors if rightly addressed might affect the performance of ERP?

The other PE factors put in the picture by the respondents were Cost, Complexity, and Skill Set of the users. According to the majority of respondents Their organizations lack planning. Pre-Implementation measures need to be focused upon and even after ERP implementation; the organization not only need to evaluate the results but should rightly focus upon the said factors in order to reap more benefits from the enterprise system.

Chapter 5

5. ANALYSIS OF RESULTS

5.1 Discussion

Exploration of the common PE factors which have also been researched as performance indicators (PIs) do have impact on ERP performance and can contribute towards performance enhancement of ERP. The results demonstrate that the gaps identification between expected and ideal PE factors' application can be both positive and negative.

5.1.1 Hypothesis 1 (H1): There is a significant gap between actual and ideal (expected) time.

As Wei (2008) investigated that 'Time' is primarily measured by schedule control by measuring the gap between the scheduled (expected) & real time taken. As the table 4.7.1 testifies the mean difference between the two scenarios i.e. expected and actual. There is a negative gap (-0.0177) between expected and actual time which mean that actual application of PE factors was more positive than the expected ones. When the significance was testified for the expected and ideal time, it was found significant as ($F = 4.589$, $p<001$) thus hypothesis 1 is accepted. In addition to the acceptance of the hypothesis 1, the inference can be developed that if there is a significant gap between expected and actual time, then there are more chances to improve ERP performance by minimizing this gap. As Holsapple & Sena. (2002) already narrated that the Ideal theoretical concept of ERP for Large scale organizations with the detailed results provision to the shareholders in a timely manner in addition to the on-going struggles. In addition to this Chien and Tsaur (2007) concluded in his model (Fig 2.2.c) that positive benefits from an

ERP system implementation can be attained though increased timeliness which means timeliness can lead the system towards performance enhancement.

5.1.2 Hypothesis 2 (H2): There is a significant gap between actual and ideal (expected) functionality.

Shehab et al. (2004) narrated that major ERP vendors are consistently putting their experience, skills and efforts towards their performance enhancement through enhanced functionality in their products in order to benefit themselves, the market and their customers. Hypothesis 2 is rejected because of insignificant gap between expected and actual functionality i.e. -0.1146 with $F = 1.571$ and $p = 0.098$. Though the there is a gap between the two scenarios but the value of 'p' reflects it insignificance which means that there is a nominal difference between the two. The inference can be developed that there is an insignificant gap between expected and actual functionality, so the room for improvement in functionality is comparatively lesser than the other factors which have significant gaps between themselves or there is a nominal gap between expected and actual functionality. Brown and Vessey (1999) already narrated that "ERP systems have not yet been critically theorized from its important complexities perceptively in a sufficient manner.

5.1.3 Hypothesis 3 (H3): There is a significant gap between actual and ideal (expected) User friendliness.

Wei (2008) investigated that Ease of Operation and (EO) and Ease of Learning (EOL) of an enterprise system vitally enhances system performance through a user friendly graphic interface and step by step command system. The results (mean difference = -0.4522) of 'user friendliness' between expected and actual are though negative but significant ($F = 2.427$, $p < 0.01$) which surely indicate the

acceptance of hypothesis 3. The inference can be built up from the its result that if there is a significant gap between expected and actual user friendliness, then there are more chances to improve ERP performance by minimizing this gap. Negative mean average reflects as system performed more than the expected outcomes. Seddon (1996) when revised the model of Seddon (1996) after DeLone and McLean (1992) by replacement of 'use' with user behavior because of its importance then system performance improved.

5.1.4 Hypothesis 4 (H_4): There is a significant gap between actual and ideal (expected) flexibility.

The results (mean difference) of 'flexibility' is positive i.e. 0.0845, with the significance level of $p<0.001$& $F = 68.459$ prove that there is a significant gap between expected and actual system flexibility thus hypothesis 4 is undoubtedly accepted. The inference can be developed that if there is a significant gap between expected and actual system's 'flexibility', then there are more chances to improve ERP performance by minimizing this gap between the two. As Shanks et al. (2003) stated that ERP implementation may result in drastic organizational changes, which carries a lot of risk and inflexibility with it. Stedman (1999), Keller and Teufel, (1998) and Akkermans et al. (2003) defended flexibility by rationalization that balance between flexibility & standardization has to be considered at the time of enterprise system package selection, based upon real organizational and industrial needs. Janson and Subramanian (1996) & Gattiker and CFPIM (2002) explored that a wrong assessment in this regard may result in both high risk of time and cost overrun.

5.1.5 Hypothesis 5 (H_5): There is a significant gap between actual and ideal (expected) reliability.

The results of the enterprise system's 'reliability' indicate that though there is a positive gap (0.6365) between the expected and actual reliability with significance level (F = 1.256, p = 0.236) which reveal that there is an insignificant gap between the two scenarios of enterprise system's reliability. Though the gap is positive but it is sheer a nominal which doesn't provide much opportunities to enhance system performance as the other factors with significant gap could do. Hence hypothesis 5 is rejected. The inference can be developed from the results that if there is not a significant gap between expected and actual system's 'flexibility', thus there are lesser chances of performance improvements if system reliability if focused. Chien and Tsaur (2007), explored that "the enterprise system quality is examined in terms of system reliability, system flexibility, system functionality, system data quality, and integration of ERP". In order to enhance system performance, system stability and recovery ability make the whole more reliable. In continuation of this statement, Wei (2008) researched that high system reliability depends upon stability and recovery ability and automatic data backup ability.

5.1.6 Hypothesis 6 (H6): There is a significant gap between actual and ideal (expected) Technology Capability.

Technology capability results with the positive gaps of 0.3476 and significance level i.e. (F = 3.220, p <0.001) prove that there is significant gap between expected and actual technology capability, so hypothesis 6 is accepted with no questions. The inference can be developed that if there is a significant gap between expected and actual system's 'technology capability', then there are more chances to improve ERP performance by minimizing this gap between the two.

Taking vendor support as independent variable when analyzed, the gap between expected and actual vendor support was 0.305 with the level of significance i.e. F

= 13.313 & p <0.001. Keeping these results for expected and actual vendor support we can coherently testify that these is a significant positive gap between the two The inference can be developed that if there is a significant gap between expected and actual 'vendor support', then there are more chances to improve ERP performance by minimizing this gap between expected and actual vendor support.

5.1.7 Hypothesis 7 (H_7): Vendor support will moderate the relationship between actual PE factors application and expected PE factors application.

Chang et al. (2004) explained that enterprise system vendors always seek out remedial measures against negative perceptions of their real & potential customers regarding ERP cost and time management and improvement in customer support and satisfaction. Confirming our hypothesis 7, the results (F change = .354, R square change = 29.709, p<0.001) show that vender support significantly moderates the relationship (gaps) between actual PE factors' application and expected PE factors' application. Khan (2002) firmly stated that vendor support and services plays a moderating role in the relationship of all the factors that enhance system performance and performance enhancement itself.

Chapter 6

6. RESEARCH FINDINGS, RECOMMENDATIONS AND CONCLUSION

6.1 Research Findings

It is proved from the literature and from the data collected from the users of all six public sector organizations that changes in ERP systems implementation are considered as one of the most critical sources of technological change in large-scale organizations. Thus, objective of the research is to explore the gaps between benchmarking the expected factors' application and what is in reality in public sector organizations of Pakistan. Ultimately resulted in different levels of significance in two different scenarios which are as followed:

- All said factors have been proved most common and reliable which indicate that Performance Enhancement (PE) factors in the study whether they are in real or expected scenario reside in the acceptable range.
- The proposed model positively carries the researchers and practitioners towards identification of the gaps between the expected and actual ERP performance enhancement factors' application successfully.
- The study analyzed the moderating role of vendor support and service which could minimize the gaps between the two scenarios which ultimately will result in better performance of ERP. Without having vendor support (the moderation effect) the gaps between all the said factors are significant except functionality and reliability.
- All six organizations have been explored keeping in view of research objectives.

- ERP vendors for the selected organizations though have sound profile but their major implementations are in private sector organizations.
- From the overall respondents 63.7% are Oracle users and 36.3% are SAP users which shows that Oracle Financials is considered as more suitable in our public sector organizations.
- In the analysis of Actual PE factors, average response behavior of the respondents was in the range of 'uncertain' to 'agree' which indicates that actual implementation has more room for improvement.
- In the analysis of same PE factors in expected scenario, average response behavior of the respondents was in the range of 'uncertain' to 'agree' except 'Flexibility' i.e. 'disagree' which indicates that expectations of the respondents need to be more realistic. This unrealistic behavior may be due to unclear understanding of enterprise system in the minds of the employees.
- When correlation test applied on actual and ideal PE factors' application, all the actual and expected PE factors found positively correlated with each other except user friendliness and reliability which indicates that there is a strong relationship exists between the actual and expected variables undertaken in the study to examine the gap between the actual and expected performance. The significant positive association between expected and actual time, functionality, flexibility, technology capability and vendor support and services indicates that if there is an improvement in real implementation then the gap between the actual and expected variables can be considerably marginalized.
- The negative association between expected and actual user friendliness suggests that the ERP was not user friendliness as it was expected or idealized, same was the case with the reliability of the ERP.

- Mean differences between expected and actual time, functionality and user friendliness are negative where as the rest resulted in positive. It signifies that actual outcomes were more than the expectations of ERP users in the case of time, functionality and user friendliness. On the other hand the results of the rest four PE factors were below the expectations.
- The outcomes exposed that there was significant mean difference between actual and expected 'time', 'user friendliness', 'flexibility', 'technology capability' and 'vendor support' which in other words proves that there is a noticeable gap between the factors of the two scenarios.
- The outcomes exposed that there was insignificant mean difference between actual and expected 'Functionality' and 'reliability' which proves that there is a marginal gap between the said actual and expected variable.
- The research study as a whole proved that actual PE factors has an impact on the expected PE factors because expectations are to be refined to make high but realistic. Actual happenings can change the expected outcomes in both positive and negative manner.
- The study will contribute as a new avenue for guiding the Public sectors' top management, regulatory bodies & ERP vendors to enhance ERP performance by focusing upon the said factors in order to minimize gaps between their actual and expected application for both current & future enterprise systems' implementations.

6.2 Recommendations

As the objective of the study was to explore the gaps between benchmarking the expected factors' application and what is in reality. it analyzed the gaps between common factors' application which have impact on ERP performance in public

sector organizations of Pakistan. The study also provided an effective ERP performance enhancement conceptual model that should facilitate the public sector organizations in identifying gaps between the expected and actual ERP performance enhancement factors' application. The study also found out that Vendor Support has a positive impact on the relationship (gaps) of Actual and Ideal (Expected) PE factors' application. The study here provides some recommendations in order to reap benefits from itself by the researchers, Industry's top management and the governments because of its complete focus upon public sector organizations. These recommendations are as followed:

- Because of its size, required functionality, required output and the risk involved, all said public sector organizations need to enhance their system performance by focusing upon the said PE factors.
- NADRA is considered as bench mark in public sector organizations of Pakistan because of its size, business and core importance that is why NADRA is required to focus upon PE factors' application i.e. its system functionality enhancement, User friendliness, processing time and technology capability in order to be in line with its global competitors.
- NLC need to put focus upon development of technology oriented culture in itself to reap extra benefits from their ERP from top to bottom levels.
- All public sector organizations need to find out and work upon the common performance enhancement factors in order to enhance the whole enterprise system's performance.
- It has been observed that in motivation for the use of technology should be enhanced in order to get the maximum out of their whole enterprise system of all public sector organizations.

- All the selected organizations need to properly define change management process and practices i.e. Procedures for handling changes, Roles and responsibilities of the IT support staff, Measurements for change management, Type of changes to be handled and how to assign priorities and Back-out procedures.
- NADRA, NLC and PIFRA need to develop a culture of feedback and change requests whenever required.
- All six organization need to improve their evaluation process on technology change implementation during and after implementation, in order to get maximum out of the enterprise system.
- If all the stake holders are positively involved in the ERP planning and implementation process, their expectation would be realistic and achievable. The same problems have been faced and are still being faced by NLC, NADRA, PIFRA, and HEC. The other two organizations i.e. OGDCL, SBP are doing comparatively better in this regard.
- There is a severe need of enterprise system training during and before system implementation in all said organizations. Though HEC, NADRA, OGDCL are doing better in this regard.
- Implementation time must be critically analyzed by ensuring realistic calculation especially committed by the vendor because implementation time for the same application by the same vendor may vary in different organizations because of various internal organizational factors.
- Functionality of the enterprise system if positively planned and negotiated with the vendor before the implementation starts, it may reduce time and cost overrun and other risks.

- ERP systems are found inflexible in public sector organizations, which is because of the system rigidity and/or user acceptance which should be catered for in the start of and during the course of implementation of the project.
- Minimum system flexibility must be ensured in coordination with the vendor and this information must be discriminated amongst all internal stakeholders to enhance its performance at the later stages.
- Though Enterprise systems are the most reliable products but the users must be convinced in this regard in order to enhance the overall system productivity.
- There is a deficiency observed in our public sector organizations of having a strong pool of experienced personals (For overall company's technology infrastructure support) to better run the enterprise system
- The quality of post sales commitments of ERP Vendor must be ensured and documented after a detailed system and organizational need analysis to be on the safe side at the time of vendor selection.
- Organizations should make full use of online learning in order to make its users productive and updated which may at the end result in better output.

In all six selected public sector organizations, ERP maintenance process is considered as the most complex and jeopardized job in our public sector organizations which should be flexible, easy and cost effective by being focused upon the performance enhancement factors' application.

6.3 Conclusion

The study explored the gaps between the Actual and Expected most common performance enhancement factors' application in ERP Projects in six public sector organizations of Pakistan. The study also analyzed the moderating role of vendor

support and service which could minimize the gaps between the two scenarios which ultimately will result in better performance of ERP. Without having vendor support (the moderation effect) the gaps between all the said factors are significant except functionality and reliability. The results demonstrate that vendor support does affect the relationship of actual and expected PE factors. This study would pave the way for guiding the Public sectors' top management, regulatory bodies & ERP vendors to enhance ERP performance by focusing upon the said factors in order to minimize gaps between their actual and expected application for both current & future enterprise systems' implementations.

6.4 Limitations and future research

Though this study explored the gaps between the actual and expected most common performance enhancement factors' application (Time, Functionality, User Friendliness, System Flexibility, Reliability and Technology Capability) in ERP Projects in six public sector organizations of Pakistan but this research faced some limitations also.

The study specifically focused on public sector of Pakistan therefore findings may not apply to private sector thus future research can explore other sectors in order to find the gaps between the two scenarios. In addition to this, there may be hundreds of other PE factors that may be improved if the gaps are identified which were not possible to cover in this research. The study was a cross sectional study therefore its findings may not be pertinent for longitudinal purposes. Fourthly this study only focused upon exploration of gaps between the two scenarios which could also be extended for finding different methods of reducing the gaps between the two. "Vendor Support and Service" was used as moderating variable where as other variable (independent) variables can also be analyzed as moderating and

mediating variables such as time, user friendliness, flexibility etc. Employees of the researched organizations were quite reluctant in providing the data in writing (questionnaires) because of the current trend of downsizing in Pakistan's public sector organizations so it has been very tough to convince them about the data collection because they were taking any of such activities as a threat for themselves.

The study exclusively incorporated only six public sector organizations where ERP has been implemented. This research can also be extended up to more public sector organizations in future.

7. REFERENCES

1. Al-Mashari, M., Al-Mudimigh, A. and Zairi, M. (2003) "Enterprise resource planning: a taxonomy of critical factors", European Journal of Operational Research, Vol. 146, No. 2, pp. 352-64.
2. Ahmed M. Ragab. (2009) "Impact of BPR on Organization Performance", Research Community of Academia, Harvard Business School, pp. 1-8.
3. Akkermans, H. P. Bogerd, E. Yucesan, L. van Wassenhove, (2003), "The impact of ERP on supply chain management: exploratory findings from a European Delphi study", European Journal of Operational Research Vol. 146, No. 2, pp. 284.
4. Baron, R. and D. Kenny, (1986) "The Moderator-Mediator Variable Distinction in Social Psychological Research: Conceptual, Strategic, and Statistical Considerations", Journal of Personality and Social Psychology, Volume 51, No. 6, pp. 1173-1182.
5. Bhatti T.R, (2005) "Critical Success Factors For The Implementation Of Enterprise Resource Planning (ERP): empirical validation", The Second International Conference on Innovation in Information Technology (IIT'05), pp.3-8
6. Brown C. and Vessey I. (1999) "ERP implementation approaches: toward a contingency framework", Proceedings of the International Conference on Information Systems, pp. 411-416.
7. Blick, G., Gulledge, T. and Sommer, R. (1999) "Defining business process requirements for large-scale public sector ERP implementations: A Case Study, presented on ECIS 2000, Vienna

8. Carton, F. and Adam, F. (2008) "ERP and Functional Fit: How Integrated Systems Fail to Provide Improved Control", The Electronic Journal Information Systems Evaluation Volume 11, No. 2, pp. 51–60.
9. Cumbie, B. A., Z. Jourdan, T. Peachey, T. M. Dugo and C. W. Craighead. (2005) "Enterprise Resource Planning Research: Where Are We Now and Where Should We Go from Here?," The Journal of Information Technology Theory and Application (JITTA), Vol 7, No. 2, pp. 21-36.
10. Chun-Chin Wei. (2008) "Evaluating the performance of an ERP system based on the knowledge of ERP implementation objectives", Int J Adv Manuf Technology, Volume 39, No. 1-2, pp. 168–181
11. Davenport, T. H. (1999) "Putting the enterprise into the enterprise system". Harvard Business Review on business value of IT. pp. 159-185
12. Deloitte Research. (2002). "The keys to smart enterprise transformation for the public sector 2002-2003", Deloitte Consulting and Deloitte & Touche.
13. DeLone, W. D. & McLean, E. R. (2003) "The DeLone and McLean Model of Information Systems Success: A Ten-Year Update", Journal of Management Information Systems, Vol. 19, No. 4, pp. 9-30.
14. Edward W.N. Bernroider & Johann Mitlöhner. (2005) "Characteristics of the Multiple Attribute Decision Making Methodology in Enterprise Resource Planning Software Decisions", Communications of the IIMA 49, Volume 5, No. 1, pp. 55.
15. E.M. Shehab, M.W. Sharp, L. Supramaniam and T.A. Spedding. (2004) "Enterprise Resource Planning, An integrative review", Business Process Management Journal, Vol. 10 No. 4, 2004, pp. 369.

16. Fiona Fui-Hoom Nah and Janet Lee-Shang Lau. (2001) "Critical factors for successful implementation of enterprise systems", Business Process Management Journal, Vol. 7, No. 3, pp. 285-296.
17. Gattiker, T. and CFPIM. (2002) 3/4 quarter, "Anatomy of an ERP implementation gone away". Production and Inventory Management Journal, Vol. 43, pp. 96-105.
18. Grady, R.B. and Caswell D. (1999) "Software Metrics: Establishing a Company-Wide Program". Englewood Cliffs, New Jersey: Prentice-Hall
19. Gulledge, T. and Simon, G. (2005) "The evolution of SAP implementation environments: a case study from a complex public sector project", Industrial Management & Data Systems, Vol. 105, No. 6, pp.714–736.
20. Hammer M. and Champy J. (2001) "Reengineering the Corporation: A Manifesto for Business Revolution", Harper Collins.
21. Holsapple, C. and Sena, M. (2002) "Beyond Transactions: The Decision Support Benefits of ERP Systems", Journal of Decision Systems, Vol. 10, No. 1, pp. 68-90
22. Ives, B., Olson, M.H., and Baroudi, J.J. "The measurement of user information satisfaction", Communications of the ACM 26, No. 10, pp. 785-793.
23. J.E. Bailey and S.W. Pearson. (1983) "Development of a tool for measuring and analyzing computer user satisfaction", Management Science 29, No. 5, pp. 530–545.
24. Janson MA and Subramanian A. (1996) "Packaged software: selection and implementation policies". INFOR 34, No.2, pp.133–151.

25. Jarrar, Y.F., Al-Mudimigh A. and Zairi M. (2000) "ERP implementation critical success factors - the role and impact of business process management", Software IEEE, Vol. 16, pp. 30-36

26. Keller, G. and Teufel, T. (1998) "SAP R/3 Process- Oriented Implementation: Iterative Process Prototyping, Addison-Wesley Publishing, Boston, MA.

27. Khan, A. (2002), "Implementing SAP with an ASAP methodology focus". San Jose etc. Writers Club Press.

28. Krejcie, R. V., & Morgan, D. W. (1970). Determining sample size for research activities. Educational and Psychological Measurement, Vol. 30, pp.607-610.

29. Law Chuck C.H. and Nagi Eric. W.T. (2007) "ERP system adoption: an exploratory study of the organizational factors and impacts of ERP success", Information Management, Vol.44, No.4. pp. 418-432.

30. Lawshe CH. (1975) "A quantitative approach to content validity". Pers Psychol, Vol. 28, pp. 563–575

31. Manikas, Ioannis , Manos, Basil, Vlachopoulou, Maro and Manthou, Vassiliki, (2010) "A case study evaluation of the factors affecting fresh produce traceability", International Journal of Business Innovation and Research, Volume 4, No. 3, pp. 232-25

32. Markus and Axline S., and Petrie D., and C. Tanis C. (2000) "Learning from Adopters' Experience with ERP Problems Encountered and Success Achieved", Journal of Information Technology, pp. 245-265.

33. M. Lynn. Markus, Sheryl Axline, David Petrie and Cornelis Tanis. (2003) "Learning from Experiences with ERP : Problems Encountered and Successes Achieved" International Journal of Accounting Information Systems Vol. 4, pp. 165-184

34. Mirchandani, D. and Motwani, J. (2001) "End-user perceptions of ERP systems: a case study of an international automotive supplier", International Journal of Automotive Technology and Management, Vol. 1 No. 4, pp. 416-20.

35. Markus, M.L. and Tanis, C. (2000), ``The enterprise system experience ± from adoption to success'', in Zmud, R.W. (Ed.), Framing the Domains of IT Management: Projecting the Future Through the Past, Pinnaflex Educational Resources, Inc., Cincinnatti, OH, pp. 173- 207.

36. Mabert, V.A., Soni, A. and Venkataramanan, M.A. (2001), "Enterprise resource planning: common myths versus evolving reality", Business Horizons, Vol. 44, No. 3, pp. 69-76.

37. Muhammad Rofi Imtihan, Mohd. Salihin Ngadiman, Habibollah Haron. (2008) "An Alternative Model For ERP Maintenance Strategy", International Journal of Cyber Society and Education, Vol. 1, No. 2, pp. 131-142.

38. Nicolaou, A.I. (2004) "Firm Performance Effects in Relation to the Implementation and Use of Enterprise Resource Planning Systems", Journal of Information Systems Vol. 18, No. 2, pp. 79-105.

39. O'Leary, D. E. (2000) "Enterprise resource planning system: Systems, life cycle, electronic commerce and risk". Cambridge university press.

40. Parr A and Shanks G. (2000) "A Model of ERP Project Implementation", Journal of Information Technology, Vol. 15, No. 4, pp. 289-303.

41. Peristeras, V. and Tarabanis, K. (2000) "Towards an enterprise architecture for public administration using a top-down approach", European Journal of Information Systems, Vol. 9, pp. 252-260.

42. Plant, R. And Willcocks, L. (2007) "Critical Success Factors in International ERP Implementations: A Case Research Approach", Journal Of Computer Information Systems, Vol. 47, No. 3, pp. 60-70.

43. Rabaa'I Ahmad A. (2009) "The impact of organizational culture on ERP systems implementation: lessons from Jordan, Queensland University of Technology (QUT), Association for Information Systems", 2009 Pacific Asia Conference on Information Systems (PACIS), No. 14, pp. 07

44. Ram, Jiwat and Swatman, Paula M.C, (2008) "Enterprise Resource Planning (ERP) Innovation Process: Towards Development of an Integrated Framework for Successful Adoption and Implementation", ACIS Proceedings. Paper 25, pp. 805

45. Parthasarathy S, N. Anbazhagan, Muthu Ramachandran, (2006) "An exploratory case study on performance enhancement of ERP projects", INFOCOMP Journal of Computer Science, Vol.6, No. 7, pp. 1-8

46. Sedera, D., Rosemann, M., Gable, G. (2001) "Using Performance Measurement Models for Benefit Realisation with Enterprise Systems- The Queensland Government Approach", Journal of Management Information Systems Vol. 18, No. 2, pp. 17-45

47. Seddon, P.B. 1997. "A Re-specification and Extension of the DeLone and McLean Model of Is Success," Information Systems Research (8:3), pp. 240-253.

48. Shih-Wen Chien & Shu-Ming Tsaur. (2007) "Investigating the success of ERP systems: Case studies in three Taiwanese high-tech industries", Computers in Industry Vol. 58, pp.784-785

49. S. Mohamed and T. S. McLaren. (2009) "Probing the Gaps between ERP Education and ERP Implementation Success Factors", AIS Transactions on Enterprise Systems, Vol. 1, No. 1, pp. 8-14.

50. Stedman, C. (1999) "Tracking changes: a must in ERP projects; business users sometimes fail to realize importance'', Computerworld, Vol. 33, No.7, pp. 41-42

51. Soliman, F., Clegg, S. and Tantoush, T. (2001) "Critical success factors for integration of CAD/CAM systems with ERP systems", International Journal of Operations & Production Management, Vol. 21 No. 5, pp. 609-29.

52. She-I Chang. (2004) "ERP Life Cycle Implementation, Management and Support: Implications for Practice and Research", Proceedings of the 37th Hawaii International Conference on System Sciences – 2004, pp. 07

53. Skok, W., Kophamel, A., & Richardson, I. (2001). Diagnosing information systems success: Importance-performance maps in the health club industry. Information & Management, Vol. 38, pp. 409-419.

54. Skok, W. and Legge, M. (2002) "Evaluating enterprise resource planning (ERP) systems using an interpretive approach", Knowledge and Process Management, Vol. 9, No. 2, pp. 72-82.

55. Shanks, G.S., Peter B. Seddon, P.B.S. Leslie P. Willcocks, L.P.W. (2003) "Second-Wave Enterprise Resource Planning Systems". Cambridge, United Kingdom, Cambridge University Press, pp. 74-101

56. Thong J.Y.L., Yap, C.S. and Raman K.S. (1994) "Engagement of external expertise in information systems implementation", Journal of Management Information Systems (JMIS) Vol.11, No. 2, pp. 209–231.

57. Uma Sakaran (2003) "Research Methods for Business", 4th edition, pp. 293-294

58. Umble, E.J., R.R. Haft and M.M. Umble, (2002) "Enterprise resource planning: Implementation procedures and critical success factors", European Journal of Operational Research, Vol. 146, No. 2, pp. 241–257.

59. DeLone W. and McLean E. (1992) "Information system success: the quest for the dependent variable, Information Systems Research Vol. 3, No. 1 pp.60–95

60. Vinod Kumar, Bharat Maheshwari and Uma Kumar. (2003) "An investigation of critical management issues in ERP implementation: Emperical evidence from Canadian organizations", Vol. 23, No. 10, pp. 793-807

61. Welti, N. (1999) "Successful SAP R/3 implementation: Practical management of ERP projects". Addison-Wesley, Longman Limited, USA

62. Willcocks LP and Sykes R. (2000) "The role of the CIO and IT function in ERP", Communications of the ACM Vol. 43, No. 4, pp.33–38.

63. Wright Sally and Wright Arnold M. (2002) "Information system assurance for Enterprise Resource planning systems: unique risk considerations", Journal of Information Sciences, Vol. 16, pp. 99-113.

64. Yu, Chian-Son (2005) "Causes influencing the effectiveness of the post-implementation ERP system", Industrial Management & Data Systems, Vol. 105 No. 1, 2005, pp. 115-132.

65. Zhang, L., Lee, M. K. O., Zhang, Z. and Banerjee, P. (2002) "Critical Success Factors of Enterprise Resource Planning Systems Implementation", Proceedings of the 36th International Conference on System Sciences (HICSS), Hawaii, USA.

Appendices

"Exploration of Gap between Actual and Ideal (Expected) common Performance Enhancement Factors' application in ERP Projects in Public Sector Organizations of Pakistan"

I am collecting data to know whether Performance enhancement factors that affect ERP implementation in Public sector Organizations of Pakistan.

You are requested to please spare 5-10 minutes from your precious time and fill this questionnaire. I ensure that the information obtained from this survey will not be disclosed and will only be used for research purposes. The survey questionnaire has been divided into two parts. **Part-I** contains information about **Actual performance enhancement factors** of ERP project in your organization and **Part-II** contains information about **Ideal (Expected) ERP performance enhancement factors** that your organization was looking for, before ERP implementation. **It will be appreciated if questionnaire may please be completed sincerely.**

Organization_____ **Department**_____
No of employees in the Dept_____ **Designation** _____
Experience (in years) ☐ **Less than 2** ☐ **2-5** ☐ **5-10** ☐ **10-15** ☐ **Above 15**
When did your organization start using the new ERP system? _____
How many ERP modules were implemented?_____
ERP Consultant(s) / Vendor (s) name _____
E mail: _____
ERP Module (s) you work with: Please tick ☑ the available choice(s)

1. SAP

Financial Applications			Human Resources			Logistics Applications	
1.1	☐	FI Financial Accounting	1.6	☐	PA Personnel Administration	1.9	☐ SD Sales and Distribution
1.2	☐	CO Controlling	1.7	☐	PT Personnel Time Management	1.10	☐ MM Materials Management
1.3	☐	EC Enterprise Controlling				1.11	☐ PP Production Planning and Control
1.4	☐	IM Investment Management	1.8	☐	PY Payroll		
1.5	☐	PS Project System				1.12	☐ LE Logistics Execution
						1.13	☐ QM Quality Management
						1.14	☐ CS Customer Service

State if any other:

2. Oracle Financials (11i)

Finance			HR			Order fulfillment	
2.1	☐	GL (general Ledger)	2.7	☐	Core HR	2.16	☐ OM (Order Management)
2.2	☐	AP (Accounts Payables)	2.8	☐	Self Service HR	2.17	☐ Shipping
2.3	☐	AR (Accounts Receivables)	2.9	☐	iRecruitment	2.18	☐ Advanced Pricing
2.4	☐	CM (Cash Management)	2.10	☐	iLearning	2.19	☐ Release Management
2.5	☐	FA (Fixed Asset)	2.11	☐	Training	2.28	☐ Inventory Control Mgmt
2.6	☐	Daily Business Intelligence	2.12	☐	Performance Management	2.29	☐ Treasury
			2.13	☐	Absence Management	2.30	☐ Enterprise Budgeting and Planning
			2.14	☐	Payroll		
			2.15	☐	Time and Labor	2.31	☐ Public sector budgeting

Purchasing/Procurement			Maintenance module			Project modules	
2.20	☐	Purchase Order	2.23	☐	EAM (Enterprise Asset Management)	2.24	☐ Project Billing
2.21	☐	Requisition				2.25	☐ Project Costing
2.22	☐	RFQ (Request for Quotation)				2.26	☐ Project Resource Management
						2.27	☐ Project Contract

State if any other:

Part-I: Actual Application of ERP performance Enhancement Factors

Strongly Disagree	Disagree	Uncertain	Agree	Strongly Agree
1	2	3	4	5

Please tick only one choice as ✔ by having the above scale in mind

S.No	Question	1	2	3	4	5
1	In my organization module wise ERP implementation has been made by the vendor as scheduled.					
2	Implemented ERP best fits our organizational processes and it doesn't need more time for further customization.					
3	Employees in my organization spend less time (as expected) as compared to the time spent in the past to perform their tasks by using this ERP.					
4	Level of workflow support in our ERP completely meets our organizational objectives as planned before ERP implementation.					
5	Permission Management features in our ERP has made the whole system highly secure.					
6	ERP users don't feel comfortable because of checks placed in ERP in order to perform their job.					
7	Our ERP users take full use of online learning because of its user friendliness when ever required.					
8	Because of the user friendliness our ERP users get a lot of benefits from ERP online help.					
9	Technology support by our organization meets our problems easily & successfully.					
10	Our ERP is quite flexible and can easily be integrated with other systems					
11	As ERP users we don't face any problem in order to communicate with other platforms.					
12	ERP maintenance is performed in a very good manner in our organization.					
13	We have minimum of system break down in our organization					
14	Our Enterprise System (ERP) processes have a best match with our organizational processes.					
15	Our ERP has a complete capability of Automatic Data Backup ability which is being utilized to the full (100%).					
16	Technology has been upgraded to support Enterprise system (ERP) to manage company's diverse, multi-directional database.					
17	We are capable of handling "diverse product introduction" with strong technology support.					
18	We have a strong pool of experienced system engineers/technical staff (For overall company's technology infrastructure support) to better run this ERP.					
19	Our ERP vendor is cooperative and is able to serve in an ideal (expected) manner.					
20	All the promises of our ERP vendor made before implementation were quite realistic and proved right.					
21	We have a complete support of our ERP vendor regarding post - sales services as committed in the beginning of the project.					

We will appreciate your comments (If any):_____
_____
_____

"Exploration of Gap between Actual and Ideal Performance Enhancement Factors' application in ERP Projects in Public Sector Organizations of Pakistan"

Part-II: Ideal (Expected) application of ERP Performance Enhancement Factors

Strongly Disagree	Disagree	Uncertain	Agree	Strongly Agree
1	2	3	4	5

Please tick only one choice as ✔ by having the above scale in mind

S.No	Question	1	2	3	4	5
1	Module wise implementation schedule promised by our vendor and/or consultant was quite realistic and achievable.					
2	Degree of customization by our ERP vendor was rightly assessed and expected to best fit our processes within the required time.					
3	Employees in my organization were expected to spend less time to perform their tasks by using this ERP.					
4	Level of workflow support in our ERP was assessed and planned accurately in order to meet our organizational objectives.					
5	Permission Management features in this ERP were sufficient, secure and not complex.					
6	Potential ERP users were fully involved and convinced about the checks placed in the system to perform their job before ERP implementation.					
7	Our ERP users were expected to take full use of online learning because of its user friendliness when ever required.					
8	Because of the user friendliness our potential ERP users had to reap a lot of benefits from ERP online help features/services.					
9	Our organization had to provide sound technology support in order to be best aligned with ERP.					
10	According to the vendor our ERP was supposed to be quite flexible and could easily be integrated with other systems.					
11	Communication of ERP with other platforms was ensured by our ERP vendor.					
12	ERP maintenance process was ensured as it would be flexible, easy and cost effective in our organization.					
13	Proactive measures were ensured for minimum of system break down in our organization at the start of the ERP project.					
14	Before implementation of ERP in our organization, It was positively ensured that our Enterprise System (ERP) processes have a best match with our organizational processes.					
15	Proposed ERP's complete capability of Automatic Data Backup ability and its complete (100%) utilization was ensured at start.					
16	Proactive up-gradation /development of technology was ensured in order to draw ideal (expected) outcomes and to manage company's diverse, multi-directional database.					

17	For the purpose of 'diverse product introduction' in future strong technology capability development was rightly considered in relation with the features of proposed ERP.					
18	Our organization positively planned to have a strong pool of experienced system engineers (For overall company's technology infrastructure support) to better run this ERP.					
19	Our ERP consultant/vendor has been cooperative and was able to serve in an ideal manner.					
20	We were expecting 100% satisfaction from our ERP vendor for its commitments/promises.					
21	Our organization ensured about the post sales commitments of our ERP Vendor to be on the safe side at the time of vendor selection.					

Do you think that the actual output of performance enhancement factors really affected your expectations after ERP implementation in your organization?
(Time, Functionality, User Friendliness, System Flexibility, Reliability, Technology Capability, Vendor Support and Service)

Do you think that the Performance of ERP can be enhanced if these factors are rightly focused?

In your opinion, what other factors if rightly addressed might affect the performance of ERP?

We will appreciate your comments (If any):

Date of Survey:_____

Thank you for your kind cooperation

Population and Sample Table

Population (N)	Sample (S)	Population (N)	Sample (S)	Population (N)	Sample (S)
10	10	220	140	1200	291
15	14	230	144	1300	297
20	19	240	148	1400	302
25	24	250	152	1500	306
30	28	260	155	1600	310
35	32	270	159	1700	313
40	36	280	162	1800	317
45	40	290	165	1900	320
50	44	300	169	2000	322
55	48	320	175	2200	327
60	52	340	181	2400	331
65	56	360	186	2600	335
70	59	380	191	2800	338
75	63	400	196	3000	341
80	66	420	201	3500	346
85	70	440	205	4000	351
90	73	460	210	4500	354
95	76	480	214	5000	357
100	80	500	217	6000	361
110	86	550	226	7000	364
120	92	600	234	8000	367
130	97	650	242	9000	368
140	103	700	248	10000	370
150	108	750	254	15000	375
160	113	800	260	20000	377
170	118	850	265	30000	379
180	123	900	269	40000	380
190	127	950	274	50000	381
200	132	1000	278	75000	382
210	136	1100	285	1000000	384

Note: Table 11.3, Uma Sakaran (2003) provides that generalized scientific guideline for sample size decisions. Krejcie and Morgan (1970) as well as Cohen (1969) can be consulted for decisions on sample size for further details.