THE CRITICAL SUCCESS FACTORS OF ENTERPRISE RESOURCE PLANNING (ERP) IMPLEMENTATION: MALAYSIAN AND AMERICAN EXPERIENCES

BY

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DECLARATION

I hereby declare that the work has been done by myself and no portion of the work contained in this thesis has been submitted in support of any application for any other degree or qualification of this or any other university or institute of learning.

________________________

Mohd Nazri Khan Bin Adam
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To my respected father, Adam Rasul Khan, my admired father in law, Tuan Haji Samsudin Yahaya and my only source of inspiration and beloved wife, Hasmawatie Binti Samsudin and my future heir and prince, Muhammad Aliff Haykal Khan
This study reports the Enterprise Resource Planning (ERP) experiences of Malaysian and the USA companies. The aim of the research is to examine the critical success factors needed to ensure success of ERP implementation and to explore the impact of ERP on various operational performance measures. Based on Dehning and Richardson (2002) theoretical model, this research adopts a survey study approach with data obtained from directors of various publicly listed firms through the use of questionnaires. The results were compared between Malaysia and the USA using statistical analysis. Since few ERP studies have been conducted in Malaysia, this research provides a better understanding of ERP practice across cultures, particularly for multinationals operating in Malaysia and the USA. The study shows that Malaysia had different critical success factors compared to the USA (t-test, p < 0.05), faced different problems compared to the USA (t-test, p < 0.05) and was driven by different motivations compared to the USA (t-test, p < 0.05). The study confirms that ERP delivered positive impacts on operational performance in Malaysia and the USA on four measures: cost, quality, delivery and flexibility (t-test, p < 0.05). Multiple regression test shows that the firm size in terms of revenue and number of employees, length of ERP, work climate, cost, quality, delivery and flexibility performance had significant impacts on overall performance (F-test, p < 0.05). Multiple regression test confirms that length of ERP and quality performance are the most important variables influencing overall firm performance (F-test, p < 0.05). Finally, the study concludes that the USA was more successful than Malaysia in the sense that it scored higher on the overall performance (t-test, p < 0.05), perceived more positive impacts on various operational measures (t-test, p < 0.05) and had a better creative climate (t-test, p < 0.05).
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This study was conducted after the author read a comprehensive guide book on Maximizing Your ERP System by Scott Hamilton (2003). Hamilton investigated the implementation process of Enterprise Resource Planning (ERP) in many firms and concluded that most firms do not effectively implement and maximise their ERP system. His study was thorough, full of practical guides and largely based on qualitative case studies. Further, the opportunity to work and visit Siemens USA and Siemens Malaysia (April 2001 till December 2001) enabled the author to obtain an early exposure to ERP practices in one of the most innovative multinationals in the world (Siemens Malaysia, 2006). It is hoped that the results will provide useful insights into ERP implementation and practices across cultures, particularly for local and foreign multinationals operating in Malaysian and American industries.
CHAPTER 1

INTRODUCTION

1.1 THE BACKGROUND OF ERP

1.1.1 ERP And Pressure For Changes

Much research has shown that firms that do well in their business are those that are responsive to change (Peters & Waterman, 1982; Kanter, 1983; Foster, 1986). Since 1980, advances in information and communication technology (ICT) have accelerated the information flow and shortened the cycle of technological development. With rising customer expectations and fast changing environments, there is an urgent need for today’s firms to be innovative to survive the global competition. Under the pressure of coping with the changing environment, many firms have adopted Enterprise Resource Planning (ERP) to boost their competitive advantage (Bingi et al, 1999). “Enterprise Resource Planning is defined as an enterprise wide set of management tools that balances demand and supply, that contains the ability to link suppliers and customers into a complete supply chain, that employs proven business processes for decision making, that provides higher degree of cross functional integration, that provides foundation for e-commerce and enables people to run their business with high levels of customer service, high level of productivity, low level of cost and inventory” (Wallace, 2001).

Davenport (1998) suggests that ERP is the most important development in the corporate use of information technology (IT) in the 1990s and 2000s. Ehie and Madsen (2005) define an ERP system as an integrated software solution that spans the range of business processes that enables companies to gain a holistic view of the business enterprise. An ERP system allows the integration of functions, divisions of businesses in
terms of information exchange and flow, and the integration of business functions as
diverse as accounting, finance, human resources, operations, sales, marketing, customer
information and even the supply chain (Koh & Saad, 2006; Motwani et al, 2002; Tarn et
al, 2002; Kumar & Van Hillegersberg, 2000; Palaniswamy & Frank, 2000). The primary
goal of ERP is to link the market, distribution channel, operations process and supplier
base effectively at low operational costs (Hill, 2000). Davenport (1998) explains that
ERP and business process redesign are two vital tools that improve organizational
competitiveness. The demand for ERP is growing very rapidly and many organizations
are using it to enhance their competitive position. Not surprisingly, the projected market
per year of the ERP worldwide is expected to be USD 1 trillion by 2010 based on the
cost of ERP implementation (Bingi et al, 1999).

1.1.2 ERP And Globalization

Since the birth of globalization in the early 1980’s, businesses have changed
everlastingly with increasing client pressure for operational changes, faster service, wider
choices, and even lower prices. A number of information systems technologies
particularly ERP have been developed in order to reply to the above challenges of the
globalization and modern economy (Botta-Genoulaz & Millet, 2006). When ERP
systems first emerged in the early 1990s, manufacturers in a wide variety of industries
enthusiastically adopted them. While many of these companies are enjoying the benefits
of ERP, some are still struggling with issues like global communication, acquisition
consolidation, process standardization, and changes in customer expectations. The ERP
implementations were often viewed as a component of a much larger business process
reengineering and organizational transformation project (Botta-Genoulaz & Millet,
2006). Scott and Shepherd (2006) say that 74% of manufacturing companies and 59% of
services companies in the USA are either using or implementing ERP in 2006. They also
say that the ERP market is the largest segment of the applications budget in the USA
with 34% market share. Further, 15% of those companies that do not have ERP plan to implement it in the near future (Scott and Shepherd, 2006).

There is a strong belief among academics that ERP plays a crucial role in successful business organisations (Rajagopal, 2002; O’Leary, 2000; Cindy, 2000). Botta-Genoulaz & Millet (2006) says that 70% of Fortune 1000 firms have installed ERP as part of their strategies to boost their competitive advantage. He stressed that ERP plays a crucial role in securing sustained competitive advantage at national and global level by helping firms to achieve cost reduction and better production system quality. Studies conducted by Rajagopal (2002) on the adoption of ERP demonstrated that the adoption of ERP is essential to organisation survival and growth particularly for firms who aspire to be responsive, innovative and globally competitive.

Businesses have been quick to embrace ERP to cope with globalization. Willis and Willis-Brown (2002) observe that the ERP market is one of the fastest growing markets in the software industry. Tarn et al (2002) and Adam and O’Doherty (2000) suggest that ERP will continue to be one of the fastest growing and influential players in the application software industry through to 2010. Despite the high growth numbers, approximately 50 per cent of ERP projects failed to achieve anticipated benefits (Appleton, 1997). Scott and Vessey (2002) observe that 90 per cent of SAP ERP projects run late. Companies have varying degree of success in implementing ERP. Several companies have failed in implementing ERP projects due to several factors as shown in Table 1.1. While many companies such as Cisco Systems, Eastman Kodak and Textronix have obtained significant benefits from ERP, some companies have huge trouble in implementing ERP. Fox Meyer Drugs, a USD5 billion pharmaceutical company filed for bankruptcy due to huge losses from implementing ERP (Al-Mashari, 2000; Chen, 2001). Dell Computers spent USD100 million but eventually had to scrap ERP because the system was too rigid for their expanding global market (Trunick, 1999). The cost associated with ERP implementations can be very high (Hayes et al,
2001). Cooke and Peterson (1998) observe that up until 1998, 6,000 companies had implemented ERP packages at an average cost of USD20 million, while Mabert et al (2001) put the total implementation cost at USD10-90 million of dollars for a medium-sized company and USD300-500 million for large international corporations. All of this leads to a heavy and potentially very large financial burden that companies must bear (Brakely, 1999; Kumar & van Hillegersberg, 2000). This financial burden is not restricted to the direct cost of the ERP system, but can lead to lost sales as experienced by USA’s Hershey Foods’ ERP implementation problems that led the company to lose USD150 million in lost sales (Burritt, 2000; Reuters, 1999). Nonetheless, businesses continue to implement ERP systems as the perceived potential benefits far outweigh the risks (Appleton, 1997). Several scholars have cited common factors (known as critical failure factors) such as shortage of skilled and experienced workers, not clearly defined responsibilities and poor project management as among reasons that contribute to failed ERP projects (Table 1.2) (Bingi et al, 1999).
TABLE 1.1 : LIST OF COMPANIES WITH FAILED IMPLEMENTATION OF ERP PROJECT

<table>
<thead>
<tr>
<th>No.</th>
<th>Company With Failed ERP Project</th>
<th>Reasons For Failure</th>
<th>Source</th>
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<tbody>
<tr>
<td>1</td>
<td>Hershey Foods</td>
<td>• Project time</td>
<td>Burri, R. (2000). Buyer beware, Australian CPA, 70 (8), 48-49.</td>
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<tr>
<td></td>
<td></td>
<td>• Cost overruns</td>
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<td></td>
<td></td>
<td>• Failure to restructure the business process</td>
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<tr>
<td></td>
<td></td>
<td>• Overambitious project scope</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>• Lack of end-user cooperation</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Cost overruns</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Functionality problems</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Business requirements and workflows not clearly defined</td>
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TABLE 1.2: LIST OF CRITICAL FAILURE FACTORS FOR FAILED ERP PROJECT

<table>
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<th>No.</th>
<th>Critical Failure Factors</th>
<th>Source</th>
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<tr>
<td>1</td>
<td>Shortage of skilled and experienced workers</td>
<td>Bingi, P., Sharma, M., &amp; Godla, J. (1999). Critical issues affecting ERP implementation,</td>
</tr>
<tr>
<td>6</td>
<td>Lack of corporate and user readiness</td>
<td>Kwahk, K., &amp; Lee, J. (2008). The role of readiness for change in ERP implementation:</td>
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<td>theoretical bases and empirical validation, <em>Information and Management</em>, <em>45</em>(7), 474-481.</td>
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<td>procedures and critical success factors, <em>European Journal of Operational Research</em>, <em>146</em></td>
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<td><em>(2)</em>, 241-258.</td>
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management’s strategic change actions for ERP implementation: how specializing on just cultural and environmental contextual factors could improve success, *Journal of Change Management*, 7 (2), 121-142.

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<th>Description</th>
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### 1.1.3 ERP And Economic Crisis

Rodrigo (2001) says there is a relationship between technology and economic growth. He further shows that the acquisition of technological capability by firms and nations in East Asia helps them in growing and sustaining their economies particularly during crisis. With the intense globalization, information technology (IT) investments such as ERP are becoming increasingly important to firms' survival and growth (Bharadwaj, 2000). In particular, Asian firms have grown successfully with the help of IT (Amsden, 2001; Enos et al, 1997). Such successes have obviously boosted the confidence of firms in developing countries. Indeed, many developing countries have turned to IT as a way to propel economic growth after the financial crisis (Song, 2000).

The latest financial crisis is triggered by a dramatic rise in mortgage delinquencies and foreclosures in the USA, with major adverse consequences for banks and financial markets around the globe. The crisis, started in late 2007, showed its full impact in 2008 and has exposed pervasive weaknesses in financial industry governance, regulation and the global financial system (Carina, 2009). The result has been a devastating decline in the capital of many firms, tightening credit around the world. The five largest U.S.
investment banks, with combined liabilities or debts of USD4 trillion, either went bankrupt (Lehman Brothers), were taken over by other companies (Bear Stearns and Merrill Lynch), or were bailed-out by the U.S. government (Goldman Sachs and Morgan Stanley) during 2008. Government-sponsored enterprises such as Fannie Mae and Freddie Mac directly owed USD5 trillion in mortgage obligations and were placed into receivership in September 2008. Other notable global failures included Northern Rock, which was nationalized at an estimated cost of USD150 billion and the USA Washington Mutual which was put into receivership with a total assets of USD328 billion (Carina, 2009). The International Monetary Funds (2009) estimates that by end of the crisis, companies around the globe will eventually have to write off USD1.5 trillion of their holdings of subprime securities. Weak corporate governance has frequently been cited as one of the causes of the financial crisis (Carina, 2009). Recent research highlights the importance of corporate governance in avoiding financial crisis. La Porta et al (2000) and Shleifer (1997) demonstrate that, across countries, corporate governance is an important factor in economic development and firm value. Johnson et al (2000) show that country-specific measures of corporate governance perform better than standard macroeconomic variables at explaining the extent of currency depreciation and stock market decline of emerging markets during the crisis. Zheng et al (2002) suggests that ERP systems may improve corporate governance by helping top management decision during crisis. Given the role of IT in the past economic crisis, ERP should help companies in facing the current subprime crisis.

1.2 THE BENEFITS OF ERP

1.2.1 Operational Benefits

According to Davenport (1998), there are many reasons why a company would implement ERP. The reasons include the provision of a single source of data, the potential cost reduction, the potential gain in business integration when reducing indirect
costs, the positive effect of speedy customer responsiveness and the rising office productivity. Overall, operational benefits such as improving productivity, reducing overhead expense and product delivery time are the top business drivers for companies to use ERP (Scott & Shepherd, 2006).

The potential operational benefits of successfully implementing an ERP system are large, and even critical to organisational performance and survival (Markus & Tanis, 2000). ERP system allow a company to manage its business better with potential benefits of improved process flow, better data analysis, higher quality data for decision-making, reduced inventories, improved coordination throughout the supply chain, and better customer service (Gattiker & Goodhue, 2005; Lengnick-Hall et al, 2004; Gupta, 2000). Gupta (2000) suggests that the operational rewards of ERP are immense. He states that ERP leads to massive reduction in operating costs, improved return on investment, improved access to information and ultimately improved decision making for better negotiation with customers and suppliers. ERP helps managers to improve delivery performance, reduce machine downtime, shorten product lead time, reduce order process time, minimise inventory level, decrease machine set up time, lessen quality problems, reduce scrap rate, reduce rework rate and increase the overall efficiency and effectiveness of the firms (Gourdin, 2000). Subsequently, many surveys (Boston Consulting Group, 2000; Holland & Light, 1999; Mabert et al, 2000) have been performed to identify the actual operational benefits of an ERP system namely information quality, complete system integration, real-time accessibility, inventory reduction, productivity improvement, logistics and order management improvement, cash flow and forecasts improvement. While many companies claimed success, few underachieved their objectives and realized less significant financial and operational impact (Mabert et al, 2000).
1.2.2 Strategic Benefits

ERP is important from strategic perspectives (Hamilton, 2003). ERP is a tool which facilitates greater communication between all departments and greater interaction between suppliers, manufacturers and customers. Zheng et al (2002) suggest that ERP systems improve the efficiency of top management decisions and increase the company flexibility in reacting to changing business needs, while Huang and Palvia (2001) suggest that ERP helps companies to plan and manage mission critical components of their business. Huang and Palvia (2001) say that ERP allows a company to position effectively within its environment to reach its maximum potential, while constantly monitoring for future environmental changes that can affect its business position. Fan et al (2000) stated the following strategic benefits of ERP namely continuous environmental scanning, vision formulation, enterprise communication, business process alignment, SWOT analysis, stakeholders’ engagement, performance measurement and values assessment.

ERP allows the company to take a macro look at itself, decide how to function effectively as a whole and embark on a strategic integration process (Huang & Palvia, 2001). A strategic integration process would contain various aspects such as customer service levels, channels of supply and distribution, facility locations, inventories, transportation, information management and organizational structures, all working towards the same vision and objectives (Gourdin, 2000). In recent years, one of the most powerful benefits of ERP is the effective integration of various top level and middle managers departments that underlie the major business process in organizations. Senheng, one of the leading Electrical Chain Stores in Malaysia has demonstrated successful implementation of ERP (Senheng, 2002). With over 60 stores all over the country, Senheng has a comprehensive ERP system in place which provides aggregated information for top managers to coordinate work and keep track of branch performance. This is achieved through an ERP component that is directly linked to top managers,
branch managers and all suppliers (Senheng, 2002). The consumer industry is one of the sectors in the USA where ERP is finding critical strategic applications. “The use of ERP provide opportunities for consumer firms such as Coke and Nestle to alert their top managers on the effectiveness of their strategy and help them to respond to any possible changes in the environment” (Wong, 2003). With the use of ERP, these consumer firms are able to contend with higher degrees of environmental complexity and shorter developmental cycles to stimulate customer interest and finally, deliver high quality products with maximum customer satisfaction.

The key objective of any ERP implementation is to sustain an efficient supply chain management aimed at creating hassle-free collaboration with suppliers, vendors and customers (Wong, 2003). O’ Leary (2000) stressed that ERP creates strategic competitive advantages, customer value, enforces use of best practices, enables top-middle-low managerial communication, better reward system, organizational standardization, eliminates information asymmetries, facilitates intra organizational collaboration and finally leads to improved decision making capabilities. Another major benefit is in the linking of ERP to the strategic planning tools and goals of the organization (O’ Leary, 2000). Kaplan and Norton (1996) say an important strategic benefit of ERP is the ability to measure the performance of individual departments reliably and accurately on a regular basis. There is research evidence to suggest that organizations which can blend strategies into their overall performance measurement systems through the use of technologies such as ERP are in a better position to execute the planned strategies because they can effectively communicate objectives and targets to the workforce. The use of ERP also facilitates a shared understanding of the organization’s strategic intentions (Kaplan & Norton, 1996).
1.3 RESEARCH AIM

The aim of the research is to examine the critical success factors of successful ERP implementation in Malaysia and the USA and then to explore the impact of ERP on operational performance measures in those countries.

1.4 RESEARCH QUESTIONS

This study is intended to answer the following questions (refer to section 3.1.5 for detailed theoretical supports):

- Do Malaysia and the USA have different critical success factors in implementing ERP?
- Do Malaysia and the USA have different problems in implementing ERP?
- Do Malaysia and the USA have different motivations in implementing ERP?
- Does ERP have varying impacts on operational performance in Malaysia and the USA?
- Does size of the firms have any impact on ERP success?
- Does length of ERP implementation influence the overall firm performance?
- Does work climate influence the overall firm performance?
- Who is more successful in implementing ERP, Malaysia or USA?
1.5 RESEARCH ISSUES AND HYPOTHESES

This study highlights the following research issues (refer to Chapter 2 for more detail on the mixed literature review):

1.5.1 Research issue 1: Critical success factors of ERP are mixed and not well defined:

Many scholars argue that the critical success factors (CSF) involved in the implementation of ERP are mixed, vary with countries and are not well understood (Keen, 1981; Cooper & Zmud, 1990). Varying CSF may be the reason that explains the mixed results on ERP success across many countries. While much research has praised the performance of ERP in the developed countries, some research has argued its limitations, especially in its ability to work outside of Western cultures (Poon & Wagner, 2001). Kyung-Kwon and Young-Gul (2001) found that ERP projects in Asia report a high failure rate based on organizations’ failure to adapt the work culture to be in line with the ERP model. An ERP study conducted by Poon and Wagner (2001) showed a mixed corporate performance leading them to speculate that the critical success factors are not well defined enough across different organizations. In another study examining the success of ERP performance across cultures, Shanks et al (2000) concluded that “the critical success factors (CSF) of ERP are not fixed but relative to countries with certain CSF being independent of national culture and some dependent on national culture, reinforcing a mixed perception on how the ERP critical success factors operate across different environments.”

1.5.2 Research issue 2: The requirements and outcomes of implementing ERP projects vary across countries:

Several scholars say that technology projects including Enterprise Resource
Planning (ERP) vary in its requirements and outcome when they operate across different countries (Shue et al, 2004). Culture plays an important role in how societies adapt to change or interact with technology under a certain business setting. “Business technologies such as Enterprise Resource Planning (ERP) and Supply Chain Management (SCM) do not generate similar results across countries due to different cultural variables operating under different environments” (Shue et al, 2004). Vidyaranya and Gargeya (2005) in their study on the transferability of ERP across cultures found that “technology outcome moves at varying rates due to certain factors such as different technology development and organizational readiness”. Therefore, understanding technology implementation across different countries is crucial to understand the success of technology projects across borders (Vidyaranya & Gargeya, 2005).

1.5.3 Research issue 3 : The impacts of ERP on firm performance are mixed and not well defined:

Many scholars say that companies report a mix of business outcome after investing heavily in ERP, with some firms claiming reduced costs and greater operational efficiency while other firms facing declining productivity and deteriorating customer relationships (Brown & Vessey, 2003; Mabert et al 2001). “Despite the huge ERP investments, the results are not consistent with several companies reporting quadruple revenue after full implementation, with other companies facing litigation and going under over ERP implementation issues” (Nash, 2000). Hendricks et al (2007) say “the impact of ERP on corporate performance were mixed with a slight improvement in the profitability of companies and a negative decline in the stock price”. Poston and Grabski (2001) also reported “a mixture of results with a significant increase in cost as a percentage of revenue, but a decrease in the number of employees as a percentage of revenue”. Finally, Wieder et al (2006), in their study on several manufacturing firms, “failed to explain benefits derived by the companies from the use of the ERP system due to insignificant results”. Given the mixed findings on the success of ERP, this study
hopes to add more knowledge and evidence on the usefulness of ERP implementation particularly for Malaysia and other developing countries.

Based on the research issues above, the study tests the following nine alternate hypotheses (HA) using statistical analysis at 5 percent significance level (refer to section 3.1.5 for detailed theoretical supports):

**HA-1: There is a significant difference between Malaysia and the USA with regard to the critical success factors needed in the implementation of ERP.**

It is very important to identify the critical factors that will result in organizations realizing the benefits of ERP implementation. Business conditions are not the same in different countries and hence it is important to understand the success factors before formulating the ERP strategy.

**HA-2: There is a significant difference between Malaysia and the USA with regard to the types of major problems faced in the implementation of ERP.**

This is a significant issue because while designing and implementing ERP systems and practices, the local business conditions and problems have to be understood. In other words, there is no single success formula for implementing ERP in all countries. Companies would do well if they identify all related problems and factor them in before investing in ERP.

**HA-3: There is a significant difference between Malaysia and the USA with regard to the motivations in the implementation of ERP.**
This hypothesis addresses the important question of why companies want to implement ERP in the first place. Understanding the motivating factors will form the basis for evaluation of the scope, design and the investment levels required for implementing the ERP.

**HA-4: There is a significant impact of ERP on cost performance in Malaysia and the USA.**

The investment in ERP and committing resources and manpower would be justified only if the cost performance such as cost of goods sold, selling expense and administrative expense can be improved significantly. Hence, analysis of this hypothesis is useful to ascertain the success of the implementation.

**HA-5: There is a significant impact of ERP on quality performance in Malaysia and the USA.**

The objective of this hypothesis is to analyze whether ERP gives real value to the customers in terms of quality products and services. Successful implementation of ERP calls for fundamental changes in product line processes and quality management strategies. ERP implementations is expected to result in material and product quality improvement as proposed by ERP proponents (McCausland, 2000, Michel, 1997) This hypothesis will confirm the extent of quality improvement achieved by Malaysia compared to the USA.

**HA-6: There is a significant impact of ERP on delivery performance in Malaysia and the USA.**
The ultimate objective of ERP is to enhance delivery speed, which will translate into higher customer satisfaction and improved profitability of the company. The concept of product delivery is gaining importance in the ERP studies because organizations have increasingly relied on ERP to understand their customer behaviour pattern and fulfil their needs (Oliver, 1999, Olinger, 1998). Hence, analysis of this hypothesis is useful to assess the contribution of ERP on delivery performance in Malaysia and the USA.

**HA-7: There is a significant impact of ERP on flexibility performance in Malaysia and the USA.**

This hypothesis addresses the important contribution of ERP towards organizational flexibility. Flexible firms are generally associated with innovative, creative and adaptive organizations with high ability to make speedy solutions to suit their dynamic operating environment.

**HA-8: There is a significant impact of ERP on overall performance in Malaysia and the USA.**

This hypothesis serves the important purpose of establishing the relationship between ERP and overall performance. As the ERP becomes more effective, companies are expected to see improvement in their operational efficiencies such as cost, delivery, quality, productivity per employee and customer response time which should lead to overall firm performance. This hypothesis evaluates the extent of perceived improvement in the overall performance achieved by Malaysia compare to the USA.

**HA-9: There are significant impacts of size, length of ERP, work climate, cost, quality, delivery and flexibility on overall performance in Malaysia and the USA.**
The hypothesis is based on the logic that the firm’s size in terms of revenue and number of employees have impacts on ERP in the sense that with increasing size, ERP can become more complex to manage. Further, the longer ERP has been implemented the more likely firms will have its impacts on overall performance. Some research studies have indicated that American firms are better equipped to face the challenges of size than Asian firms due to their longer experience and creative work climate (Zain, 1993). Many Asian large firms were slow to adopt enterprise systems compared to Western giant firms (Zain, 1993). Hence, work climate may be another contextual factor which may influence overall firm performance. Finally, this hypothesis suggests the moderation effect of operational variables between ERP and overall performance as postulated by Dehning and Richardson (2002). Theoretically, companies that have strong operational performance (lower cost, better quality products, faster delivery and higher flexibility) are more likely to be associated with general excellence and improved overall performance.

1.6 REASONS FOR DOING COMPARATIVE STUDIES ON MALAYSIA AND USA

Few researchers recommend the use of comparative study as a research strategy (Berger et al, 2009; Deshpande and Webster, 1989; Redding, 1994). “Comparative research, as a research methodology, allows for the ability to compare and control similar variables” (Berger et al, 2009). Comparative research is useful in technology studies that explore product similarities, benefits, and effectiveness across a wide variety of industries. For instance, Berger et al (2009) have noted that “the comparative research method is highly useful in the medical field for its ability to provide information on prescription drugs across sectors and countries”. On the corporate side, Deshpande and Webster (1989) have highlighted comparative research as being useful in analyzing the impacts of different management styles and organizational structures on technology and marketing structure. Comparative research has also widely been used in examining the
influence of certain variables such as management practices, government policies, leadership styles and organizational structure on corporate performance as noted by Redding (1994).

Few researchers advocate the use of country level as units of analysis in management research (Martin et al, 2007; Morris et al, 2004). Morris et al (1994) say “cultural influences are always underestimated in organizations”. Culture has been identified as a key variable in determining the adoption of technology and behaviour of corporations. Morris et al (1994) have noted that “cultures influence on personality traits, such as individualism and collectivism, can help to explain the entrepreneurship of companies”. “Country focused research therefore can further elaborate on organizational behaviour and business strategies of specific firms particularly in adopting a certain technology” (Morris et al, 1994). Using country level of analysis has been influential in determining company’s willingness to succumb to bribery (Martin et al, 2007). Vijayakumar et al (2009) stress the benefits of using country level of analysis in their study on country risk ratings and their influence on the inflow of foreign direct investment. In general, the study shows negative correlation between the risk rating and foreign direct investment with emerging countries having more pronounced risk-investment relationship compared to developed countries.

Malaysia is a good example of a developing economy with growing economic growth. It has recorded a fairly robust economic growth of 5.49% from year 2000 to year 2008. Its gross domestic product (GDP) is estimated as USD384 billion while its GDP per capita stands at USD13,310 in 2009 (Economist Intelligence Unit, 2009a). Despite being hit by the subprime crisis, the Malaysian economy managed to post a relatively strong growth of 4.64% in 2008. The Malaysian economy however is expected to shrink by 3% in 2009. A modest rebound in the global economy in 2010 will push the Malaysian economy to grow by just 1.2%, a much slower rate by historical standards. The external environment will be extremely challenging. Malaysia's real exports of goods and services however are expected to contract by 18.8% in 2009 as export
markets weaken considerably (Economist Intelligence Unit, 2009a). Despite that, the Malaysian economy has passed through a transition, having been transformed from an agricultural to an industrial and currently a service economy with information technology becoming one of the most important economic sectors (Bank Negara, 2009).

According to the IMD World Competitiveness Yearbook, the world's most renowned and comprehensive annual report on the competitiveness of nations, Malaysia was ranked 19th in terms of overall competitiveness index among all nations for the year 2008 (The IMD, 2009). Malaysia was also ranked 8th in the overall economic performance index and 14th in the overall business efficiency index. Malaysia however scored lower in overall business infrastructure and government efficiency with a ranking of 19th and 25th respectively. Further, Malaysia is well known to depend on exports and receive strong support from the government. In year 2000, the Malaysian government officially launched Multimedia Super Corridor, basically a government initiative, designed to leapfrog Malaysia into the information and knowledge age. Multimedia Super Corridor is a large commercial area near Kuala Lumpur which hosts more than 900 multinationals, foreign-owned and home-grown Malaysian companies focusing on multimedia and communications products, solutions, services, corporate portals and enterprise system (The IMD, 2009). The experience of Malaysia as a fast developing country with a strong international orientation, government support, business adaptability and efficiency, should be valuable for research cases as it may provide fertile grounds for other countries to learn and globalise. Further, the ample technological projects implementation in Malaysia Multimedia Super Corridor offers important insights into ERP research practices (The IMD, 2009).

The USA is currently the world's largest economy with gross domestic product (GDP) estimated as USD13.9 trillion in 2009 (Economist Intelligence Unit, 2009b). The USA has a capitalist mixed economy which is fueled by abundant natural resources, possessed a well-developed infrastructure and produced high value added productivity.
It is a mixed economy where private firms make the majority of the microeconomic decisions while being regulated by the government. The USA economy maintains a high level of output per person with GDP per capita of USD45,300 in year 2009. The USA economy has maintained a stable overall GDP growth rate with high levels of research and capital investment (International Monetary Fund, 2008). The USA has registered an average economic growth of 2.33% from year 2000 to year 2008. The USA economy is currently in a severe recession with the economy posted a small growth of 1.11% in 2008. Real GDP is expected to contract by 2.6% in 2009 as the financial crisis and the housing downturn take their toll on domestic demand. Massive fiscal and monetary stimulus however will lead to a recovery of growth of 1.4% in 2010 (Economist Intelligence Unit, 2009b).

The USA economy constitutes over 25.5% of the gross world product at market exchange rates and over 19% of the gross world product at purchasing power parity (PPP). Currently, the country ranks fourth in the world in GDP per capita. It has been a leader in scientific research and technological innovation since the late nineteenth century (The IMD, 2009). Today, the bulk of research and development funding in the USA is directed at corporate innovations including computers, internet and enterprise system. Further, the country leads the world in scientific research papers and corporate patents. Americans enjoy high levels of access to technological consumer goods and more than half of U.S. households have broadband Internet service. Finally, the IMD World Competitiveness Yearbook, ranked USA as the world’s most competitive country for the year 2008 (The IMD, 2009). USA was ranked first in the overall competitiveness index, first in the overall economic performance index and first in the overall business infrastructure index. USA however scored lower in government efficiency and business efficiency with a ranking of 20th and 16th respectively. The experience of USA as the largest world economy with strong innovative culture and longer technological history therefore should provide rich context for ERP research cases particularly for other developing countries such as Malaysia to learn, benchmark and emulate.
Many scholars stress the research advantage of using the USA as a study focus compared to the EU (Onwuegbuzie & Daniel, 2000). Unlike European states, America has historically been a fertile land for democracy and technology (Mayer & Palmowski, 2004). “Despite the multi-ethnic diversity existing in the USA, a single larger melting-pot culture has been created out of the multiple sub-cultures. This has been the opposite case for Europe, where immigrant societies have maintained their own culture within their own communities to a higher degree. Further, all member states of the EU have their own distinct culture despite having the same economic union and continental currency. Thus, conducting studies in the USA would allow researchers to achieve a research sample with a higher degree of uniformity and external validity” (Onwuegbuzie & Daniel, 2000). Mayer and Palmowski (2004) note that “due to the high degree of cultural variance in the EU, reliability coefficients for the research may mask notable differences existing between the sub-cultures (eg. varying technological level and language skills) and conceal low score reliabilities generated from different individual subgroups. This will lead to more volatile statistical outcomes, which can affect the representativeness of the data, and therefore produce less reliable results”. Given the high priority of external validity, Onwuegbuzie and Daniel (2000) suggest the use of the USA as a research location as opposed to the EU, unless the research specifically involves examining cultural differences among the EU members.

1.7 THE SIGNIFICANCE OF THE STUDY

It is hoped that this study will add more knowledge and give a better perspective of ERP particularly for Malaysia and other developing countries. Even though the economic and commercial significance of technological innovation is highly recognised, the subject of innovation including ERP is by no means well-understood (Tornatzky et al, 1983; Gurbaxani et al, 1990). Some studies make the assumption that there is a universal theory of technological implementation that can be applied at any time and place (Dewar & Dutton, 1986). Many researchers show that fundamental differences
exist across many types of innovation and technological implementation (Damanpour & Evan, 1984; Dewar & Dutton, 1986; Kimberly & Evanisko, 1981; Moch & Morse, 1977; Nelson & Winter, 1977). This study is the first comparative research conducted in Malaysia and the USA in the area of ERP. The study demonstrates that each implementation of ERP is unique to each country and hence no simple theory can be applied at all times. Further, this study was conducted to extend and confirm the results of many studies in American industry (Yahya & Goh, 2002; Tchokogue & Bareil, 2005, Beard & Summer, 2004). While many studies used a qualitative case approach to investigate ERP, this research uses a quantitative and comparative studies approach to ERP implementation in Malaysia and the USA. This research provides managers with an insight into various ERP implementation activities, its implementation problems, its critical success factors, its impacts on various operational measures and finally its total contribution to the company’s overall performance. Hence, it is hoped that managers will use the results to boost their competitive positions particularly in the light of the current subprime crisis.
CHAPTER 2  

LITERATURE REVIEW  

2.1 DEFINITIONS OF ERP  

There is no simple or single way to describe ERP systems and to identify their attributes. Table 2.1 summarises definitions of ERP in the literature. Some of the definitions (definitions 1, 2, 4, 5 and 7) are narrowly focused purely on the computer system technologies while others (definitions 3, 6 and 8) are broader in nature and difficult to measure, rendering the term to be widely applicable to almost all sorts of business procedures, products, process, service, management techniques, patents, markets and strategies (West & Farr, 1990).

### TABLE 2.1 : DEFINITIONS OF ERP

<table>
<thead>
<tr>
<th>Definition</th>
<th>Author</th>
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<tbody>
<tr>
<td>1. a computer-based system and enterprise wide database that is designed to process an organization’s transactions and facilitate integrated real-time planning, production and customer response that is designed for a client server environment, that integrates majority of business process, that processes majority of organizations transactions and allows access to data in real time</td>
<td>O’ Leary (2000)</td>
</tr>
<tr>
<td>2. a package of computer application that support most aspects of company’s information needs</td>
<td>Davenport (2000)</td>
</tr>
<tr>
<td>3. the broad set of activities supported by multi module application software that helps management to manage important parts of the business</td>
<td>Saud (2000)</td>
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<tr>
<td>4.</td>
<td>an information system that manages through integration of all aspects of a business</td>
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<tr>
<td>5.</td>
<td>a business system that links all areas of a company with external suppliers and customers into a tightly integrated system with shared data and visibility</td>
</tr>
<tr>
<td>6.</td>
<td>an enterprise system that provides efficient feedback, extensive information and coordination of supply chain functions which facilitates enterprise wide integration by tying together suppliers, distributors and customers without geographical restrictions</td>
</tr>
<tr>
<td>7.</td>
<td>an integrated computer system that uses relational database management system and client server network architecture which integrates individual functional systems, standardizes information flow and captures valuable management data</td>
</tr>
<tr>
<td>8.</td>
<td>an enterprise wide set of management tools that balances demand and supply, that contains the ability to link suppliers and customers into a complete supply chain, that employs proven business processes for decision making, that provides higher degree of cross functional integration, that provides foundation for e-commerce and enables people to run their business with high levels of customer service, high level of productivity, low level of cost and inventory</td>
</tr>
</tbody>
</table>
2.2 HISTORY OF ERP

The main focus of manufacturing industry in the 1960’s was on inventory control (Mabert et al, 2000). Most of the heavy software which used mainframe power was designed to manage inventory based on traditional concepts. It was in late 1960’s when the focus expanded to total inventory management, a system called Inventory Management And Control (IMC) which uses bills of material and master schedules to determine company raw material requirement. In the 1970’s, Inventory Management And Control (IMC) then quickly evolved to Materials Requirements Planning (MRP) which had more functions and tools such as capacity planning, forecasting and resource analysis to address priority and capacity management. The next stage of evolution was Manufacturing Resource Planning, also known as MRP2, in 1980’s where more powerful extensions were made to the original MRP which included sales, operation planning, financial interface and simulation. In early 1990’s, MRP 2 functions were further enlarged to cover new areas such as engineering, finance, human resource and project management. The term ERP (Enterprise Resource Planning) was then used to describe this new extension which was broader in scope, stronger in integration and more effective in dealing with multiple internal and external units (Mabert et al, 2000).
Table 2.2 summarises the evolution of ERP from 1960s to 1990s:

**TABLE 2.2 : EVOLUTION OF ERP**

<table>
<thead>
<tr>
<th>Timeline</th>
<th>System</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960s</td>
<td>Inventory Management &amp; Control (IMC)</td>
<td>“Inventory Management And Control (IMC) is the combination of information technology and business processes of maintaining the appropriate level of stock in a warehouse. The activities of inventory management include identifying inventory requirements, setting targets, providing replenishment techniques and options, monitoring item usages, reconciling the inventory balances, and reporting inventory status” (Rashid et al, 2002). Inventory Management And Control (IMC) is primarily about specifying the size and placement of stocked goods. IMC is needed by factories to protect the regular and planned course of production against the random disturbance of running out of materials or goods. “The scope of IMC also concerns the fine lines between replenishment lead time, carrying costs of inventory, asset management, inventory forecasting, inventory valuation, inventory visibility, future inventory price forecasting, physical inventory, available physical space for inventory, quality management, replenishment, returns and defective goods and demand forecasting” (Rashid et al, 2002).</td>
</tr>
<tr>
<td>1970s</td>
<td>Material Requirements Planning (MRP)</td>
<td>Materials Requirements Planning (MRP) utilises software applications for scheduling production processes. “MRP generates schedules for the operations and raw material purchases based on the production requirements of finished goods, the structure of the production system, the current inventories levels and the lot sizing procedure for each operation” (Rashid et al, 2002).</td>
</tr>
</tbody>
</table>
MRP is a production planning and inventory control system used to manage manufacturing processes. An MRP system is intended to simultaneously meet three objectives namely to ensure materials and products are available for production and delivery to customers, to maintain the lowest possible level of inventory and finally to plan manufacturing activities, delivery schedules and purchasing activities. Other functions of MRP include inventory control, bill of material processing and elementary scheduling. MRP is used heavily by factories to plan manufacturing, purchasing and delivering activities (Rashid et al, 2002).

<table>
<thead>
<tr>
<th>1980s</th>
<th>Manufacturing Resource Planning (MRP II)</th>
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<td></td>
<td>“Manufacturing Resource Planning or MRP II utilises software applications for coordinating manufacturing processes, from product planning, parts purchasing, inventory control, product distribution and sales management” (Rashid et al, 2002). MRP II is defined as a method for effective planning of all resources of a manufacturing company. Ideally, it addresses operational planning in units, financial planning in dollars, and has a simulation capability to answer “what-if” questions and extension of closed-loop MRP. MRP II involves a marriage of information technology and operation management skills, dedication to data base accuracy, and computer resources. It is a total company management concept for using human and manufacturing resources more productively (Rashid et al, 2002).</td>
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<table>
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<tr>
<th>1990s</th>
<th>Enterprise Resource Planning (ERP)</th>
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<td></td>
<td>ERP uses multi-module application software for improving the performance of the internal business processes. “ERP integrates business activities across functional departments, from product planning, parts purchasing, inventory control, product distribution, order fulfillment to order tracking. It may include</td>
</tr>
</tbody>
</table>
application modules for supporting marketing, finance, accounting and human resources” (Rashid et al, 2002). “ERP is an integrated computer-based system used to manage internal and external resources including tangible assets, financial resources, materials, and human resources. It is a software architecture whose purpose is to facilitate the flow of information between all business functions inside the boundaries of the organization and manage the connections to outside stakeholders. Built on a centralized database and normally utilizing a common computing platform, ERP systems consolidate all business operations into a uniform and enterprise wide system environment” (Rashid et al, 2002).

2.3 THE PRESENT AND FUTURE OF ERP

The ERP market is a fast expanding market, with total revenue expected to grow by an average of 11% from 2008 to 2011 (AMR Research, 2007). ERP market worldwide is predicted to expand to USD35.8B, USD39.4B, USD43.4B and USD47.7B in the year 2008, 2009, 2010 and 2011 respectively (AMR Research, 2007). Globalization, centralization, and regulatory compliance were the key drivers for continued ERP investment among large corporations (AMR Research, 2007). In the small and midsize business segment, which continues to outgrow the overall market, companies are buying ERP in response to new customer requirements and the desire to participate in the global market (AMR Research, 2007).

Many scholars believe that ERP have now reached a level where both software vendors and users understand the technical, human resource and financial resources required for its implementation and ongoing use (Jacobs & Bendoly, 2003). Most ERP today have various modules to deal with the complex corporate needs such as
production, accounting, procurement, distribution, field service, material planning, capacity planning, production planning, sales planning, sales order processing, customer service and business planning modules (Hamilton, 2003). ERP should now enter an era of relatively easy configuration that takes weeks, with implementation completed at most in 2–3 months. Major corporations have realized the benefits of short implementation cycles and many are striving to implement a module in 6 months or less (Jacobs & Bendoly, 2003). The project management issues related to large and medium scale implementations will be significant when ERP involves conflicting business and personal cultures from various departments (Jacobs & Bendoly, 2003).

The ERP industry in the USA previously underwent massive consolidation in early and mid 2000s. For example, in September 2005, Oracle acquired Siebel, both companies are two major players in ERP application. Lawson and Intentia, two other ERP industrial players merged in May 2006. Finally, in late 2006, Baan decided to join hands with SSA Corporation. Consolidation changes within the industry also suggest that ERP players perceived market saturation and more intense competition in the market (BusinessWeek, 2008). As in year 2007, Oracle and SAP continue to dominate the market with 41% and 21% market share respectively. They face formidable competition from Infor, Sage Group, Microsoft, Lawson, Epicor and IFS which collectively have 20% of the market share. The major growth for most ERP vendors is coming from add-on functionality such as Human Capital Management (HCM) and Business Intelligence (BI) (AMR Research, 2007). Gattiker & Goodhue (2005) say company cultures have obviously been affected by ERP consolidations. With mergers and acquisitions, many corporate cultures have been turned upside down which may affect smooth implementation of ERP (Gattiker & Goodhue, 2005). This area is ripe for future case studies and research addressing questions such as the human costs of consolidation. Consolidation also raises the question of ERP project management in a global marketplace where Western culture may not predominate (Gattiker & Goodhue, 2005).
Allen (2005) postulates that generic ERP software packages in the future will be increasingly specialised and tailored to specific market segments, e.g. refinery, hospital, automotive assembly, law office, etc, such that niche markets create niche products and niche vendors. Preconfigured software modules incorporating best practices and standard business processes will simplify future implementations (Allen, 2005). Hardware and software architectural platforms within and between firms will increasingly become a common standard with data modelling tools and translation software possessing the ability to move any amount of data in any format, any language, anywhere in near real-time. Portals to both internal and external business information will become commonplace in ERP systems (Allen, 2005). In other words, ERP will become much more flexible and intelligent. Data mining and intelligence tools including expert systems, and advanced planning systems (with optimization) will increasingly be used to make business decisions. Simulation will become an increasingly important element of ERP. Examples of major areas to receive the benefits of simulation include cost accounting, forecasting, capacity planning, order rate and response capacity planning, strategic planning, inventory management and supply network planning (Jacobs & Bendoly, 2003).

ERP systems are being developed continuously and nowadays they can encompass all integrated information systems that can be used across any organization (Kumar et al, 2003). Koh et al (2007) says that ERP may evolve into a loosely named iteration called extended ERP. Extended ERP provided backbone financial transaction processing capabilities along with Supply Chain Management (SCM), Customer Relationship Management (CRM), Sales Force Automation (SFA), Advanced Planning and Scheduling (APS), Business Intelligence (BI), and e-business capabilities (Rashid et al, 2002). It basically extends the firms business processes across partners, opens application architectures, provides vertical-specific functionality and is capable of supporting global enterprise-processing requirements. Further, extended ERP will be a
new business strategy that builds customer and shareholder value by optimising inter-enterprise, collaborative operational and financial processes.

Finally, Pollock and Cornford (2004) say several future trends are observable. First, small and middle sized enterprises (SMEs) are increasingly becoming targets of ERP vendors. Second, ERP coupled with more internet functionality specifically customised for the SMEs will dominate the market. Meanwhile, more e-commerce-based ERP systems are expected to be commercially available. Third, post ERP system such as Customer Relationship Marketing (CRM) and Supply Chain Management (SCM) software will be used to extend ERP capacity. The new system will enable organizations to pursue larger industry-wide integration for the whole supply chain beyond what ERP can provide. In other words, ERP will be more innovative, more intelligent and have wider approaches to solve complicated business problems in the future (Pollock & Cornford, 2004).

2.4 ERP IN MALAYSIA

ERP software vendors are experiencing global expansion in the Asia-Pacific region. The Asia-Pacific ERP market accounts for 40 percent of total revenue with Malaysia having less than 5 percent in year 2007 (The IMD, 2009). Despite the small market, Malaysia is predicted to be a major ERP market as it shifts from custom local software to established packaged systems. While ERP use is not widespread, it has seen a significant increase. It is reported that sales of ERP software in Malaysia almost doubled to RM5 billion in 2007 (The IMD, 2009). Huang & Palvia (2001) say that Malaysia's regional environment, strong service sector and positive organizational culture are partially responsible for the market growth. Malaysia's open economy with high linkages for manufacturing and distribution make ERP an attractive business proposal. Economic expansion in Malaysia is the major reason for the growing ERP market. Further, fierce competition and pressures from Western corporations force
Malaysian local firms to vigorously pursue information technology to improve their competitive advantage. Good IT infrastructure, proactive governmental policies, availability of highly skilled IT personnel and high IT literacy are among other factors influencing the use of ERP (The Star, 2007).

Many Malaysian companies use ERP as a response to increased internal competition and foreign competition (Hobday, 1996). The Malaysian government is acutely aware of the threats posed to Malaysia’s competitiveness by the emerging trends of globalization (The Star, 2007). Technological innovation such as ERP has been the main driving force in the Malaysian economy and will continue to be so in the future (Hobday, 1996). Hobday (1996) showed that technological and organisational innovation, particularly in multinational companies, has played a major part in Malaysian export success and economic growth. Malaysian economic growth exceeded 8 percent from 1987 to 1996, 5 percent from 1997 to 2003, 6 percent from 2004 to 2007 and 4% in 2008 (Ministry Of Finance, 2009). Malaysia has made impressive economic progress compared to major industrial countries since the South East Asian economic crisis in 1997 and should continue to grow in 2009. The expansion will rely mostly on the techniques Malaysia used during the 1997 economic crisis, namely corporate-wide integration, corporate restructuring and technological innovation policies encouraged by the government across all private and public sectors (Ministry Of Finance, 2009). While there has been much research done on the implementation of ERP, unfortunately, most was done in developed countries such as the USA and very little in Malaysia. This study is therefore necessary to shed more light on the importance of ERP and its impact on Malaysian firms. To date, there have been few studies in Malaysia as compared to the USA that report on the influence of varying local culture on ERP, the different critical success factors that influence ERP and their effect on operational performance (Zain, 1993). There is evidence that ERP played a significant role in the USA and Europe in handling expanding global markets but a smaller role in Asia and emerging countries (Holland & Light, 1999). Developing countries including Malaysia however are not able
to share the benefits of globalisation in a fair and equitable manner (The Star, 2007). Penetrating the world market has been increasingly difficult due to increased competition from technologically advanced countries with better and cheaper products particularly in the manufacturing industry (Zain, 1995). Thus, there is a good reason for all firms in Malaysia to implement ERP to cut costs and achieve operation efficiency. Technological innovations and change management are therefore imperative to survive in a competitive environment (Peters, 1999; Bessant, 1982). Further, there is a general perception that the western countries such as the USA and in Western Europe have more efficient ERP systems, employ different critical success factors and face different problems compared to Asian countries (Cindy, 2000).

This study attempts to explore all of these comparative issues and ascertain whether the perception above is a fact by comparing the ERP practices in Malaysian and American companies. Further, since ERP has been successfully used by many American firms since early 1990’s, the findings from this study should provide important lessons in implementing ERP for local Malaysian firms.

2.5 ERP IN THE USA

The USA, currently has the largest ERP market representing 66 percent of revenues for the major vendors. The American ERP market, although impacted by the worsening business climate, ended 2007 year with 3.4% growth and a market value of USD16 billion in total software revenue (The IMD, 2009). Due to globalization and highly competitive environment, many USA multinationals used ERP systems to connect more tightly with suppliers and customers. In late 1990’s, many big ERP vendors shifted their focus from Europe to USA including SAG AG, Baan, JBA International and Intentia. Historically, strong service industry is an underlying reason for so many ERP vendors in Europe. Huang and Palvia (2001) stated several reasons for flourishing ERP market in the USA. First, USA has a solid service and manufacturing
base which are ideal for the use of ERP. Second, there is a strong national information and technology infrastructure in the USA. Third, the existence of large multinationals in the USA makes the demand for ERP software attractive. Fourth, quality employees are ample in the USA to support ERP and implement advanced technologies.

Extensive research on ERP in the USA appears in the literature. The most dominant is the work of Willis and Willis-Brown (2002), which identifies two distinct phases of ERP adoption by American firms: ERP implementation and ERP integration. Recent research in the USA has focused more on ERP implementation and ERP integration including its impact on corporate operational performance. Gulledge and Simon (2005) describe the ERP implementation methodology of SAP, one of the largest ERP software makers. Gulledge (2006) examine SAP implementation in the USA Navy and later provide an analytical approach that could be used to analyse operational improvement from using standalone SAP’s ERP solutions. Different sizes of enterprise and different business environments require different types of ERP systems. Mabert et al (2000) find that enterprises of different sizes in the USA approach ERP implementation differently across a range of issues, and larger enterprises report improvements in financial measures, whereas smaller enterprises report better performance in manufacturing and logistics. These results are not surprising given that larger enterprises measure success based on return on investment (ROI) and business benefits, while smaller enterprises focus on direct operational benefits (Mabert et al, 2001). Gattiker and Goodhue (2005) explore the impact of ERP on American manufacturing enterprises. Standard packaged ERP systems generally demand that organisational sub-units adapt their business processes to fit the needs of the software. The study suggests that the ERP-driven business process changes yield positive organizational and operational impacts. The trustworthiness of the vendor is equally important to determine the success of ERP system customisation. Gefen (2002) examine how ERP vendors in the USA can influence ERP implementation process. Tarn et al (2002) study the integration of ERP and SCM to enable information sharing in a supply chain in the USA. They suggest that
under the electronic work environment, the next generation ERP systems will be based on total integration in a supply chain, including customers and competitors. Much research on ERP implementation has been carried out in the USA compared to Asia (Koh & Saad, 2006). They discovered different outcome of ERP research in developed and developing economies. Further, they found ample research of ERP in the USA and stressed the difficulty in finding research in South East Asia, particularly those that deal with operational performance of multinational enterprises.

2.6 ERP AS A POPULAR MANAGERIAL TECHNIQUE

Since early 1800’s, the utilisation of various management theories has become an important force to improve the ways organization are run (Khong & Richardson, 2003). History has shown that many management practices have been contrived in the past 250 years (Hammer & Champy, 1993). Management practices constantly evolve and become the backbone of many successful organizations (Gulledge, 2006). “There are arguments that management ideas developed by Henry Fayol and Frederick Taylor years ago may not be appropriate in the dynamic, turbulent and competitive environment today” (Khong & Richardson, 2003). Therefore, many new management techniques are adopted by firms such as Total Quality Management (TQM), Just In Time (JIT) and Human Resource Management (HRM) (Khong & Richardson, 2003). ERP has been considered as the most popular managerial tools and philosophies in the late 1990s (Hamilton, 2003). Effective use of ERP has become a key discriminator of competitive advantage for American firms, particularly for the large multinational corporations (Blanchard, 1998).
2.7 IMPLEMENTATION ISSUES OF ERP

Extensive research has been published which deals with various issues in implementing ERP. Several works address ERP technical issues pertaining to hardware architecture, data standards, system configuration and software integration (eg Jordan & Krumwiede, 1999; Markus & Tanis, 2000; Olinger, 1998). Others consider tactical issues such as process and organizational adaptation, measurement of the benefits, and resistance to change (Glass, 1998; Laughlin, 1999; Swan et al, 1999; Hammer & Stanton, 1999; Jacobs & Whybark, 2000; Soh et al, 2000). Hammer and Stanton (1999) link ERP with reengineering issues, since ERP provides feedback that flows horizontally across the business. They argue that firms should use ERP as an integrative mechanism to create a new style of management. Zain (1995) consider strategies as an important issue in implementing ERP. Some companies develop ERP in house while others outsource ERP to the third party or simply use off-the-shelf software bought at the market. Some companies use phased transition strategies instead of making a complete drastic migration from legacy system to ERP system (Zain, 1995). Zain (1995) says that different companies used different key roles in the implementation of ERP project such as top management, customers, consultants, academics, outside sponsors, employees, business partners and even government regulators. Zain (1995) also stresses the significance of training and development programme prior to the implementation of ERP. Many researchers look at critical success factors (eg top management support, sufficient training, proper project management, communication, etc) that lead to the success of ERP implementation (Bingi et al, 1999; Kumar & Hillegersberg, 2000; Griffith et al, 1999; Holland & Light, 1999; Hong & Kim, 2002; Verville & Halingten, 2002; Willcocks & Sykes, 2000). Few researchers focus on the cultural issues involved in the alignment of ERP implementation to business processes (Bowersox et al, 1998; Davenport, 1998). Bowersox et al (1998) state that ERP was not only a software package but also a way of doing business. Davenport (1998) confirms that many failures of ERP implementation are due to the lack of alignment with business culture and needs.
He further cautions that firms could lose their competitive advantage by adopting processes that are indistinguishable from competitors. He even suggests that firms should restrain from ERP investment until further study of its business implications is fully understood. Jacobs and Whybark (2000) stress on customer issues in ERP implementation. Using the furniture industry as a reference, they illustrate how ERP implementation could lead to disaster unless adequate consideration is given to customer needs and demand. They stress that two factors, centralization of information and flexibility of production systems, should be simultaneously taken into account to match customer requirements as firms implement their ERP systems across their organization.

2.8 HUGE CORPORATE INVESTMENT IN ERP AND THE NEED TO MEASURE ERP BENEFITS

Enterprise resource planning (ERP) systems have been recognised as one of the most significant business software in the new era (Davenport, 2000). Mabert et al (2001) mention that industry reports indicated as many as 30,000 companies worldwide have implemented ERP systems. Kalling (2003) cites as much as USD180 billion are projected in global ERP investments by 2010. Bingi et al (1999) even project the ERP market worldwide to hit USD 1 trillion by end of 2010. It was found that companies in the USA continue to invest significantly in ERP software and accompanying hardware using a variety of business justifications, including reduced costs, greater operational efficiency, improved productivity, enhanced customer relationship management, and better supply chain management (Brown & Vessey, 2003: Mabert et al 2001). Despite the huge ERP investments, many companies failed to maximise ERP benefit, faced litigation over ERP implementation issues (Boudette, 1999; MacDonald, 1999; Nash, 2000) and even faced bankruptcy (Montoya, 1998; Nash, 2000). Scott and Wagner (2003) suggest that many organizations have been caught between the perceived need to implement ERP and the challenge of realizing the benefits from them.
The need to measure the benefits of ERP is even more important in the light of high failure rate in ERP implementation. Estimates vary widely on the failure rate of ERP implementations (Velcu, 2007). Barker and Frolick (2003) suggest that 50 percent of ERP implementations are failures. Hong and Kim (2002) estimate a 75 percent unsuccessful rate. Scott and Vessey (2002) estimate failure as high as 90 percent. Other research has suggested current demand for ERP is growing fast, but there are relatively few success stories (Hong & Kim, 2002). The cost associated with ERP implementations is extremely high (Hayes et al, 2001). Mabert et al (2001) put the total implementation cost at USD10-50 million for a medium-sized company and USD300-500 million for large international corporations (Brakely, 1999; Kumar & Van Hillegersberg, 2000). Cooke and Peterson (1998) claimed that 6,000 companies had implemented ERP packages at an average cost of USD20 million. Appleton (1997) says 50% of ERP projects failed to achieve anticipated benefits. Scott and Vessey (2002) claim that 90 percent of SAP R/3 projects run late. This is reflected by FoxMeyer Drug Company who went into bankruptcy due to ERP failure (Al-Mashari, 2000). Hershey Foods’ ERP implementation problem was also a disaster which led the company to lose USD150 million in lost sales (Burritt, 2002; Reuters, 1999). Given the high failure rate, many studies have examined how ERP contribute value to an organization and how they should be integrated with already-existing IT resources (Markus & Tanis, 2000; Ross & Vitale, 2000). Zain (1993) claims that any technology can be assessed from various angles of benefits such as financial, operational, organizational, strategic, technological, quality, application and stakeholders satisfaction.

2.9 CRITICAL SUCCESS FACTORS OF ERP

It is crucial that organisations understand the critical success factors (CSF) involved in the implementation so as to optimise benefits from investment in innovation (Keen, 1981; Cooper & Zmud, 1990). Many corporate leaders and IT managers viewed ERP as part of their company technological innovation (Sweat, 1998). Van De Ven et al (1989)
defines the processes of innovation as the development and implementation of new ideas by people who over time engage in transactions with others within an institutional context. Van De Ven et al (1989) indicate that there are many crucial factors that are associated with successful technological innovations. Most CSFs can be categorised according to the stage of innovative processes which include initiation, implementation and evaluation (Hage & Aiken, 1970) or idea evaluation, implementation, problem solving and diffusion (Utterback, 1971). The issue of critical success factors (CSF) and ERP implementation have drawn much interest from researchers (Rickards & Bessant, 1988).

Al-Mashari (2000) says that most CSF of ERP found in the literature was taken from the perspectives of managers. This may lead to a narrow one-sided management centric view on ERP and firm performance (Finney & Corbett, 2007; Al-Mashari, 2000). Further, there is little research on ERP critical success factors (CSF) in Malaysia (Zain, 1993). CSF can be defined as crucial factors that facilitate the successful implementation of the ERP (Zain, 1993). Zain (1993) discovered the following critical success factors namely “management openness to new ideas, employee awareness that innovations are important to the organizational survival and competitiveness, organizational structure that is less hierarchical, proper rewards system that can encourage ideas and innovation, the need to constantly scan the external environment, the need to have ample time before deadline, the need to ensure project compatibility with corporate strategies and companies managerial techniques, the use of effective management techniques, the use of gradual approach to innovation and finally the relationship of trust among all parties concerned in the project”. Another important factor identified by Everdingen et al (2000) and Soh et al (2000) is the organizational fit between ERP and its business processes. Soh et al (2000) suggest that the organizational fit of ERP in Asia is worse than in the USA or Europe as the reference process might be influenced by the western business practices which are different from Asian business culture. Davenport (2000) emphasizes the fit between ERP and company strategies. Hamilton (2003) stresses the importance of top management support, clear project mission, strategies, objectives, goals and
directions in ERP project. Further, ERP necessitates disruptive organizational changes and hence requires smooth change management (Hammer & Stanton, 1999; Volkoff, 1999). Successful ERP implementation requires change of the organizational socio-technical system which is intertwined with technology, task, people, structure and culture (Volkoff, 1999). Laughlin (1999) and Markus (1999) stressed that managing organizational resistance is crucial to successful ERP implementation. Table 2.3 shows that many researchers cite common CSFs. Hence, there is a well-established and strong consensus among the various researchers regarding the CSFs in the implementation of ERP.

**TABLE 2.3 : A SUMMARY OF THE CRITICAL SUCCESS FACTORS IN THE IMPLEMENTATION OF ERP**

<table>
<thead>
<tr>
<th>FACTORS</th>
<th>AUTHORS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top management support</td>
<td>Khong &amp; Richardson (2003), Hamilton (2003),</td>
</tr>
<tr>
<td></td>
<td>Hammer (1997), Zain (1995), Khan &amp; Martin</td>
</tr>
<tr>
<td></td>
<td>(1989), Slevin &amp; Pinto (1987), Kerzner (1987),</td>
</tr>
<tr>
<td></td>
<td>Bessant (1982)</td>
</tr>
<tr>
<td>Project missions and strategies</td>
<td>Hamilton (2003), Zain (1995), Nicholas (1989),</td>
</tr>
<tr>
<td></td>
<td>Slevin &amp; Pinto (1987), Bessant (1982)</td>
</tr>
<tr>
<td>Project schedule and planning</td>
<td>Zain (1995), Nicholas (1989), Kanter (1983),</td>
</tr>
<tr>
<td></td>
<td>Kerzner (1987), Slevin &amp; Pinto (1987) Dimitris</td>
</tr>
<tr>
<td></td>
<td>(2001)</td>
</tr>
<tr>
<td>Appropriate operational technology</td>
<td>Khan &amp; Martin (1989), Slevin &amp; Pinto (1987),</td>
</tr>
<tr>
<td></td>
<td>Bessant (1982), Power &amp; Dickson (1973)</td>
</tr>
<tr>
<td>Appropriate personnel, skills and expertise</td>
<td>Khan &amp; Martin (1989), Kanter (1983) Kerzner</td>
</tr>
<tr>
<td></td>
<td>(1987), Slevin &amp; Pinto (1987), Bessant (1982),</td>
</tr>
<tr>
<td></td>
<td>Power &amp; Dickson (1973)</td>
</tr>
<tr>
<td>Strong control system, monitoring and feedback</td>
<td>Zain (1995), Nicholas (1989), Kanter (1983),</td>
</tr>
<tr>
<td></td>
<td>Kerzner (1987), Slevin &amp; Pinto (1987), Bessant</td>
</tr>
<tr>
<td></td>
<td>(1982), Power &amp; Dickson (1973)</td>
</tr>
</tbody>
</table>
2.10 PROBLEMS OF IMPLEMENTING ERP

Van De Ven et al (1989) argue that there are four types of problems which are frequently faced during the implementation process namely the human problems (eg managing change), the process problems (eg converting new ideas into profitable operation), the strategic problems (eg leadership transition, knowledge management) and finally the structural problems (eg managing relationships between functions). They suggest that future studies of innovation should consider these four problems seriously. Zain (1995) categorises the main problem into various types namely knowledge, technical, people, markets, business process, strategic, organizational and resource problems. Another key problem in implementing ERP is to decide whether firms should develop or buy from a third party, whether to create the software internally or to go for outsourcing (Lucas et al, 1988). The decision to outsource or not has always been a challenge for organizations as outsourcing has its own advantages and drawbacks. Most firms prefer outsourcing as it allows them to use the latest technology, expertise and
service value at competitive costs (Bingi et al, 1999). Other problems in implementing ERP include lack of technological capability, complacency, lack of data and information flow, mistrust and power games within the organization (Bingi et al, 1999). It is in the interest of all organizations that these pitfalls are avoided and eliminated before implementing a full-fledged ERP system.

2.11 MOTIVATION OF IMPLEMENTING ERP

Kunda (1990) informally defines motivation as “any wish, desire, or preference that concerns the outcome of a given reasoning task”. He describes financial, operational, technological and strategic as the most important motivation in implementing IT projects. Others claim that functional, organizational, market and customer concerns can also motivate companies to implement IT projects (Hunton et al, 2003, Zain, 1993). Many scholars conclude that motivation is important in implementing business projects (Idris et al, 1996; Najmi & Kehoe, 2001; Gotzamani and Tsiotras, 2002). Van Der Wiele et al (2000) have revealed that motivations are positively correlated with project success, customer relationships, organizational control, financial aspects and market share. Terziovski et al (2003) observe that the level of motivations have a highly significant effect on business performance and waste reduction. Hunton et al (2003) state that non-financial incentives and motivation can influence positively the success of ERP project and corporate performance. Arauz and Suzuki (2004), in a study on 292 ISO 9000 certified companies in Japan, show that motivation was the critical factor in influencing cost and quality performance. Various surveys have revealed that firms that have high motivations achieve higher profits than those that have low motivation (Lee & Lee, 2000; Van Der Wiele et al, 2000; Singels et al, 2001; Yahya & Goh, 2002; Terziovski et al, 2003).
2.12 CREATIVE WORK CLIMATE

Davenport (2000) stresses the importance of having positive work climate to support successful implementation of ERP. Kanter (1983) says work climate is “a relatively enduring quality of an organisation’s internal environment that results from the behaviour and policies of members of the organisation, especially its top management”. Further, he states that work climate is “more of an attitude or culture which must be fostered by top management and must eventually permeate downward throughout the whole organisation”. Fischer and Farr (1985) and Kanter (1983) identify organisational climate as an important antecedent of technological innovation. Evidence that climate influences innovation and creativity can be found in many studies conducted by James and Jones (1974), Rosenbloom and Abernathy (1982), Ekvall et al (1983) and Howell and Higgin (1990).

Ekvall et al (1983) make a major attempt at measuring the creative organisational climate. They define organisational climate as “a conglomerate of the attitudes, feelings and behaviour which characterise life in an organisation”. This definition was based on the assumption that each employee in the organisation has his own perception of the climate. Ekvall et al (1983) constructed and validated an instrument to measure work climate known as the Creative Climate Questionnaire (CCQ). The instrument was administered to employees from various parts of an organisation. The overall results can be divided into eight indices that measure various aspects of organisational climate. They discover that the perceived organisational climate of successful departments differed significantly from those in the less successful departments. The CCQ scores can be used to suggest the extent to which an organisation or a department within an organisation is innovative or stagnated (Talbot et al, 1992). The scores range between 0 to 3, with higher score reflecting higher creative climate. Ekvall et al (1983) later increase the eight Ekvall’s Creative Climate indices into ten indices comprising challenge and motivation, idea support, freedom, liveliness and dynamism, playfulness
and humour, trust and openness, debates, risk taking, conflict and finally idea time. Zain (1995) confirms the relationship between the indices and innovativeness based on the result of his field study on the implementation of technological innovation by eight manufacturing firms in Malaysia.

2.13 ERP AND FIRM PERFORMANCE

2.13.1 Lack Of Empirical Research On ERP And Firm Performance

Given the level of ERP investment, there is relatively little empirical research that links ERP investments to firm performance (Matolcsy et al, 2002). While some researchers have examined the effect of investments in ERP systems on financial performance, research on the effect of ERP systems on business process and operational performance is very limited or nonexistent. Further, existing research on the effect of ERP on firm performance is not as comprehensive and thorough as it could be in terms of the metrics used, the methodology used to estimate the performance effects, and the time periods covered (Matolcsy et al, 2002). Matolcsy et al (2002) urge researchers to provide more rigorous and complete evidence on the effects of ERP system on both operational and financial performance in their studies.

Most studies have focused primarily on the level of IT spending and its impact on different financial performance metrics instead of operational performance (Dehning & Richardson, 2002). Very few studies have attempted to examine the effects of specific type of IT investments on specific operational performance (Bhatt, 2000). Therefore, even though the literature shows that an aggregate level of IT spending positively affects performance, the knowledge about how specific IT investments affect performance through business process is limited (Dehning & Richardson, 2002). Such knowledge can be useful in operational management, capital budgeting and allocating decision so that
firms can maximise returns from their investment. Since investments in ERP systems require major commitments of capital and managerial resources, it makes sense to carefully estimate the returns from these investments (Dehning & Richardson, 2002).

### 2.13.2 Research On ERP And Financial Performance

In documenting the effect of ERP, researchers have used objective performance data on stock returns and accounting metrics as well as performance data collected through surveys and experiments (Hunton et al, 2003). With respect to stock returns, researchers have used event study methods to analyze the short-term stock market reaction to announcements of ERP implementation (Hitt et al, 2003). Hitt et al (2003) analyze a sample of ERP implementations in the USA using accounting and stock market based performance measures. They found evidence of improved financial performance during implementation, but were unable to estimate the long-run impact of ERP systems due to a lack of post-implementation data at the time they conducted their study. Hayes et al (2001) and Ranganathan et al (2004) estimate the stock market reaction to ERP implementation announcements based on 136 sample firms in the USA. The studies find statistically significant abnormal stock market returns ranging anywhere from 0.5% to 0.84%, indicating that the market reacts positively to ERP investment announcements.

Using the efficient market theory (ie a financial theory that states price fully reflects all information and future values), one could argue that the stock market reaction documented by these studies is an unbiased estimate of the value of such investments (Hunton et al, 2003). However, abnormal returns over short windows may not provide a complete assessment of the value of investment as some researchers have shown that the stock market only partially anticipates many corporate announcements (Hayes et al, 2001). “Abnormal performance must therefore be estimated to get a better idea of the value of ERP investments over a longer time period. This is even more significant for
ERP, given the complex nature of these investments, their relative uniqueness and newness, as well as the uncertainty associated with how the adoption and benefits of these systems will evolve over time” (Hendricks & Stratman, 2007).

2.13.3 Research On ERP And Operational Performance

Few academic studies have examined the effect of ERP investments on operational performance. McAfee’s (2002) is an example of an in-depth case study of an ERP implementation and its effect on operational performance in a single firm. A case study by Mabert et al. (2001) found some improvements in managers’ perceptions of operational performance (mainly on scrap, financial close cycles, lead time and order management) but found that few firms had reduced direct operational costs. Stratman and Roth (2002) in his case study found that ERP in manufacturing firms saw positive changes in operational metrics. Hunton et al. (2003) experimentally tested the relationship between ERP and several operational indicators. The results of the case study and experiment indicate that the use of ERP gave positive impacts on labour productivity, inventory turnover, operational cost, product development time, wastages and lead time, thereby providing support for the hypothesis that implementation of ERP systems have a positive effect on operational performance (Hunton et al., 2003).

Dehning and Richardson (2002) investigate the business process benefits of enterprise systems by analyzing a set of 123 manufacturing firms who have chosen to implement or have implemented an ERP application. They find that that these systems generally are associated with improved operational performance. In their research, Dehning and Richardson (2002) controlled for industry and economy-wide effects by using the median industry performance as benchmark.
Several studies on the impacts of ERP on operational performance have found some evidence supporting the claim of all major ERP vendors that their products enable companies to achieve higher productivity, better delivery, faster return on investment and faster inventory turnover (SAP, 2003; Oracle, 2003; Peoplesoft, 2003). Poston and Grabski (2001), for example, analyse four financial and operational characteristics before and after ERP adoption using univariate tests. Their results indicate that ERP adoption leads to business processes efficiency increase in terms of a reduction in employee numbers and in the ratio of employees to revenues for each year following the ERP implementation. Most ERP studies that deals with performance used objective secondary data (Zain, 1995). The results from such research could be further supported by triangulation with findings based on perceptive and subjective performance data (Zain, 1995).

2.14 THEORETICAL MODELS OF ERP AND FIRM PERFORMANCE

Understanding the impacts of information technology on business performance has been a popular research question intriguing researchers since the 1980’s (DeLone & McLean, 2001). In order to better understand the correlation between information technology and business performance, researchers have developed several models. Several famous models which have been cited widely are the resource based view model (RBV), technology acceptance model (TAM), strategic alignment model (SAM), and the information success systems model (ISS) (DeLone & McLean, 2001). The study does not use these models due to several limitations. The resource based view (RBV) model provides researchers with a theoretical framework to determine firm resources to achieve sustainable competitive advantage and superior business performance (Byrd et al, 2008).

In sum, the RBV model is an economic model used to determine the strategic resources available to a firm to reach its business goals. The limitation of the RBV model is that it does not account for other variables which may be impacting a firm performance such as organizational structure, management leadership, and organizational environment (Byrd
et al, 2008). On the other hand, the technology acceptance model (TAM) was developed in order to determine the acceptance of information systems by individuals and companies. The TAM model proposes that the acceptance of information technology depends on two independent factors namely perceived usefulness and perceived ease of use (Hernandez et al, 2008). While the TAM model may gauge the openness of organization to adapt a specific information technology, the model does not explain how this openness directly lends to enhanced firm performance. The model is also narrow as it does not properly take into account other relevant variables that influence technology use such as organization type, level of technology, individuals willingness to utilize the technology, management leadership style and structure of the firm. Therefore, it is not the best model to measure the contribution of technology on overall business performance (Hernandez et al, 2008). Meanwhile, the strategic alignment model (SAM) is a popular theoretical framework which considers business strategies in assessing technology effectiveness. The model is divided into quadrants which work to define parts of the business such as the business scope, technology scope, administrative structure, leadership style and information technology sectors (Papp, 2001). The overall purpose of the SAM model is to shed light on how the adaption of information technology achieves a firm’s business strategy. The SAM model however considers complex technology drivers and various firms strategies to assess firms’ success. The limitation of the SAM model is that it is relatively complicated and does not specifically determine the direct relationship between the information technology and various business strategies on business performance (Papp, 2001). Finally, the information systems success model (ISS) is another model used widely as a framework to assess information systems’ overall success. “It is a good model to measure the effectiveness of information technology at the broad level” (DeLone & McLean, 2003). “Similar to the other models, the ISS model is limited in its ability to gauge the success of a firm adoption of information technology as it ignores contextual factors and focuses only on a direct path between information systems and overall performance” (DeLone & McLean, 2003).
This study employs Dehning and Richardson (2002) model primarily due to its simplicity and multidimensionality in explaining ERP contribution to overall firm performance. Several scholars suggest the use of the Dehning Richardson model in explaining IT performance (Wider & Booth, 2006; Matolcsy et al, 2002; Lucas, 1999). Unlike other models, the Dehning and Richardson (2002) model focuses on business process and external variables through indirect paths which make it a popular multi dimensional model to explain the impacts of IT on business performance. Further, the model put forth by Dehning and Richardson considers simpler quantifiable variables such as return on investments (ROI) and market share measures. In sum, the model is meant to calculate performance specifically through return on investments. This is in opposition to the traditional research models, which focus on differences in the amount of money spent on IT, type of IT purchased, and how IT assets are managed. Lucas (1999) posits that profits gained from IT investments are complex and often not evident immediately. Dehning and Richardson’s recognition of utilizing the return on investment as being a primary factor in gauging the success of IT-firm performance is beneficial in that the ROI, as a calculation, is simple, quantifiable and versatile (Lucas, 1999). Given that all companies keep records of their return on investment for investors and stock portfolios, the ROI figures are easily assessable. Varghese (2003) claims that the Dehning Richardson multi dimensional research model is robust enough to account for the various business strategies utilized by companies to leverage their information technology. Wieder and Booth (2006) claim that the model considers operational and contextual factors in assessing the comprehensive impacts of technological factors on firms’ overall performance (IT \(\rightarrow\) Business Process Performance \(\rightarrow\) Firm Performance). Matolcsy et al (2002) say that the model is used widely in the literature especially in the area of business information system.
2.15 SUMMARY

Various definitions of ERP were found (O’ Leary, 2000; Davenport, 2000; Chen, 2001). Various CSF were discovered with various authors citing several common critical success factors (Hong & Kim, 2002; Nelson, 2001; Newell et al, 2003). Very little research has been conducted in Malaysia that engaged in comparative studies of Malaysia - USA implementation of technological project (Zain, 1995). Al-Mashari (2000) says that there is a lack of research that focused on the identification of CSFs from the perspectives of key stakeholders. Most studies adopt CSF from managerial perspectives which lead to the narrow one sided management centric view on ERP and firm performance (Finney & Corbett, 2007; Al-Mashari, 2000). There are many conflicting studies on the success, failure and overall benefits of ERP which produce mixed results (Barker & Frolick, 2003; Scott & Vessey, 2002; Al-Mashari & Al-Mudimigh, 2003). Most studies were conducted in the developed world with a heavy bias on the use of aggregated, objective, publicly available financial accounting data to measure performance (Poston & Grabski, 2001). There is much variance with respect to what exactly are the operational impacts of ERP with most studies focused only on the overall impacts of ERP based on traditional financial indicators (Poston & Grabski, 2001; Matolcsy et al, 2002; Bhatt, 2000). Most studies do not clearly distinguish between overall firm performance and business process performance. In fact, many studies use a simple model with direct ERP and overall performance relationship without any moderating variables (Bhatt, 2000).

There have been no prior studies in Malaysia as compared to the USA that report on the influence of ERP on operational performance and various critical success factors that affect the results. In fact, no studies have ever focused on Malaysian and American country specific factors in the implementation of ERP. A comparative study between Malaysian and American firms on implementation of ERP would therefore fill a number of gaps in the current literature available on ERP in Malaysia. This study will also shed
more light on the practice of ERP in Malaysian firms. Further, this study utilises perceptive data instead of the publicly available accounting data to measure performance. The study is unique as it uses directors’ views instead of the traditional managerial views to measure firm performance. This study also focuses on various moderating variables such as company size, length of ERP, work climate and business processes that may influence the total results. Finally, the study clearly distinguished between overall firm performance and business process performance in measuring the impacts of ERP.
CHAPTER 3

RESEARCH METHODOLOGY

3.1 THEORETICAL MODEL OF ERP AND FIRM PERFORMANCE

3.1.1 Dehning And Richardson (2002) Model

Wieder and Booth (2006) say that most IT related research focuses on only one path (IT $\rightarrow$ Firm Performance), bypassing many other important factors. They argue convincingly that this mainstream one-dimensional approach fails to explain IT performance and leaves a gap on the misleading evidence of IT success and firms performance. Given that, this study uses the generic IT framework as suggested by Dehning and Richardson (2002) which considers operational and contextual factors in assessing the comprehensive impacts of technological factors on firms overall performance (IT $\rightarrow$ Business Process Performance $\rightarrow$ Firm Performance). The Dehning and Richardson (2002) model was used extensively in the literature (Matolcsy et al, 2002) and basically uses simple five paths as shown in Figure 3.1.
Recent evidence suggests that IT investments, such as ERP, are most likely to provide tangible business value when well targeted, well timed, well managed and accompanied with complementary improvement with business processes (Barua & Mukhopadhyay, 1995). Assessments of the business value of IT investments should therefore reflect a direct path from the nature of the IT investment being undertaken to specific metrics reflective of the business objectives being sought. Most of the research examining the business value of IT, however, has focused on broad, overarching firm performance metrics, such as market share (Bharadwaj, 2000), equity market capitalization (Brynjolfsson, 2000) or stock price changes around the announcement of IT investments (Dos Santos et al, 1993; Dehning & Richardson, 2002). While these studies do provide insights into the overall business value of IT investment, associated analyses are accompanied by considerable measurement ‘noise’ attributed to (1) the indirect path between the IT investment and these overarching performance metrics and (2) a recognition that these overarching performance metrics are affected by numerous
factors other than the focal IT investment (Dehning & Richardson, 2002). The intent of the model is to explicitly hypothesise the direct impacts of IT investments on overall financial performance through business process metrics. Mukhopadhyay et al (1995), for example, offer a rare glimpse at the specific changes in detailed financial performance measures by considering the effects of Electronic Data Interchange (EDI) project on total inventory, obsolete inventory, and premium freight charges. Barua and Mukhopadhyay (1995) identify relations between various IT and non-IT inputs and business processes, and relations between these business processes and overall firm performance. They discover (a) a positive impact of IT spending on business processes and (b) a positive impact of business processes on overall firm performance. Dehning and Richardson (2002) develops a conceptual model that considers the impact of IT-based system on discrete components of the value chain and then predicts changes in specific firm performance measures associated with these components. The study examines the impact of IT-based system on firm performance measures associated with business processes such as raw materials, work-in-process, finished goods inventory, gross margin, and selling, general, and administrative expenses (Dehning, R & Zmud, 2007). The results shows that the direct process effects of IT-based system implementations, in turn, have an important influence on profit margins and overall return on assets. The study also confirms that certain contextual effects such as firms in the high-tech industry and the scope of the IT-based system implementation have dramatic effects on the overall firm performance (Dehning, R & Zmud, 2007).

This study uses the Dehning and Richardson (2002) model primarily due to its simplicity and multidimensionality in explaining ERP contribution to overall firm performance. The model considers operational and contextual factors in assessing the comprehensive impacts of technological factors on company aggregate performance (Matolcsy et al, 2002). The model is used extensively in the literature and it basically aims at showing how technology and business process improvements combine to improve firm overall performance. Several scholars confirm the high explanatory power
of the Dehning Richardson model from various studies conducted in the USA (Matolcsy et al, 2002; Li et al, 2009). The model has been tested and developed based on a simplified value chain which involved new technology and new business process improvements made throughout the firm’s supply chain activities. The model uses multi-dimensional approaches such as cost, quality, profit, productivity, technology scope and work climate to explain IT performance and firm performance. However, it is important to note that the study questionnaire does not include items such as employee quality, employee efficacy, employee morale, staff employability and leadership as the variables are not included in the Dehning Richardson theoretical framework. In some studies, employee related variables and leadership related variables were not represented as it was already accounted in the work climate dimension (Zain, 1996). The justification for this argument is that leadership and employees themselves simultaneously affect working climate. Several studies have been conducted to establish direct relationships between employee-leadership variables and certain outcome variables such as profitability, technology performance, employee productivity and job satisfaction, but the results were inconsistent (House, 1977; Armenakis et al, 1993; Cunningham et al, 2002). Reasons for these findings may include a failure to take account of the complex effect of any interaction between employee behaviour and technology performance in the business process during which the top management practices and leadership styles were manifested. Research conducted in the USA however shows that the Dehning and Richardson original model is sufficient (Li et al, 2009; Matolcsy et al, 2002). Specifically, variables such as leadership styles, employee quality and employee efficacy are found to have minor explanatory power and hence are not significant predictor variables.
3.1.2 IT Measures

Davenport (1998) cites ERP as the most important information technology (IT) investment in the 1990s and 2000s. The definitions of ERP provided by the literature vary slightly, but they all have one common theme: a set of computer based tools which enables enterprise-wide integration of data and business processes. Early empirical analysis of the performance of ERP uses “ERP adoption” as the only independent variable, and then compares the performance of organisations pre and post-adoption (Poston & Grabski, 2001). Later research considers and investigates the time-factor in more detail, or more precisely: the time-difference between the adoption of an ERP and when performance is measured (eg Hunton et al, 2003; Matolcsy et al, 2002; Nicolaou, 2004). The results suggest the existence of a time-lag of approximately two years between the adoption of an ERP and the realisation of benefits (Matolcsy et al, 2002).

3.1.3 Business Process Performance Measures

All ERP systems on the market support business processes and methods in operations management as part of their primary function. Hunton et al (2003) say the adoption of ERP leads to better performance in terms of business processes in the value chain. The operations management and supply chain management literatures provide many examples of business process performance measurement (Kaplan & Norton, 1996). The supply-chain operations reference model (SCOR-model) published by the Supply Chain Council is considered to be the most established model for measuring business process performance (Dehning & Richardson, 2002). The model comprises a complex set of operational measures with emphasis on the level of cost, products quality, delivery speed and company flexibility in changing operation. This study used a simple perception-based cost, quality, delivery and flexibility performance as the major aspects of operational measures as recommended by many scholars (Wheelwright & Bowen, 1996; Schmenner, 1986; Hayes & Wheelwright, 1984; Hill, 2000).
There is a great consensus among scholars on the impacts of IT projects on business processes and operational performance namely cost, quality, delivery and flexibility. Table 3.1 shows studies which relate IT projects to business processes:

### TABLE 3.1: CITED EVIDENCE OF THE IMPACTS OF IT PROJECTS ON BUSINESS PROCESSES

<table>
<thead>
<tr>
<th>Operational Measures</th>
<th>Authors</th>
</tr>
</thead>
</table>

### 3.1.4 Firm Performance Measures

Many ERP studies use primarily financial accounting ratios and limited market data to measure firm performance (Wieder & Booth, 2006). However, there are many overlaps in terms of the precise measures used. Interestingly, there is no agreement in the literature with regard to which indicators best measure overall firm performance in the context of ERP evaluation (Wieder & Booth, 2006). There are even substantially
different views as to whether certain indicators measure firm performance or business process performance. They claim that hidden assets may not be measured adequately by the accounting based indicators. Hence, several studies used perceptual measures of top managers and experts to quantify the real benefits of ERP and firm performance. This study used the subjective perception of directors to quantify the overall performance of the firms.

3.1.5 Theoretical Model And Links With Research Hypotheses

The study theoretical framework is based on the Dehning Richardson model which is presented in Figure 3.1 in section 3.1.1. The framework proposes that ERP (IT Measures) indirectly affects the firm’s overall performance (Firm Performance Measures) through operational factors (Business Process Measures) which are then moderated and enabled by several contextual factors. In doing this, the framework considers the direct impact of operational factors on overall performance as well as the moderating impact of contextual-related enablers between operational and overall performance. Based on the extant literature, a number of hypotheses were developed with respect to the proposed relationships between ERP, operational performance, overall performance and contextual variables as covered by the Dehning Richardson model.

Dehning and Richardson (2002) argue that a similar IT project may deliver different impacts in different firms due to varying conditions faced by the firms. This includes different factors related to contextual factors surrounding the firms operation such as top management support, innovation culture, project management, rewards system and staff expertise. Numerous studies have found that the success rate of ERP differs across cultures due to different critical success factors (CSF) involved during the implementation stage (Zhang et al, 2009, Zain, 1996). Rajapakse and Seddon (2006) study concluded that Western countries are more successful in their use of ERP,
compared to Asian countries, based on the fact that this technology is of Western innovation and not as easily transferable to Asian societies. A 2009 study conducted by Zhang et al, concluded that in general ERP has a low success rate, with Asian countries, such as China, holding a success rate of only 10 percent in comparison with the success rate garnered by America. Zhang et al (2009) discovered that in Asian nations, such as China and India, the success rate tends to be lower primarily due to different cultural related CSF, which is not taken into account in implementing ERP. Therefore, studying CSF across countries is essential to maximise the success of ERP particularly in the fast growing Asian business markets. This leads to the first hypothesis:

HA-1 : There is a significant difference between Malaysia and the USA with regard to the critical success factors needed in the implementation of ERP.

Several scholars that use the Dehning and Richardson (2002) model divide contextual variables into inhibitors and enablers (Wieder & Booth, 2006). Understanding the effect of ERP on firms’ operational performance will not be complete unless due consideration is given to explore the model related inhibiting factors. Inhibitors consist of factors that prevent ERP from giving positive impacts on firms’ aggregate performance. The model inhibitors include resistance to change from employees, wrong business strategies, insufficient vendor support, integration with supplier’s and customer’s systems, system technical flaws, integration within existing system, resources shortages, skills shortages and many others. Zain (1995) categorises the main inhibitors into various types of problems namely knowledge, technical, people, markets, business process, strategic, organizational and resource problems. Zain (1995) speculates that different levels of inhibitors are faced by different ERP implementers which explains the varying success of ERP projects. Despite the popularity of ERP as a pervasive operational force in the USA, ERP is less successful in Asia (Jenson & Johnson, 2001). Skok and Legge (2001) highlighted, in their research, that the implementation processes of ERP in American and Asian businesses is not similar due to a different range of problems faced such as organizational, management, and political
issues. Jenson and Johnson (2001) noted that the USA firms generally faced behavioural problems while Asian firms reported cultural problems. Davenport (1998) and Soh et al (2009) discovered that many failures of ERP implementation outside the USA are due to the lack of alignment with business culture and needs. Zain (1995) concludes that implementation problems, issues and strategies of ERP differ between Asian and the USA manufacturing firms. Given that, the second hypothesis is formulated:

**HA-2: There is a significant difference between Malaysia and the USA with regard to the types of major problems faced in the implementation of ERP.**

Wieder and Booth (2006) interpret the model contextual variables as being inhibitors and enablers. The enablers are the opposite of inhibitors which consist of factors that facilitate ERP positive impacts on firm aggregate performance. Many scholars conclude that business motivation is the biggest enabler of technology projects (Idris et al, 1996; Najmi & Kehoe, 2001). While American firms used ERP to support their multinational presence, many transitional Asian economies implement ERP to increase their competitive standing in the global market (Ji & Min, 2005). Van Mandal and Guneskaran (2003) revealed that motivations of American firms are related to customer relationships, financial aspects and market share while Asian firms motivations are linked to power and organizational control. Thus, it can be seen that there are differences in the reasons for implementing ERP between American and Asian corporations. This guides to the next hypothesis:

**HA-3: There is a significant difference between Malaysia and the USA with regard to the motivations in the implementation of ERP.**

Dehning and Richardson (2002) argue that IT projects deliver two types of impacts namely (a) impacts on business processes and (b) impacts on overall firm performance. Hunton et al (2003) say the adoption of ERP affect company performance directly and indirectly through business processes in the value chain. Any ERP scholars
that use the Dehning Richardson conceptual model must therefore consider the impact of ERP on components of the business process measures and then predict changes on overall firm performance measures associated with these components. This study uses cost, quality, delivery and flexibility performance as the major components of business process measures as suggested by several researchers (Wheelwright & Bowen, 1996; Schmenner, 1986; Hayes & Wheelwright, 1984; Hill, 2000).

Despite having different business processes, ERP is increasingly being adopted in Asian businesses as a way to enhance business performance and to keep up with Western markets (Pan et al, 2001). Therefore, understanding the varying impacts of ERP on different business processes in Asia and the USA is essential to assess the global impact of ERP. There is evidence that Asian firms face different benefits of ERP than American firms due to additional challenges related to economic, cultural, and basic infrastructure issues (Huang & Palvia, 2001). Pan et al (2001) highlighted in their research, that the implementation processes of ERP generate various outcomes across countries. Generally, American firms do better than Asian firms due to more efficient business processes, longer experience and better technology. Jenson and Johnson (2001) noted that ERP investment in the USA firms generally break even in a shorter time frame compared to Asian firms. Davenport (1998) discovered a higher failure rate of ERP implementation outside the USA primarily due to the lack of process fitness with business culture and needs. The whole theoretical argument above supports the next hypotheses:

**HA-4:** There is a significant impact of ERP on cost performance in Malaysia and the USA.

**HA-5:** There is a significant impact of ERP on quality performance in Malaysia and the USA.
HA-6: There is a significant impact of ERP on delivery performance in Malaysia and the USA.

HA-7: There is a significant impact of ERP on flexibility performance in Malaysia and the USA.

HA-8: There is a significant impact of ERP on overall performance in Malaysia and the USA.

There is evidence that smaller firms face different benefits of ERP than larger firms due to less flexible financing ability and smaller economies of scale (Ifenedo, 2007). Larger organizations however are slower and more rigid to adopt the ERP systems due to bigger change resistance and higher pressure to respond to the fast changing business environment (Hunton et al, 2003). Laukkonen et al (2005) discovered that ERP success is positively correlated with the size of organizations. This reasoning has been reaffirmed by Ifenedo (2007) who found that there is a positive relationship between firms’ size and organizational success, with larger firms experiencing more success than smaller firms due to their greater information resource. A more comprehensive study conducted by Mabert et al (2003) found that companies of different sizes benefit differently from the implementation of ERP ie. smaller companies have better performance in manufacturing and logistics sectors while larger companies perform better in financial and technology sectors.

“There is evidence that ERP projects take some time before delivering benefits” (Hunton et al, 2003). As firms get more experience in dealing with ERP complexities, they maximise benefit from ERP. Given that, Wider et al (2006) postulate that the longer ERP has been implemented the more likely it will have impacts on overall performance. Wieder et al (2006) in their study found a significant performance difference between those companies which utilized ERP for various periods of time. They concluded that “the longer ERP system implementation helps companies to achieve higher
performance, allowing for a more competitive edge over non-ERP adopters”. The finding indicate a mild statistical significant relationship between the period of ERP implementation and firm performance. This would suggest that the time-length of ERP is among important variables in explaining overall ERP project success.

Several scholars hypothesize that creative corporate work climate results in a higher level of corporate performance (Ekvall & Tangeberg-Anderson, 1986). McDermott and O’Dell (2001) posit that positive organizational climate is characterized by informality, richness of communication, and openness to transfer of learning and knowledge absorption which lends to high performance work environment. Lee and Yu (2004) found that positive corporate climate impacts a variety of organizational processes and performance. A study conducted by Quezada and Martin (2003) discovered a high correlation between working performance and working climate. An earlier study by Ahmed (1998) argued that creative work climates facilitate effective organizations with enhanced business performance.

Several scholars agree that operational and contextual factors directly influence firms’ aggregate performance (Hunton et al, 2003; Lee an& Yu, 2004). Dehning and Richardson (2002) suggest the moderation effect of operational and contextual variables between ERP and overall performance. Theoretically, companies that have strong operational factors (lower cost, better quality products, faster delivery and higher flexibility) combined with contextual factors mentioned above (positive work climate, long experience implementing ERP and large company size) are more likely to be associated with general excellence. This leads to the final study hypothesis:

**HA-9: There are significant impacts of size, length of ERP, work climate, cost, quality, delivery and flexibility on overall performance in Malaysia and the USA.**
3.2 OPERATIONALIZATION OF CONSTRUCTS AND VARIABLES

The following measures are used in the study:

- **IT Measures (Independent Variables)**: A set of computer based tools that enables enterprise-wide integration of data and business processes (Poston & Grabski, 2001).
- **Business Process Measures (Moderating Variables)**: A set of procedures that must be accomplished to generate a commercially viable products (Hammer, M., 1997).
- **Firm’s Performance Measures (Dependent Variables)**: A single composite measure of performance metric that gives a comprehensive view of a business ability at present to achieve long-term interest in the future (Bharadwaj, A.S., 2000).
- **Contextual Measures (Moderating Variables)**: A set of external factors that modify and impose a contingent effect on the original dependent independent variables relationship (Kimberly & Evanisko, 1981).

The following variables are used in the measures:

- **ERP**: The adoption and implementation of a set of computer based tools that allows enterprise wide integration of data and business processes (Independent Variable) (Poston & Grabski, 2001).
- **COST**: The value of money that has been used up on resources to produce goods and services (Moderating Variable) (Jordan & Krumwiede, 1999).
- **QUALITY**: The degree of excellence that conforms to business requirements that meets or exceeds customers' expectations (Moderating Variable) (Van Der Wiele & Williams, 2000).
• DELIVERY : The level of efficiency and effectiveness involved in receiving orders to its completion (Moderating Variable) (Wheelwright & Bowen, 1996).

• FLEXIBILITY : The ability to adapt business operations to both internal and external business changes (Moderating Variable) (Chen & Paulraj, 2004).

• SIZE : The amount of revenue generated and number of employees hired by the firm (Moderating Variable) (Brakely, 1999).

• WORK CLIMATE : The degree of creativity permeated in the working environment which facilitates experimentation and innovation (Moderating Variable) (Ekvall et al, 1983).

• LENGTH OF ERP : The length of time (duration) ERP has been implemented in the firm (Moderating Variable) (Zain, 1993).

• OVERALL PERFORMANCE : The aggregate results of all activities conducted by an organization (Dependent Variable) (Zain, 1993).

3.3 DATA COLLECTION PROCESSES

3.3.1 Survey Research Based On Subjective Judgement From Directors Of Public Listed Firms

Fraenkel and Wallen (2000) mention that survey research has the potential of providing a great deal of information in the most efficient manner from a large sample of individuals. Primary data collection such as surveys can reveal facts and features of any company clearly and comprehensively; however, they have to be gathered between the same periods of time (Hutt & Speh, 2001). This study uses survey approaches and hence relies primarily on data collected from electronic questionnaires sent to the respondents over a period of two months (January 2006 till February 2006).
This study uses data from company directors of public listed firms. Several researchers suggest the use of publicly listed companies as respondents for research study (Lease et al, 1983; Simon, 2003). As noted by Chan and Wright (2007), conducting survey research with publicly traded companies allows researchers to better analyze corporate attitudes towards market based variables such as consumer taste, business technology and pricing policies. Lease (1983) stresses the use of publicly traded companies for easier access to sensitive data due to strict data policies among private firms and state owned companies. He also highlights the benefits of using publicly listed firms to estimate the future value of strategic announcement such as mergers, divestment and adoption of expensive business technology. Publicly traded companies are useful in understanding company performance operating under certain leadership styles and specific technology platforms (Simon, 2003).

Several scholars highlight the role of board of directors in providing useful research data (Hermalin & Weisbach, 2003). Norburn (1986) says company directors encompass the most strategic role in an organization. This in turn makes them prime participants for survey research based on the strategic knowledge they hold regarding the company’s overall strategy and future plans. Norburn (1986) posits that company directors should be in the best position to provide in-depth insider information regarding the company and industry performance as a whole. “The leadership role played by members of board of directors is another reason why they should be surveyed as opposed to company employees. The leadership style of corporate directors affects the way the organization is run and how well the company succeeds. Therefore, surveying directors can be the best way to determine the strategic force of an organization and its impacts on company performance” (Ogbonna & Harris, 2000). Taking a different focus, Hermalin and Weisbach (2003) note that utilizing company directors as research participants helps to bring an understanding of the influence of top level corporate politics and hidden power play involved in the organizational work climate. Given the strategic role and insider position they played, the company directors are deemed to be the best respondents than other stakeholders eg. employees, customers, suppliers and
This study uses subjective perception of directors to measure the complex impacts of ERP on overall performance. Many scholars recommend the use of perception based research to gain an in-depth understanding of complex human behaviour (Maxwell, 2004; Norman & Lincoln, 2005). “Strengths of perception based research include ability to get first hand data directly from the research subjects, ability to unravel participants meaning and hidden motives, ability to study complex phenomena with deeper context and detailed explanation, ability to identify intricate and delicate reasons for certain behaviour and ability to provide cross-case comparison and analysis. Further, perceptive based study has been used extensively to test hypothesis particularly in cross cultural research with a large participant sample” (Norman & Lincoln, 2005). Maxwell (2004) claimed that “research results using perceptive based study have high external validity to be generalized to other people in different settings”. “Despite being more scientific, objective fact based research may have less usefulness as it is more focused on strict forms of measurement” (Norman & Lincoln, 2005). “Perception based assessment is cost effective, simple, quick, comprehensive, and non-invasive based on participant’s history and expert opinion. The perception based study has been validated against objective parameters, measures of validity and reliability in various research context and has been shown to have a high degree of inter-rater reliability” (Sacks et al, 2000). Maxwell (2004) says perceptive study is equally as effective as objective assessment in examining research hypotheses.

Despite using subjective perceptual data, the study applies statistical analysis on feedback derived from company directors. The approach is not new as there are many studies that employ statistical analysis on perception based studies (Easterlin, 1973, Fischer & Farr, 1985). Easterlin (1973) finds no link between the perceived society’s economic development and the perceived level of happiness. He concludes that there is no statistically significant evidence between perceived income and perceived happiness. A study conducted by Stevenson and Wolfers (2008) analyzes real GDP per capita,
measured by purchasing power parity, in correlation with countries’ perceived happiness level. Statistical analysis of the data portrays that there is a relationship between the perceived subjective happiness and the recorded GDP per capita, which tends to be stronger in wealthier countries. The results of the research depicts that self-reported happiness and other perception based measures of life satisfaction tend to rise with income and economy, for both perspectives; within a country and between poorer and richer countries. The findings of the study show that there is a positive statistical relationship between a society’s economic development and the perceived level of happiness. Stevenson and Wolfers (2008) also conducted validity and reliability test which produce good results and hence add more weight to their findings.

3.3.2 Pilot Studies

Hutt and Speh (2001) stress the importance of pilot studies before conducting any survey research. A pilot study was conducted involving twelve directors, one each from twelve publicly listed companies of different sizes. Each director must have two criteria: (1) Be a member of the board of directors elected by their shareholders for their respective firms (2) Involved directly or indirectly in the ERP implementation for their respective firms. The pilot samples were equally split with six from Malaysia and six from the USA. Hutt and Speh (2001) find a pilot study of 10 to 50 cases as sufficient to discover the major flaws in the questionnaire. Pilot studies are important (i) to examine the reliability, validity, accuracy, integrity and ambiguity of the questionnaires (ii) to identify any omission of important factors (iii) to examine any needs to integrate or remove certain factors from the questionnaires. Care was taken to ensure that the respondents were company directors who were actually involved in the ERP project. The questionnaire and a cover letter describing the nature of the research were sent directly by e-mail.
The questionnaire was developed through the following procedures:

1. A first draft was developed based on the literature review and then submitted to a member of the board of directors, one each from twelve pilot companies (six in Malaysia and six in the USA) for review and recommendations. These directors assessed the readability, and face validity of the questionnaire.

2. A second draft was redesigned and modified based upon the earlier feedback, critique and recommendations made by the respondents from the pilot companies. Based on the next feedback, significant effort was done to condense, reword and integrate the questions until it reached a point all experts agreed the questionnaire was logical, understandable and comprehensive.

3. A third draft was subsequently sent and completed by the pilot companies for final approval and validation purposes. The approved final draft became the research questionnaire.

3.3.3 Reliability And Validity Test

The pilot study showed that there were no problems of comprehension. All respondents in the pilot studies agreed on the appropriateness and adequateness of the content and clarity of the items in the questionnaire. This reflects the reasonable level of face validity and content validity of the questionnaire. Feedback from the pilot studies suggests a potential bias and danger from using subjective data. 90% of the questions are based on perception and subjective data instead of facts. Miller and Roth (1994) however suggest two criteria to minimise bias in the use of subjective data (a) questions do not require recall from distant past and (b) respondents are motivated to provide accurate information.
To boost and encourage accurate response, several researchers suggest the use of small gifts in research study (Church, 1993). Porter (2004) acknowledged that certain individuals perceived filling out surveys as a waste of their time. This has led to the need of researchers to find ways to entice participation in their research. Porter (2004) has identified the offering of incentives as a good way to entice honest participation in survey research. The inclusion of small, prepaid, monetary incentives, typically in the form of a single one-currency bill increases participant’s willingness to provide valuable data (Church, 1993; Warriner et al, 1996; Tourangeau, 2004). Willimack et al (1995) note a tendency for individual to provide inaccurate data in survey research. They discovered that the provision of post feedback incentives such as single one-currency bills, mailing labels, or pencils improved data accuracy from participants. Given the recommendation, this study provided a post feedback gift, promised confidentiality of data and highlighted the usefulness of the project (Appendix B). Hence, the respondents were encouraged to respond as accurately as possible to ensure maximum benefit for their company. Given the incentives offered, the study hopes to minimise distortions in subjective data obtained from the respondents.

The study employed several tests to investigate the validity and reliability level of the research questionnaire. A test on internal consistency indicator was utilized in order to determine the general reliability of the questionnaire scale. The results determined that internal consistency indicator reliabilities were adequate at 0.882 overall (0.805 from Malaysia, 0.914 from the USA) for the pilot study and 0.784 overall (0.765 from Malaysia, 0.811 from the USA) for the actual study. A split half test was also conducted, whereby the scores for the odd number questions and the even number questions were correlated. Results from the split half test revealed a reliability score of 0.884 overall (0.835 from Malaysia, 0.924 from the USA) for the pilot study and 0.835 (0.805 from Malaysia, 0.885 from the USA) for the actual study; both scores portray a positive scale reliability picture for the overall study. A test-retest reliability measure was also conducted by passing out the questionnaire scale to the same participants in the
pilot study after a period of two weeks. The results from the test-retest reliability measure yielded a result of 0.931 overall (0.885 from Malaysia, 0.965 from the USA) for the entire questionnaire scale. Further, the author conducted an inter-item consistency reliability test on all items in the questionnaire and obtained satisfactory results with Cronbach’s Alpha 0.822 overall (0.815 from Malaysia, 0.854 from the USA) for the pilot study and 0.802 overall (0.785 from Malaysia, 0.825 from the USA) for the actual study. Nunally (1978) defines interitem consistency reliability as the stability of measures over diverse situations. There are no absolute guidelines in interpreting reliability scores but Brown and Frederick (1983) and Nunally (1978) generally recommend the minimum value of 0.70 for measuring perception, attitudes and values. Content validity was also analyzed during the pilot study for the purpose of assessing to what extent a measure represents all aspects of a given social construct. The content validity test generated scores of 0.851 overall (0.825 from Malaysia, 0.880 from the USA) for the entire questionnaire. Finally, the pilot study showed that there were no problems of comprehension. All experts in the pilot studies agreed on the clarity, appropriateness and adequateness of the items in the questionnaire. This reflects the reasonable level of face validity of the questionnaire. Given that, the overall reliability and validity level of the survey employed in this study was deemed satisfactory.
TABLE 3.2 : RESULTS ON RELIABILITY AND VALIDITY TEST OF THE RESEARCH QUESTIONNAIRE

<table>
<thead>
<tr>
<th>Test Conducted</th>
<th>Malaysia</th>
<th>USA</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal Consistency Indicator (Pilot Study)</td>
<td>0.805</td>
<td>0.914</td>
<td>0.882</td>
</tr>
<tr>
<td>Internal Consistency Indicator (Actual Study)</td>
<td>0.765</td>
<td>0.811</td>
<td>0.784</td>
</tr>
<tr>
<td>Split Half Test (Pilot Study)</td>
<td>0.835</td>
<td>0.924</td>
<td>0.884</td>
</tr>
<tr>
<td>Split Half Test (Actual Study)</td>
<td>0.805</td>
<td>0.885</td>
<td>0.835</td>
</tr>
<tr>
<td>Test-Retest (Pilot Study)</td>
<td>0.885</td>
<td>0.965</td>
<td>0.931</td>
</tr>
<tr>
<td>Inter-item Consistency Cronbach Alpha (Pilot Study)</td>
<td>0.815</td>
<td>0.854</td>
<td>0.822</td>
</tr>
<tr>
<td>Inter-item Consistency Cronbach Alpha (Actual Study)</td>
<td>0.785</td>
<td>0.825</td>
<td>0.802</td>
</tr>
<tr>
<td>Content Validity (Pilot Study)</td>
<td>0.825</td>
<td>0.880</td>
<td>0.851</td>
</tr>
<tr>
<td>Expert Face Validity (Pilot Study)</td>
<td>Satisfactory</td>
<td>Satisfactory</td>
<td>Satisfactory</td>
</tr>
</tbody>
</table>

3.3.4 Adequacy Of Samples And Statistical Power

Statistical power is an inherent part of empirical studies and is essential for the planning of studies, for the interpretation of study results and for the validity of study conclusions (Cohen, 1988; Rademacher, 1999). “Statistical power is defined as the probability that a statistical test will correctly reject the null hypothesis. A test without sufficient statistical power will not be able to provide the researcher with enough information to draw conclusions” (Borokowski et al, 2001). The fundamental assumption involved in statistical power analysis was established by Cohen (1988) who mentions “the need for the statistical power to be in ‘sync’ with three variables namely significance criterion, sample size and model predictive power. For any statistical
model, these relationships are such that each is a function of the other three”. Cohen (1998) recommends the use of past literature to decide on the right statistical power. Thus, a properly designed study can plan and determine the ideal power for its statistical test, by looking at other variables surveyed in the literature (Baroudi & Orlikowski, 1989). Given that, the author surveyed 30 statistically-based ERP studies from various issues of *Communications of the ACM, Decision Sciences, Management Science* and *MIS Quarterly*. The final sample included 49 statistical tests conducted primarily in the USA and Europe. The average significance criterion, predictive power and statistical power reported is 5%, 30% and 90% respectively. Based on the analysis of the pilot study (with regression model predictive and explanatory power R² of 0.305) and the information in Table 3.2, the required number of respondents to achieve $\alpha = 0.05$, $R^2 = 0.30$ and statistical power $= 0.90$ is 30. Austin et al (1998) point out that a power greater than 0.80 is reliable in behavioural research. Since the study employed 42 and 48 respondents from Malaysia and the USA, the samples are considered adequate, meet the statistical power assumption and are deemed to have high statistical power.

### TABLE 3.3 : SAMPLE SIZE TO ACHIEVE SELECTED LEVELS OF POWER FOR $\alpha = 0.05$.

<table>
<thead>
<tr>
<th>Power</th>
<th>0.05</th>
<th>0.07</th>
<th>0.10</th>
<th>0.15</th>
<th>0.20</th>
<th>0.25</th>
<th>0.30</th>
<th>0.35</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.70</td>
<td>121</td>
<td>86</td>
<td>59</td>
<td>39</td>
<td>29</td>
<td>23</td>
<td>18</td>
<td>15</td>
</tr>
<tr>
<td>0.75</td>
<td>136</td>
<td>96</td>
<td>67</td>
<td>43</td>
<td>32</td>
<td>25</td>
<td>20</td>
<td>17</td>
</tr>
<tr>
<td>0.80</td>
<td>153</td>
<td>109</td>
<td>75</td>
<td>49</td>
<td>36</td>
<td>28</td>
<td>23</td>
<td>19</td>
</tr>
<tr>
<td>0.85</td>
<td>175</td>
<td>124</td>
<td>85</td>
<td>56</td>
<td>41</td>
<td>32</td>
<td>26</td>
<td>21</td>
</tr>
<tr>
<td>0.90</td>
<td>204</td>
<td>144</td>
<td>100</td>
<td>65</td>
<td>47</td>
<td>37</td>
<td>30</td>
<td>25</td>
</tr>
<tr>
<td>0.95</td>
<td>255</td>
<td>180</td>
<td>124</td>
<td>80</td>
<td>58</td>
<td>46</td>
<td>37</td>
<td>30</td>
</tr>
<tr>
<td>0.99</td>
<td>355</td>
<td>251</td>
<td>172</td>
<td>111</td>
<td>81</td>
<td>63</td>
<td>50</td>
<td>42</td>
</tr>
</tbody>
</table>

Source: Jaccard & Becker (2002)
3.3.5 Actual Study

This research used a non-experimental field study with email questionnaire to investigate Malaysian and the USA firm experience in implementing ERP project. A close contact was established with prospective samples primarily through the firms’ investor relation departments for two purposes namely to confirm the existence of ERP and to identify the right director for the questionnaire. One director from each company is identified to fill up the questionnaire. As in the pilot study, the directors must have two criteria: (1) Be a member of the board of directors elected by the shareholders for their respective firms (2) Involved directly or indirectly in the ERP implementation for their respective firms. 400 directors of various companies from Malaysia and the USA (equally split, 200 Malaysia and 200 USA) with formal ERP projects were randomly selected for the survey in December 2005. A simple random sampling method was employed with every director having an equal chance of being selected. The study used a computer random number generator to select the final sample. Sufficient time was allowed for the email reply and return of the questionnaire survey. After four weeks, the first follow-up e-mail was sent to those directors who had not responded. About one week after the first follow-up e-mail, a second follow-up e-mail was again sent to those who did not respond. Finally, a total of 90 completed surveys from 400 initial samples (22.5% reply rate) were obtained and used for the research, of which 42 and 48 came from Malaysia and the USA respectively. Malaysia and the USA are terms used throughout the thesis to refer to sample firms whose headquarters are based and listed in Malaysia and the USA respectively. This is important as the study assumes the firms would have inherited most of the working culture and practices from the country where their headquarters operate from.
3.3.6 The Format Of Questionnaire

The study employed an electronic questionnaire format written in American-style English. Abbot and Guijt (1997) stresses that electronic questionnaire is the most popular technique in modern research to reach diverse participants due to its cost and time effectiveness. The author believes that translation is not necessary in this comparative study as the majority of the work force in Malaysia and the USA are able to read and write English fluently. A detailed questionnaire (see Appendix A) with a cover letter (see Appendix B) stating the objectives of this study was emailed to 400 companies randomly selected at the same time. The cover letter sent also contained the researcher’s affiliation with the educational institution and the discipline of study being undertaken for the Doctorate of Philosophy (PhD).

While the cover letter comprised of a single page (see Appendix B), the questionnaire has a total of twenty six pages (see Appendix A). The questionnaire was designed to be completed in less than 30 minutes. Further, the questionnaire has two parts and was based on the factors identified from literature sources. In the first part (Part A), there were twenty eight questions that touch on various demographic and implementation issues. The second part (Part B) of the questionnaire is used to investigate the company’s work climate. It consists of 50 questions taken from the Ekvall Creative Climate Questionnaire which has been validated in many studies (Zain, 1995).

The first part was meant to collect general information related to the company such as the location and size, the position held by the respondent and the company classification. It taps information on the ERP project such as the perceived understanding of ERP, the important roles played in the project, the strategies used to implement ERP, the various ERP modules implemented, the estimated cost and the perceived current status of ERP implementation. The first part of the questionnaire also
deals with the study’s hypotheses. It was designed to assess the perceptions of the respondents on the critical success factors and problems faced in implementing ERP, the underlying motivations behind ERP effort, the impact of ERP on various operational performance measures and finally the impact of ERP on aggregate firm performance. The first part ended with an open ended question where the respondents can comment on anything appropriate not covered in the questionnaire. This may included the pro and cons of implementing ERP systems, the influence of other issues such as the role of organizational trust, the role of consultant, the impact of the old legacy system etc. One of the main reasons for using open-ended questions and not insisting on specific details was to encourage a greater response to the survey and consequently, larger amounts of data to be analyzed. The open-ended questions were put at the top of a page. An entire page was dedicated to answers for each question. This allowed for as much detail as possible. No restrictions or limitations were put on the number of words that could be used. Respondents were informed that they could attach additional pages if the need arose.

3.3.7 Follow Ups And Response Rate

Of the 400 surveys sent out the first time (200 to the USA companies and 200 to Malaysian companies) only 42 surveys were returned completed in four weeks time while another eight surveys were returned with partially completed information. Of the eight partially completed surveys returned, three were from the USA companies and five were from Malaysia. In all cases the respondents failed to answer at least ten questions. While a low rate of return is not unusual, the inability to use eight of the returned survey made the task of analysis difficult. Any statistics obtained would be skewed and would confound the results which would be unusually biased towards companies only because they sought to reply. Such a study would not be apt for generalization and has minimum usefulness in comparative studies. The initial reply rate to the survey was therefore calculated as 10.5% (42 surveys accepted out of 400 surveys, 8 surveys rejected).
According to Anderson and Berdie (1975) follow-ups are an essential phase of any survey study. The use of follow-ups, or reminders, is certainly the most important technique employed to increase the response rate. Therefore, follow-ups and reminders, were used to increase the response rate. After four weeks, the first follow-up e-mail was sent to those who had not responded. About one week after the first follow-up e-mail, a second follow-up e-mail was sent to those who did not respond. Finally, a total of 90 completed surveys (22.5% final reply rate) were obtained and used for the research, of which 42 and 48 came from Malaysia and the USA respectively. Final examination of the questionnaires however showed that all respondents failed to answer the open ended questions in the first part of the questionnaire. The open ended questions include questions like “Others” and “Any other comments”. Since these questions are just optional inputs designed to tap miscellaneous issues, the author believe it does not affect the validity and future direction of the research.

3.4 EKVALL’S CREATIVE CLIMATE QUESTIONNAIRE (CCQ)

Several questionnaires have been used to measure creativity and innovativeness of a firm’s work climate namely the Creative Climate Questionnaire (CCQ), the Siegel Scale of Supportive Innovation (SSSI) and the Team Climate Inventory (TCI) (Mathisen & Einarsen, 2004). The CCQ is the most popularly used by management research which is designed to measure organizational conditions that stimulate or hamper creativity and innovation (Ekvall & Tangeberg-Anderson, 1986). The CCQ consists of 50 detailed questions which were designed to fit several dimensions such as mutual trust and confidence, challenge and motivation, freedom to seek information, and pluralism in views. “The scale utilized for the CCQ consist of three response categories ranging from zero to three, with zero equating to strong disbelief and three representing strong agreement. Reliability tests for the CCQ questionnaire have garnered medium results with Cronbach Alpha score between 0.82 and 0.84, representing high reliability. Overall, the CCQ is the most comprehensive work climate questionnaire, and the structure
promotes immediate understanding of the creative climate from various dimensions” (Ekvall & Tangeberg-Anderson, 1986).

The SSSI was developed with the aim of measuring organizational factors leading to product innovation (Siegel, 1978). “The SSSI measures five theoretical dimensions namely leadership, ownership, norms for diversity, continuous development, and consistency. Results from validity testing determined that the SSSI is a useful tool to decide whether an organization’s climate is conducive to product innovation. However, a major limitation of the SSSI includes the fact that a conducted factorial analysis test showed that a single factor accounted for 56.2% of the variance, while the remaining factors did not contribute to more than 12.6% variance. Thus, there is a problem concerning the factor structure of the measurement. In addition, there remains some uncertainty regarding the scope of the psychometric testing quality which is not comprehensive enough to cover other dimensions of innovation. A further weakness includes poor description of variables laid out in the questionnaire” (Siegel, 1978).

The TCI (Team Climate Inventory) assesses small work group climate for innovation (Anderson & West, 1996). The TCI’s primary aim is to serve as a measurement instrumentation for scoring innovation in work groups. “TCI consists of 38 items tapping various dimensions of team innovativeness namely vision, participative safety, task orientation, and support for innovation. The TCI has become recognized as being well suited for informal team group. Several psychometric testing shows that the questionnaire holds an acceptable factor structure and reliability. Currently, the TCI is the instrument reviewed to be an explicit measure of climate within loose team’s structure. One drawback is that the actual test itself may not be the most suitable for measuring climate on a broad organizational level, based on the fact that people who work closely together often develop a common understanding of the work environment but with possibility that other factors are encouraging certain responses amongst individuals such as personality, cognitive style, personal values, and demographic
factors. Therefore to what extent the questionnaire accurately measures the overall firm climate is uncertain” (Mathisen & Einarsen, 2004).

This study chose the CCQ due to its popularity and comprehensiveness in assessing creative work climate. The CCQ was used in the second part of the questionnaire sent to potential respondents to measure the creative work climate in the USA and Malaysia. This instrument was validated in Sweden (Nystrom, 1990; Talbot et al, 1992) and Malaysia (Zain, 1995; Zain, 1996). Further, this study also obtained satisfactory results with regard to Cronbach’s Alpha during the pilot stage (0.83 overall, 0.81 from Malaysia, 0.85 from the USA). The questionnaire which consisted of 50 structured questions (see Appendix A) investigated ten dimensions of creative climate (Ekvall et al, 1983) as shown in Table 3.3. For hypothesis testing, a composite rating was calculated for each firm, based on the average scores from ten dimensions. The score ranges from 0 to 3 with higher score reflecting higher creative climate.
### TABLE 3.4: EKVALL’S DIMENSIONS OF CREATIVE CLIMATE

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Descriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freedom</td>
<td>The independence in behaviour exerted by the people in the organisation.</td>
</tr>
<tr>
<td>Challenge</td>
<td>The emotional involvement of the members of the organisation in its operations and goals.</td>
</tr>
<tr>
<td>Trust / Openness</td>
<td>The emotional safety in relationship.</td>
</tr>
<tr>
<td>Dynamism / Liveliness</td>
<td>The eventfulness of the life in the organisation.</td>
</tr>
<tr>
<td>Idea Time</td>
<td>The amount of time people use to elaborate ideas.</td>
</tr>
<tr>
<td>Conflicts</td>
<td>The presence of personal and emotional tensions in the organisation.</td>
</tr>
<tr>
<td>Playfulness / Humour</td>
<td>The spontaneity and ease that is displayed in the organisation.</td>
</tr>
<tr>
<td>Debates</td>
<td>The occurrence of encounters and clashes between viewpoints, ideas and different experience or knowledge.</td>
</tr>
<tr>
<td>Idea Support</td>
<td>The extent to which new ideas are treated constructively.</td>
</tr>
<tr>
<td>Risk Taking</td>
<td>The promptness of response to emerging opportunities.</td>
</tr>
</tbody>
</table>

### 3.5 POPULATIONS AND SAMPLES

The study’s populations were restricted to all Malaysian and American publicly listed companies that have implemented some forms of ERP. Company registers and the corresponding directors’ name were obtained from Kuala Lumpur Stock Exchange (now known as Bursa Malaysia) and New York Stock Exchange website as at the 1st of July 2005. There is a total of 913 and 2775 companies listed in the Kuala Lumpur Stock Exchange (Kuala Lumpur Stock Exchange, 2005) and the New York Stock Exchange respectively (New York Stock Exchange, 2005). Several research assistants were employed to contact directors and prepare a list of companies that have implemented ERP. A total of 380 and 1320 companies in Malaysia and the USA claimed to have implemented ERP. A simple random sampling method was employed with every director having an equal chance of being selected. The study used a computer random
number generator to select the final sample. The initial survey were sent to 400 directors, equally split from Malaysia and the USA. The study finally ended up with 90 samples of which 42 and 48 (22.5% response rate) came from Malaysia and the USA respectively.

3.6 METHODS OF DATA ANALYSIS AND PRESENTATION

This research was a cross-sectional survey study where data were analysed quantitatively by using hypotheses and parametric statistical analysis. The Statistical Package for the Social Sciences Version 10.0 (SPSS) was used to analyze the data. The statistical test was conducted at the 0.05 level of significance, a standard level employed by many ERP related studies (Zain, 1993, Palaniswamy & Frank, 2000). First, data from the questionnaires were coded and tabulated in computer readable format by using Microsoft Excel. Next, data were exported from Microsoft Excel into SPSS for statistical analysis. Data analysis techniques used were:

i. descriptive statistics to describe the general features of data including frequencies distribution, percentage distribution, mean, mode, median, range and standard deviation on respondent’s demographics and characteristics of ERP project implementation.

ii. inferential statistics to test each hypothesis and compare results between variables. Student’s t-test for independent samples was conducted to examine whether Malaysian and American populations have differences on certain measures namely CSF (Critical Success Factors), PRM (Types Of Problems), MTN (Types Of Motivations), CLIMATE (Average Climate Values Based On CCQ Questionnaires), COST (Cost Performance), QUALITY (Quality Performance), DELIVERY (Delivery Performance), FLEXIBILITY (Flexibility Performance) and OVERALL (Overall Firm Performance). A multiple regression analysis was
then conducted to test Dehning and Richardson (2002) model used in the study. The test involved the following variables: SIZE 1 (Amount Of Revenue), SIZE 2 (No Of Employees), LENGTH (Period ERP Has Been Implemented In Years), CLIMATE (Average Climate Values Based On CCQ Questionnaires), COST (Cost Performance), QUALITY (Quality Performance), DELIVERY (Delivery Performance) and FLEX (Flexibility Performance) as the independent variables and OVERALL (Overall Firm Performance) as the only dependent variable. Since all variables are quantitative, no dummy variables were created.

3.7 STATISTICAL CONSIDERATIONS

The importance of statistical analysis cannot be overemphasized as it provides scientific evidence regarding the findings of research studies (Saweh et al., 2008). Cohen (1992) highlights the importance of having a research sample, whether big or small, as a way of testing the null hypothesis; yet, cautions about the sample size being less than 30, to be too small to accurately test the hypothesis in question. Many scholars suggest a sample of 40 as the cut off point to get value from using statistical analysis (Ahire & Devaraj, 2001, Elliott & Woodward, 2006). A study by Saweh et al (2008) to predict ERP implementation success, was conducted in Egypt using 45 ERP implementers. “The results of the statistical analysis found that several critical success factors such as leadership, work culture and good team work contribute to the success of ERP implementation in Egypt. Despite the relatively small survey sample involved in the study, the finding shows good results with high reliability and external validity” (Saweh et al, 2008). Several scholars confirm that “statistical analysis on small size research studies provide credible findings particularly on emerging areas of research” (Cohen, 1992, Elliot & Woodward, 2006). Since the study employed a sample of 90 (with 42 and 48 respondents from Malaysia and the USA respectively), the author is convinced that samples are adequate and statistical analysis adds great value to the findings.
However, there are a number of statistical considerations in the social sciences that must be met. Many are covered in general texts (for example, Frankfort-Nachmias, 1997). In particular, statistical tests are divided into parametric and non-parametric. Parametric tests are used when the data is quantitative and the distribution is at least symmetrical. Non-parametric statistics are used when the data is non-symmetrical or when the data is nominal and ordinal. This study used parametric test namely Student’s t-test and multiple regression.

Elliott and Woodward (2006) state that the key assumptions underlying t-test are as follows:

1. The study compares means from quantitative variables.
2. The study compares independent samples that are not paired and matched in any way.
3. The samples are normally distributed without any serious skewness and influential outliers.
4. Sample size is relatively large with a minimum of 40.
5. The population variances are considered equal for both samples.

To use multiple regression, Elliott and Woodward (2006) state the following assumptions as follows:

1. The samples are normally distributed without any serious skewness and influential outliers.
2. Sample size is relatively large with a minimum of 40.
3. The samples have equal variance.
4. The dependent variables are independent of each other. All variables tested are free from any multicollinearity effect.
To test normality, the study employed both boxplots and statistical approaches. The boxplots test revealed a symmetric distribution with no sizeable outliers. Kolmogorov-Smirnov and Shapiro-Wilk statistical tests were used to examine normality. Any significant statistics suggest abnormal distribution. The test showed non-significant statistics ($p>0.05$). Hence, a bell shaped normal distribution can be concluded. Note that the study employed 90 samples of which 42 and 48 were selected randomly from Malaysia and the USA respectively.

To test equality of variance, Levene F-test was conducted. Variance is considered unequal if statistic generated is significant. The test however produced insignificant statistic ($p>0.05$), hence variance is considered equal and not significantly different. Next, scatterplots were used to ensure linearity. As the plots produced no curvilinear relationship, linearity can be assumed.

To test multicollinearity, a correlation matrices was employed as shown in Table 3.4. The correlation with the greatest magnitude was 0.48. Kennedy (1988) indicates that correlations of 0.80 or higher are problematic. There is no definitive criterion for the level of correlation that constitutes a serious multicollinearity problem. Inspection of the correlation matrices as shown in Table 3.4, reveals that all correlations do not exceed 0.60 with 24 of the 36 correlations (67%) being significant at 0.05 level. The correlation matrices therefore indicate an absence of multicollinearity problems. In addition to that, VIF (Variance Inflation Factor) test were also conducted to test multicollinearity. The test produced values less than 5. The absence of high correlation in the matrices and low VIF values ($<10$) confirmed strongly that each dependent variable is independent with zero multicollinearity. To summarise, the Elliott and Woodward (2006) assumptions were tested and met successfully with satisfactory results. The statistical requirements for the use of Student’s t-test and multiple regression test were fulfilled and therefore can be used effectively in the study.
TABLE 3.5 CORRELATION MATRICES ON REGRESSION VARIABLES: SIZE, LENGTH OF ERP, WORK CLIMATE, COST, QUALITY, DELIVERY, FLEXIBILITY AND OVERALL FIRM PERFORMANCE

<table>
<thead>
<tr>
<th></th>
<th>SIZE1</th>
<th>SIZE2</th>
<th>LENGTH</th>
<th>CLIMATE</th>
<th>COST</th>
<th>QUALITY</th>
<th>DELIVERY</th>
<th>FLEX</th>
</tr>
</thead>
<tbody>
<tr>
<td>OVERALL</td>
<td>0.33</td>
<td>0.30</td>
<td>0.46</td>
<td>0.33</td>
<td>0.30</td>
<td>0.48</td>
<td>0.34</td>
<td>0.36</td>
</tr>
<tr>
<td>SIZE1</td>
<td>0.38</td>
<td>0.36</td>
<td>0.24</td>
<td>0.30</td>
<td>0.17</td>
<td>0.30</td>
<td>0.34</td>
<td></td>
</tr>
<tr>
<td>SIZE2</td>
<td>0.30</td>
<td>0.21</td>
<td>0.22</td>
<td>0.37</td>
<td>0.36</td>
<td>0.25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LENGTH</td>
<td>0.22</td>
<td>0.27</td>
<td>0.22</td>
<td>0.36</td>
<td>0.30</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CLIMATE</td>
<td>0.33</td>
<td>0.27</td>
<td>0.32</td>
<td>0.24</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COST</td>
<td>0.31</td>
<td></td>
<td>0.20</td>
<td>0.19</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>QUALITY</td>
<td>0.31</td>
<td>0.37</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DELIVERY</td>
<td></td>
<td></td>
<td>0.29</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FLEX</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Size1 = Size based on amount of revenue, Size2 = Size based on number of employees, Numbers bold and italicized are significant at p < 0.05
CHAPTER 4

RESULTS AND ANALYSIS

4.1 GENERAL FINDINGS

4.1.1 The location of the companies

The location of the companies is presented in Table 4.1. A total of 42 and 48 respondents came from Malaysia and the USA respectively.

<table>
<thead>
<tr>
<th>Samples</th>
<th>After the first email</th>
<th>After the first follow up</th>
<th>After the second follow up</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Malaysia</td>
<td>20</td>
<td>48</td>
<td>9</td>
<td>21</td>
</tr>
<tr>
<td>USA</td>
<td>22</td>
<td>46</td>
<td>20</td>
<td>42</td>
</tr>
</tbody>
</table>

Note: The total study response rate is 22.5% based on 400 questionnaires sent and 90 questionnaires returned. 8 samples were rejected because they were either blank, illegible or incomplete. Malaysia and the USA are terms used throughout the thesis to refer to sample firms whose headquarters are based and listed in Malaysia and the USA respectively. This is important for comparative study purposes as the firms would have inherited most of the working culture and practices from the country where their headquarters operate from.
### 4.1.2 Classification of companies

Based on Table 4.2, respondents were identified from various sectors of the economy as follow:

<table>
<thead>
<tr>
<th>Economic Sectors</th>
<th>Malaysia</th>
<th>USA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Airlines</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Banks</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>Computer Service and Software</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Electronic and Electrical</td>
<td>5</td>
<td>12</td>
</tr>
<tr>
<td>Energy</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Engineering and Construction</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Entertainment</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Food and Drug Store</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>General Merchandisers</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>Healthcare</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Hotel, Tourism and Hospitalitys</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Insurance, Life and Health</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Metal</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Mining</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Motor Vehicles and Parts</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>Retailers</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>Semiconductors</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>Telecommunication</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Trading</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>
Table 4.3 and 4.4 summarise the size of the revenue and number of employees working in the sampled companies. The biggest class of respondents was from the middle size sector in terms of revenue and number of employees.

**TABLE 4.3 SIZE OF THE REVENUE**

<table>
<thead>
<tr>
<th>Samples</th>
<th>Revenue is more than RM 1 billion</th>
<th>Revenue is between RM 100 million to RM 1 billion</th>
<th>Revenue is less than RM 100 million</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Malaysia</td>
<td>4</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>USA</td>
<td>6</td>
<td>13</td>
<td>25</td>
</tr>
</tbody>
</table>

Note: Percentage based on usable samples of 42 and 48 in Malaysia and the USA respectively.

**TABLE 4.4 NUMBER OF EMPLOYEES**

<table>
<thead>
<tr>
<th>Samples</th>
<th>No of employees is greater than 1000</th>
<th>No of employees is between 100 to 1000</th>
<th>No of employees is less than 100</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Malaysia</td>
<td>6</td>
<td>14</td>
<td>23</td>
</tr>
<tr>
<td>USA</td>
<td>10</td>
<td>21</td>
<td>26</td>
</tr>
</tbody>
</table>

Note: Percentage based on usable samples of 42 and 48 in Malaysia and the USA respectively.
4.1.4 Position of the respondents

Table 4.5 identified that respondents were roughly split between executive and non executive directors in Malaysia and the USA.

<table>
<thead>
<tr>
<th>Samples</th>
<th>Malaysia</th>
<th>USA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Executive Directors</td>
<td>20</td>
<td>48</td>
</tr>
<tr>
<td>Non Executive Directors</td>
<td>22</td>
<td>52</td>
</tr>
<tr>
<td>Total</td>
<td>42</td>
<td>100</td>
</tr>
</tbody>
</table>

4.1.5 Demographic Characteristics Of Respondents By Categories

Table 4.6 showed the characteristics of the respondents based on gender, academic qualification, working experience, background and number of ERP projects involved. It can be seen that most of the respondents were male, had a Master’s level degree with working experience between 10 to 20 years, were equally mixed from an IT and non IT background and had been involved between 1 to 5 ERP projects. Overall, it is clear that Malaysia and the USA had a similar distribution of respondents’ demographic characteristics.
### TABLE 4.6 DEMOGRAPHIC CHARACTERISTICS OF THE RESPONDENTS

<table>
<thead>
<tr>
<th>Samples</th>
<th>Malaysia</th>
<th></th>
<th>USA</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Male</td>
<td>30</td>
<td>71</td>
<td>29</td>
<td>60</td>
</tr>
<tr>
<td>Female</td>
<td>12</td>
<td>29</td>
<td>19</td>
<td>40</td>
</tr>
<tr>
<td>PhD</td>
<td>2</td>
<td>5</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Master</td>
<td>17</td>
<td>40</td>
<td>34</td>
<td>71</td>
</tr>
<tr>
<td>Degree</td>
<td>16</td>
<td>38</td>
<td>8</td>
<td>17</td>
</tr>
<tr>
<td>Below Degree</td>
<td>7</td>
<td>17</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Working Experience</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>more than 20 years</td>
<td>10</td>
<td>24</td>
<td>16</td>
<td>33</td>
</tr>
<tr>
<td>between 10 to 20 years</td>
<td>25</td>
<td>60</td>
<td>26</td>
<td>54</td>
</tr>
<tr>
<td>less than 10 years</td>
<td>7</td>
<td>17</td>
<td>6</td>
<td>13</td>
</tr>
<tr>
<td>IT Background</td>
<td>20</td>
<td>48</td>
<td>22</td>
<td>46</td>
</tr>
<tr>
<td>Non IT Background</td>
<td>22</td>
<td>52</td>
<td>26</td>
<td>54</td>
</tr>
<tr>
<td>No of ERP project</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>involved is more than 5</td>
<td>5</td>
<td>12</td>
<td>12</td>
<td>25</td>
</tr>
<tr>
<td>involved is between 1 to 5</td>
<td>37</td>
<td>88</td>
<td>36</td>
<td>75</td>
</tr>
<tr>
<td>Not a single ERP project</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Note: Percentage based on 42 and 48 respondents in Malaysia and the USA respectively.
4.1.6 Current Status of ERP Implementation

The current status of ERP implementation is depicted by Table 4.7. Most respondents from Malaysia reported completion of ERP between 1 to 3 years before data collection (questionnaire sent between January 2006 till February 2006) while many respondents from the USA declared end of ERP implementation between 3 to 5 years before data collection.

<table>
<thead>
<tr>
<th>Samples</th>
<th>Malaysia</th>
<th>USA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Implementation is in progress</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Implementation was completed less than a year ago</td>
<td>11</td>
<td>6</td>
</tr>
<tr>
<td>Implementation was completed between 1 to 3 years ago</td>
<td>18</td>
<td>10</td>
</tr>
<tr>
<td>Implementation was completed between 3 to 5 years ago</td>
<td>7</td>
<td>20</td>
</tr>
<tr>
<td>Implementation was completed more than 5 years ago</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>Implemented but scrapped</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>42</td>
<td>48</td>
</tr>
</tbody>
</table>

TABLE 4.7 STATUS OF ERP IMPLEMENTATION
4.1.7 Components of ERP Implemented

Table 4.8 shows the components of ERP implemented. It can be seen that all respondents implemented production and accounting modules. The next popular components in Malaysia were material planning (100%) and production planning (100%) modules while in the USA were production planning (100%) and business planning (100%) modules.

**TABLE 4.8 COMPONENTS OF ERP IMPLEMENTED**

<table>
<thead>
<tr>
<th>Samples</th>
<th>Malaysia</th>
<th>USA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Production</td>
<td>42</td>
<td>100</td>
</tr>
<tr>
<td>Accounting</td>
<td>42</td>
<td>100</td>
</tr>
<tr>
<td>Procurement</td>
<td>35</td>
<td>83</td>
</tr>
<tr>
<td>Distribution</td>
<td>34</td>
<td>81</td>
</tr>
<tr>
<td>Field Service</td>
<td>22</td>
<td>52</td>
</tr>
<tr>
<td>Material Planning</td>
<td>42</td>
<td>100</td>
</tr>
<tr>
<td>Capacity Planning</td>
<td>38</td>
<td>90</td>
</tr>
<tr>
<td>Production Planning</td>
<td>42</td>
<td>100</td>
</tr>
<tr>
<td>Sales Planning</td>
<td>36</td>
<td>86</td>
</tr>
<tr>
<td>Sales Order Processing</td>
<td>37</td>
<td>88</td>
</tr>
<tr>
<td>Customer Service</td>
<td>25</td>
<td>60</td>
</tr>
<tr>
<td>Business Planning</td>
<td>36</td>
<td>86</td>
</tr>
<tr>
<td>Others</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Note: The suggested components are based on Hamilton’s (2003) overview of basic architecture of ERP system.
4.1.8 Total Cost of Implementation As A Percentage of Annual Revenue

Based on Table 4.9, most respondents reported the cost of implementing ERP as less than 10% of the annual revenue. However, a closer look at the table revealed that a greater percentage of Malaysian respondents (48% compared to 16% from the US respondents) perceived ERP as expensive consuming more than 10% of the annual revenue.

TABLE 4.9 ERP IMPLEMENTATION COST AS A PERCENTAGE OF ANNUAL REVENUE

<table>
<thead>
<tr>
<th>Samples</th>
<th>Malaysia</th>
<th>USA</th>
</tr>
</thead>
<tbody>
<tr>
<td>%</td>
<td>n %</td>
<td>n %</td>
</tr>
<tr>
<td>Percentage of the annual revenue is more than 100%</td>
<td>2 5</td>
<td>1 2</td>
</tr>
<tr>
<td>Percentage of the annual revenue is between 50 % to 100 %</td>
<td>2 5</td>
<td>1 2</td>
</tr>
<tr>
<td>Percentage of the annual revenue is between 20 % to 50 %</td>
<td>6 14</td>
<td>2 4</td>
</tr>
<tr>
<td>Percentage of the annual revenue is between 10 % to 20 %</td>
<td>10 24</td>
<td>4 8</td>
</tr>
<tr>
<td>Percentage of the annual revenue is less than 10 %</td>
<td>22 52</td>
<td>40 84</td>
</tr>
</tbody>
</table>

Note: For those companies whose ERP is still in progress, an estimated cost of ERP implementation is used.

4.1.9 Financial Performance Achieved After ERP Implementation

The financial performance achieved after ERP implementation is described in Table 4.10. Most respondents were satisfied with the financial achievements with majority reported improvement in the revenue, improvement in net profit and reduction
in operating expense. Although positive, Malaysia recorded a less impressive perception relative to the USA with greater percentage perceived revenue unchanged or decreased, net profit unchanged or decreased and operating expense unchanged or increased.

**TABLE 4.10 FINANCIAL PERFORMANCES AFTER ERP IMPLEMENTATION**

<table>
<thead>
<tr>
<th>Samples</th>
<th>Malaysia</th>
<th>USA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Revenue increased more than 50 %</td>
<td>5</td>
<td>14</td>
</tr>
<tr>
<td>Revenue increased between 20 % to 50 %</td>
<td>4</td>
<td>11</td>
</tr>
<tr>
<td>Revenue increased between 0 % to 20 %</td>
<td>21</td>
<td>57</td>
</tr>
<tr>
<td>Revenue unchanged</td>
<td>4</td>
<td>11</td>
</tr>
<tr>
<td>Revenue decreased</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>Net profit increased more than 50 %</td>
<td>4</td>
<td>11</td>
</tr>
<tr>
<td>Net profit increased between 20 % to 50 %</td>
<td>17</td>
<td>46</td>
</tr>
<tr>
<td>Net profit increased between 0 % to 20 %</td>
<td>10</td>
<td>27</td>
</tr>
<tr>
<td>Net profit unchanged</td>
<td>4</td>
<td>11</td>
</tr>
<tr>
<td>Net profit decreased</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Operating expense decreased more than 30 %</td>
<td>10</td>
<td>27</td>
</tr>
<tr>
<td>Operating expense decreased between 0 % to 30 %</td>
<td>16</td>
<td>43</td>
</tr>
<tr>
<td>Operating expense unchanged</td>
<td>8</td>
<td>22</td>
</tr>
<tr>
<td>Operating expense increased</td>
<td>3</td>
<td>8</td>
</tr>
</tbody>
</table>

Note: Financial performance was calculated one year before and one year after ERP implementation based on respondents feedback. No effort has been made to verify the figures due to confidentiality policy of some companies. A total of 11 companies were excluded (5 Malaysia and 6 USA) as their ERP implementation were still in progress.
4.1.10 Definition of ERP

The definition of ERP can greatly influence the perception and response of respondents on ERP (Davenport, 2000). Table 4.11 shows that Malaysia had a fairly equal distribution of respondents on various definitions of ERP while the USA had a more concentrated distribution on definition 1 and 8. Both Malaysia and the USA scored highly on definition 1 and 8 with the USA leading Malaysia with a greater percentage. Hence, there was a greater agreement in the USA on the concept of ERP as compared with Malaysia. It is possible that the concept of ERP was more uniformly understood and practised by the USA than Malaysia.

<table>
<thead>
<tr>
<th>TABLE 4.11 DEFINITION OF ERP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Samples</td>
</tr>
<tr>
<td>---------</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>1. a computer-based system and enterprise wide database that is designed to process an organization’s transactions and facilitate integrated real-time planning, production and customer response that is designed for a client server environment, that integrates majority of business process, that processes majority of organizations transactions and allow access to data in real time</td>
</tr>
<tr>
<td>2. a package of computer application that support most aspects of company’s information needs</td>
</tr>
<tr>
<td>3. the broad set of activities supported by multi module application software that helps management to manage important parts of the business</td>
</tr>
<tr>
<td>4. an information system that manages through integration all aspects of a business</td>
</tr>
<tr>
<td>5. a business system that link all areas of a company with external suppliers and customers into a tightly integrated system with shared data and visibility</td>
</tr>
<tr>
<td>6. an enterprise system that provides efficient feedback, extensive information and coordination of supply chain functions which facilitates enterprise wide integration by tying together suppliers, distributors and customers without geographical restrictions</td>
</tr>
<tr>
<td>7. an integrated computer system that uses relational database management system and client server network architecture which integrates individual functional</td>
</tr>
</tbody>
</table>
systems, standardizes information flow and captures valuable management data. 8. an enterprise wide set of management tool that balances demand and supply, that contains the ability to link suppliers and customers into a complete supply chain, that employs proven business processes for decision making, that provides higher degree of cross functional integration, that provides foundation for e-commerce and enables people to run their business with high levels of customer service, high level of productivity, low level of cost and inventory. 9. Others

Note: The figures did not add up to 100% as respondents were allowed to choose more than one option that best describes ERP.

4.1.11 Importance of ERP Implementation

Although both groups believed ERP as an important corporate tool, there is evidence that the USA perceived ERP as much more important than Malaysia with a greater percentage ranking ERP as extremely important and very important (Table 4.12).

**TABLE 4.12 IMPORTANCE OF ERP IMPLEMENTATION**

<table>
<thead>
<tr>
<th>Samples</th>
<th>Malaysia</th>
<th>USA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Extremely important</td>
<td>5</td>
<td>12</td>
</tr>
<tr>
<td>Very important</td>
<td>20</td>
<td>48</td>
</tr>
<tr>
<td>Important</td>
<td>17</td>
<td>40</td>
</tr>
<tr>
<td>Marginally important</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Not important</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
4.1.12 Relationship Between Company Strategies And ERP

Both the USA and Malaysia viewed ERP and strategy as mutually affecting each other as described in Table 4.13 with greater agreement obtained among the American respondents.

**TABLE 4.13 : RELATIONSHIP BETWEEN ERP AND COMPANY STRATEGIES**

<table>
<thead>
<tr>
<th>Samples</th>
<th>Malaysia</th>
<th>USA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>ERP led to strategy</td>
<td>10</td>
<td>24</td>
</tr>
<tr>
<td>Strategy led to ERP</td>
<td>11</td>
<td>26</td>
</tr>
<tr>
<td>ERP and strategy influenced each other</td>
<td>20</td>
<td>48</td>
</tr>
<tr>
<td>The two processes largely unconnected</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>
4.1.13 Means of Evaluating Success of ERP Implementation

There was no specific measure for evaluating ERP used in Malaysia and the USA. However, most respondents agreed that financial and operational measures are the most popular methods of assessing ERP (Table 4.14).

**TABLE 4.14 MEANS OF EVALUATING ERP IMPLEMENTATION**

<table>
<thead>
<tr>
<th>Samples</th>
<th>Malaysia</th>
<th>USA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Financial Performance (Revenue, Net Profit, Operating Expense etc)</td>
<td>42</td>
<td>100</td>
</tr>
<tr>
<td>Operational Performance (Throughput, Productivity, Yield, Response Time, Lead Time, Inventory Turnover, Asset Turnover etc)</td>
<td>40</td>
<td>95</td>
</tr>
<tr>
<td>Technological, Application and Software Performance</td>
<td>15</td>
<td>36</td>
</tr>
<tr>
<td>Strategic Performance Management Planning and Control</td>
<td>35</td>
<td>83</td>
</tr>
<tr>
<td>Organizational Integration, Communication and Flexibility</td>
<td>25</td>
<td>60</td>
</tr>
<tr>
<td>Intra Organizational Integration, Communication and Flexibility (Supply Chain Efficiency etc)</td>
<td>30</td>
<td>71</td>
</tr>
<tr>
<td>Customer Satisfaction</td>
<td>36</td>
<td>86</td>
</tr>
<tr>
<td>Employee Satisfaction</td>
<td>5</td>
<td>12</td>
</tr>
<tr>
<td>Others</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Note: Evaluation means are based on the literature review. The figures did not add up to 100% as respondents were allowed to choose more than one option that best measure the success of ERP implementation.
4.1.14 Key Roles In ERP Implementation

There is some evidence that both groups used different key roles and people to influence their ERP project as illustrated by Table 4.15. For example, employees, business partners and government regulators are perceived to be more influential and have more important key roles in Malaysia as compared to the USA. On the other hand, academics and consultants are found to be more influential in the USA than Malaysia. Both companies however acknowledge the important roles of customers, top management, team leaders and its members in their ERP project.

TABLE 4.15 : IMPORTANT KEY ROLES IN IMPLEMENTATION OF ERP

<table>
<thead>
<tr>
<th>Samples</th>
<th>Malaysia</th>
<th></th>
<th>USA</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>Top Management</td>
<td>26</td>
<td>62</td>
<td>27</td>
<td>56</td>
</tr>
<tr>
<td>Customers</td>
<td>40</td>
<td>95</td>
<td>42</td>
<td>88</td>
</tr>
<tr>
<td>Team leader</td>
<td>33</td>
<td>79</td>
<td>30</td>
<td>63</td>
</tr>
<tr>
<td>Team members</td>
<td>30</td>
<td>71</td>
<td>35</td>
<td>73</td>
</tr>
<tr>
<td>Consultants</td>
<td>20</td>
<td>48</td>
<td>40</td>
<td>83</td>
</tr>
<tr>
<td>Outside Sponsors</td>
<td>4</td>
<td>10</td>
<td>8</td>
<td>17</td>
</tr>
<tr>
<td>Employees</td>
<td>28</td>
<td>67</td>
<td>16</td>
<td>33</td>
</tr>
<tr>
<td>Intrapreneurs</td>
<td>2</td>
<td>5</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>ERP Champion</td>
<td>8</td>
<td>19</td>
<td>10</td>
<td>21</td>
</tr>
<tr>
<td>ERP Initiators</td>
<td>6</td>
<td>14</td>
<td>8</td>
<td>17</td>
</tr>
<tr>
<td>ERP Academics</td>
<td>6</td>
<td>14</td>
<td>35</td>
<td>73</td>
</tr>
<tr>
<td>Business Partners</td>
<td>38</td>
<td>90</td>
<td>30</td>
<td>63</td>
</tr>
<tr>
<td>Government and Regulators</td>
<td>30</td>
<td>71</td>
<td>8</td>
<td>17</td>
</tr>
</tbody>
</table>
4.1.15 Human Training And Development Programmes

This study found that the USA perceived more introductions of training programmes to support ERP implementation than Malaysia as shown in Table 4.16.

### TABLE 4.16 HUMAN TRAINING AND DEVELOPMENT PROGRAMMES TO SUPPORT ERP IMPLEMENTATION

<table>
<thead>
<tr>
<th>Samples</th>
<th>Malaysia</th>
<th>USA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Very few programmes have been introduced</td>
<td>8</td>
<td>19</td>
</tr>
<tr>
<td>Few programmes have been introduced</td>
<td>10</td>
<td>24</td>
</tr>
<tr>
<td>Fair amount of programmes have been introduced</td>
<td>20</td>
<td>48</td>
</tr>
<tr>
<td>Many programmes have been introduced</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Too many programmes have been introduced</td>
<td>2</td>
<td>5</td>
</tr>
</tbody>
</table>

4.1.16 Management Strategies In ERP Implementation

Most respondents in Malaysia and the USA perceived ‘Cross Functional Project Teams’ and ‘Executive Steering Committee’ as their structure to manage ERP projects (see Table 4.17). Both groups preferred to use a gradual phased transition strategies rather than a simultaneous big bang ERP implementation strategies. However, no specific strategies were used by Malaysia and the USA with regard to customising / outsourcing / using off the shelf software and funding ERP project. In other words, a
mixture of strategies were utilised by both groups in implementing ERP. A closer look at Table 4.17 suggests that the USA stressed more on pre-implementation ERP education, ERP vision statement and prototyping in implementing ERP. It is also interesting to note that a higher percentage of Malaysian respondents employed consultants (both technical and managerial) as part of their ERP implementation strategies.

**TABLE 4.17 MANAGEMENT STRATEGIES IN ERP IMPLEMENTATION**

<table>
<thead>
<tr>
<th>Samples</th>
<th>Malaysia</th>
<th>USA</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>Customise and develop in house</td>
<td>14</td>
<td>33</td>
</tr>
<tr>
<td>Customise but outsource to third party</td>
<td>16</td>
<td>38</td>
</tr>
<tr>
<td>Use off the shelf software</td>
<td>12</td>
<td>29</td>
</tr>
<tr>
<td>Use high level ERP executive steering committee</td>
<td>30</td>
<td>71</td>
</tr>
<tr>
<td>Use cross-functional project team</td>
<td>32</td>
<td>76</td>
</tr>
<tr>
<td>Use special department to monitor ERP implementation</td>
<td>6</td>
<td>14</td>
</tr>
<tr>
<td>Use fund specifically allocated for ERP project</td>
<td>20</td>
<td>48</td>
</tr>
<tr>
<td>Fund not allocated but applied from time to time</td>
<td>22</td>
<td>52</td>
</tr>
<tr>
<td>Pre-implementation education conducted with participation from top management and ERP team members</td>
<td>14</td>
<td>33</td>
</tr>
<tr>
<td>ERP vision statement prepared and communicated to all employees with highest priority</td>
<td>12</td>
<td>29</td>
</tr>
<tr>
<td>Cost benefit analysis and ERP schedule prepared on a joint venture basis with participation from all related parties</td>
<td>25</td>
<td>60</td>
</tr>
<tr>
<td>Full time experts used in ERP project team</td>
<td>25</td>
<td>60</td>
</tr>
</tbody>
</table>
Technical consultants (software and system experts) with good track record employed

Managerial consultants (business process and change management experts) with good track record employed

Phased transition strategies used from legacy system to ERP system

Big bang transition strategies were used from legacy system to ERP system

Prototyping and pilot-testing used before implementing ERP

Others

Note: The figures did not add up to 100% as respondents were allowed to choose more than one option.

4.1.17 Creative Climate of Companies Implementing ERP Implementation

Based on the Ekvall et al (1983) Creative Climate Questionnaire (CCQ), an assessment of the firm’s psychological climate was conducted to assess the climate of both groups participating in the questionnaire (see Part B Research Questionnaire in Appendix A). The instrument has been validated on many occasions with reliable results (Zain, 1993). Ten item scores and their corresponding mean values are illustrated in Table 4.18. An examination of the mean scores revealed that both groups scored highly in each ten items with the USA had better creative climate as compared to Malaysia in almost all dimensions of Ekvall Creative Climate. Conducting t-test revealed that the mean value for the USA is higher than Malaysia in eight dimensions of creative climate but lower in two dimensions namely trust and playfulness (all significant at $p < 0.05$). Hence, the USA reported a more innovative climate to support ERP implementation than Malaysia. The results showed two interesting discoveries namely (i) both Malaysia and the USA have a positive creative climate (CCQ mean value $> 2$) (ii) USA generally has
more creative climate compared to their Malaysian counterpart (CCQ mean value for USA = 2.266 and Malaysia = 2.150).

**TABLE 4.18 : CREATIVE CLIMATE OF FIRMS BASED ON EKVALLS’ METHOD OF ASSESSMENT**

<table>
<thead>
<tr>
<th>Dimensions of Creative Climate</th>
<th>Malaysia</th>
<th>USA</th>
<th>p-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Challenge / Motivation</td>
<td>2.421</td>
<td>2.536</td>
<td>0.031</td>
</tr>
<tr>
<td>Freedom</td>
<td>2.157</td>
<td>2.534</td>
<td>0.048</td>
</tr>
<tr>
<td>Idea Support</td>
<td>2.096</td>
<td>2.153</td>
<td>0.033</td>
</tr>
<tr>
<td>Liveliness / Dynamism</td>
<td>2.428</td>
<td>2.497</td>
<td>0.036</td>
</tr>
<tr>
<td>Playfulness / Humour</td>
<td>2.291</td>
<td>2.012</td>
<td>0.033</td>
</tr>
<tr>
<td>Debate</td>
<td>1.960</td>
<td>2.183</td>
<td>0.006</td>
</tr>
<tr>
<td>Trust / Openness</td>
<td>2.434</td>
<td>2.305</td>
<td>0.018</td>
</tr>
<tr>
<td>Conflict (Reverse Score)</td>
<td>1.860</td>
<td>1.952</td>
<td>0.039</td>
</tr>
<tr>
<td>Risk Taking</td>
<td>1.810</td>
<td>2.306</td>
<td>0.026</td>
</tr>
<tr>
<td>Idea Time</td>
<td>2.040</td>
<td>2.182</td>
<td>0.016</td>
</tr>
<tr>
<td><strong>Mean Value</strong></td>
<td><strong>2.150</strong></td>
<td><strong>2.266</strong></td>
<td><strong>0.036</strong></td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>0.452</td>
<td>0.387</td>
<td>NA</td>
</tr>
</tbody>
</table>

Note: Total sample = 90 (48 from the USA and 42 from Malaysia), each CCQ questionnaire comprised 50 questions, 4 point scale was used where 0 = Not at all applicable, 1 = Applicable to some extent, 2 = Fairly applicable, 3 = Applicable to a high degree.
4.1.18 Overall Performance of ERP After Implementation

Table 4.19 revealed that a striking 83 % of the USA respondents perceived overall performance of ERP as excellent and good compared to 67 % in Malaysia.

<table>
<thead>
<tr>
<th>Samples</th>
<th>Malaysia</th>
<th></th>
<th>USA</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Excellent</td>
<td>10</td>
<td>24</td>
<td>11</td>
<td>23</td>
</tr>
<tr>
<td>Good</td>
<td>18</td>
<td>43</td>
<td>29</td>
<td>60</td>
</tr>
<tr>
<td>Moderate</td>
<td>9</td>
<td>21</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Poor</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Extremely Poor</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Note: The figures did not add up to 100 % as some companies were still in implementation stage.

4.2 HYPOTHESES TESTING

Two types of statistical test (F-test and t-test at p < 0.05) were carried out to examine the hypotheses. First, a Levene F-Test was conducted to test whether the USA and Malaysia’s populations have equal variability. Based on the Levene F-test (at p < 0.05), no evidence was found to suggest differences in population variances between the USA and Malaysia. Hence, it is concluded that t-test is appropriate to compare means between the two populations. The following hypotheses were tested at p < 0.05:
4.2.1 Hypothesis 1

HA-1: There is a significant difference between Malaysia and the USA with regard to the critical success factors needed in the implementation of ERP.

The study demonstrated that Malaysia and the USA perceived different degree of importance with regard to the CSFs (Table 4.20). Although both groups agreed on the importance of all mentioned factors, there were some factors reported to be much more important in the USA compared to Malaysia and vice versa (e.g., proper rewards, management openness to new ideas, human motivation and good crisis management are more important in the USA; appropriate operational technology, relationship of trust, gradual approach and ample time before deadline are more important in Malaysia). Perhaps, these differences could be attributed to cultural differences, however, further research in the future is needed to confirm this. Further, top management support, customer acceptance and qualified staff were the top three most important CSFs as perceived by both groups. Finally, t-test on Table 4.20 revealed that all responses are valid and statistically significant. Based on the above result, it shows that both the USA and Malaysia have different CSFs. The alternate Hypothesis 1 above is therefore well supported.

**TABLE 4.20: THE IMPORTANCE OF CRITICAL SUCCESS FACTORS TO ERP IMPLEMENTATION**

<table>
<thead>
<tr>
<th>Critical Success Factors</th>
<th>Malaysia</th>
<th>USA</th>
<th>p–Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Management openness to new ideas</td>
<td>3.206</td>
<td>4.174</td>
<td>0.028</td>
</tr>
<tr>
<td>Top management support and commitment to innovation</td>
<td>4.417</td>
<td>4.464</td>
<td>0.028</td>
</tr>
<tr>
<td>Well designed project schedule and plan</td>
<td>3.275</td>
<td>3.482</td>
<td>0.018</td>
</tr>
<tr>
<td>Proper rewards system to encourage ideas and innovation</td>
<td>3.107</td>
<td>4.150</td>
<td>0.030</td>
</tr>
<tr>
<td>CSF</td>
<td>Mean of Malaysia</td>
<td>Mean of USA</td>
<td>p-value</td>
</tr>
<tr>
<td>--------------------------------------------------------------------</td>
<td>------------------</td>
<td>-------------</td>
<td>---------</td>
</tr>
<tr>
<td>Qualified staff, skills and expertise</td>
<td>4.361</td>
<td>4.379</td>
<td>0.019</td>
</tr>
<tr>
<td>Having awareness that innovations are important</td>
<td>3.909</td>
<td>3.087</td>
<td>0.010</td>
</tr>
<tr>
<td>to the organisational survival and</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>competitiveness</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adequate control system, monitoring and</td>
<td>3.441</td>
<td>4.091</td>
<td>0.006</td>
</tr>
<tr>
<td>feedback</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Customer acceptance, user participation and commitment</td>
<td>4.376</td>
<td>4.544</td>
<td>0.033</td>
</tr>
<tr>
<td>Having clear project mission, vision, strategies, objectives and</td>
<td>4.120</td>
<td>4.144</td>
<td>0.016</td>
</tr>
<tr>
<td>direction</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organisational structure that is less hierarchical</td>
<td>3.876</td>
<td>3.540</td>
<td>0.039</td>
</tr>
<tr>
<td>Need to constantly scan the external environment</td>
<td>3.611</td>
<td>3.433</td>
<td>0.024</td>
</tr>
<tr>
<td>Good communication among affected parties</td>
<td>3.562</td>
<td>3.436</td>
<td>0.023</td>
</tr>
<tr>
<td>Use of effective management techniques</td>
<td>3.931</td>
<td>3.736</td>
<td>0.048</td>
</tr>
<tr>
<td>Good crisis management and ability to handle</td>
<td>3.720</td>
<td>4.183</td>
<td>0.003</td>
</tr>
<tr>
<td>surprise</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gradual approach to innovation</td>
<td>4.023</td>
<td>3.277</td>
<td>0.016</td>
</tr>
<tr>
<td>Human motivation, support and consideration</td>
<td>3.162</td>
<td>4.290</td>
<td>0.009</td>
</tr>
<tr>
<td>Appropriate operational technology</td>
<td>4.041</td>
<td>3.578</td>
<td>0.033</td>
</tr>
<tr>
<td>Progressive corporate culture and work climate</td>
<td>4.244</td>
<td>4.432</td>
<td>0.030</td>
</tr>
<tr>
<td>Good change management and organizational adaptability</td>
<td>4.012</td>
<td>3.980</td>
<td>0.017</td>
</tr>
<tr>
<td>Relationship of trust among all parties concerned</td>
<td>4.189</td>
<td>3.668</td>
<td>0.016</td>
</tr>
<tr>
<td>Ample time before deadline</td>
<td>4.125</td>
<td>3.590</td>
<td>0.038</td>
</tr>
<tr>
<td>Compatibility with corporate strategies</td>
<td>3.999</td>
<td>3.873</td>
<td>0.011</td>
</tr>
<tr>
<td>Compatibility with other managerial techniques being implemented</td>
<td>3.753</td>
<td>3.930</td>
<td>0.011</td>
</tr>
</tbody>
</table>

Note: CSFs are based on literature review and feedback from pilot studies. Total samples = 90 (42 from Malaysia, 48 from the USA), 5 point scale was used where 1 = Not important 2 = Marginally Important 3 = Important 4 = Very Important 5 = Extremely Important. Since all p values < 0.05, all responses are statistically significant.
4.2.2 Hypothesis 2

HA-2: There is a significant difference between Malaysia and the USA with regard to the types of major problems faced in the implementation of ERP.

Table 4.21 shows that there was a significant discrepancy in the major problems faced by both groups in implementing ERP. The USA perceived people and organizational as major problems while Malaysia viewed knowledge, technical and resource as critical problems. However, both strongly recognised markets, business process and strategic as their common major problems. Conducting the t-test revealed that these responses were not the product of chance as they were significant at p < 0.05. The alternate Hypothesis 2 is therefore accepted.

**TABLE 4.21 : MAJOR PROBLEMS FACED DURING ERP IMPLEMENTATION**

<table>
<thead>
<tr>
<th>Major Problems Faced</th>
<th>Malaysia</th>
<th>USA</th>
<th>p–Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge : Lack of ideas, information and experience</td>
<td>4.069</td>
<td>3.492</td>
<td>0.036</td>
</tr>
<tr>
<td>Technical : Limited skill and expertise, lack of time</td>
<td>4.181</td>
<td>3.274</td>
<td>0.029</td>
</tr>
<tr>
<td>People : Problem with attitudes, employee resistance to change</td>
<td>3.021</td>
<td>4.296</td>
<td>0.023</td>
</tr>
<tr>
<td>Markets : Difficulties in understanding markets and customers</td>
<td>4.341</td>
<td>4.129</td>
<td>0.020</td>
</tr>
<tr>
<td>Business Process : Lack of fit with business procedures</td>
<td>4.194</td>
<td>4.124</td>
<td>0.041</td>
</tr>
<tr>
<td>Strategic : Problem with leadership and management, lack of fit with corporate strategies</td>
<td>4.138</td>
<td>4.142</td>
<td>0.012</td>
</tr>
<tr>
<td>Organizational : Lack of support structure, bureaucracy and too much politics</td>
<td>3.042</td>
<td>4.013</td>
<td>0.009</td>
</tr>
<tr>
<td>Resource : Lack of funds and time</td>
<td>4.014</td>
<td>3.849</td>
<td>0.031</td>
</tr>
</tbody>
</table>

Note : Problems are based on literature review and feedback from pilot studies. Total samples = 90 (42 from Malaysia, 48 from the USA), 5 point scale was used where 1 = Strongly Disagree 2 = Disagree 3 = Neutral 4 = Agree 5 = Strongly Agree. Since all p values < 0.05, all responses are statistically significant.
4.2.3 Hypothesis 3

Zain (1996) mentioned that different underlying motivations can influence results when implementing technological innovation. Thus:

HA-3: There is a significant difference between Malaysia and the USA with regard to the motivations in the implementation of ERP.

A t-test was conducted on Tables 4.22 with results showing statistically significant responses. Table 4.22 clearly shows that Malaysia and the USA perceived different type of underlying motivations in ERP implementation. Although both groups picked financial, operational, strategic and market factors as their common underlying motivation, a closer look revealed that Malaysia were strongly motivated by technological factor while the USA were strongly stimulated by organizational and intra organizational factors. It is probable that these differences could be attributed to the different economic stages and cultural differences in both countries. Given that, the alternate Hypothesis 3 above is therefore supported.

### TABLE 4.22 UNDERLYING MOTIVATION OF IMPLEMENTING ERP

<table>
<thead>
<tr>
<th>Samples</th>
<th>Malaysia</th>
<th>USA</th>
<th>p-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial (Profit, Revenue etc)</td>
<td>4.579</td>
<td>4.602</td>
<td>0.014</td>
</tr>
<tr>
<td>Operational (Business Process etc)</td>
<td>4.557</td>
<td>4.464</td>
<td>0.039</td>
</tr>
<tr>
<td>Technological (IT Platform, Software etc)</td>
<td>4.048</td>
<td>3.772</td>
<td>0.007</td>
</tr>
<tr>
<td>Strategic (Information, Planning, Competitors etc)</td>
<td>4.062</td>
<td>4.379</td>
<td>0.045</td>
</tr>
<tr>
<td>Functional (Departmental Needs etc)</td>
<td>3.788</td>
<td>3.867</td>
<td>0.041</td>
</tr>
<tr>
<td>Organizational (Firm-Wide Communication, Collaboration etc)</td>
<td>3.798</td>
<td>4.204</td>
<td>0.026</td>
</tr>
</tbody>
</table>
Note: Motivational options are based on literature review and feedback from pilot studies. Total samples = 90 (42 from Malaysia, 48 from the USA), 5 point scale was used where 1 = Strongly Disagree 2 = Disagree 3 = Neutral 4 = Agree 5 = Strongly Agree. Since all p values < 0.05, all responses are statistically significant.

4.2.4 Hypotheses 4, 5, 6 and 7

The following hypotheses were aimed to investigate the positive impact of ERP implemented by both firms on four important critical measures of operational performance which included cost, quality, delivery and flexibility. Hence:

HA-4: There is a significant impact of ERP on cost performance in Malaysia and the USA.
HA-5: There is a significant impact of ERP on quality performance in Malaysia and the USA.
HA-6: There is a significant impact of ERP on delivery performance in Malaysia and the USA.
HA-7: There is a significant impact of ERP on flexibility performance in Malaysia and the USA.

Table 4.23 uses Student’s t-test for one sample to confirm the impact of ERP is significant (from score of 3 = Neutral/No Impact). Meanwhile, Student’s t-test for two independent samples was employed in Table 4.24 to confirm the impact of ERP is significantly different between Malaysia and the USA.
Tables 4.23 and 4.24 show that both groups perceived a positive impact of ERP on all operational measures (cost, quality, delivery and flexibility) with USA performing better than Malaysia. Further, it is not surprising to note that on average the USA scored more highly on various critical measures mostly due to its longer history in implementing ERP. While USA is only marginally better than Malaysia on delivery measures (USA : 4.479, Malaysia : 4.400), the USA perceived stronger impact of ERP on other measures. The marginal difference on delivery measures is opposite to the findings of other technological studies where Malaysia is perceived as having slow delivery speed and logistic problems compared to the USA. These results were interesting and demand additional research for more explanation. Given the results in Table 4.23 and 4.24, there is a strong evidence to support the alternate Hypotheses 4, 5, 6 and 7 as stated above.

### TABLE 4.23 IMPACT OF ERP ON CRITICAL MEASURES AGAINST NEUTRAL SCORE

<table>
<thead>
<tr>
<th>Samples</th>
<th>Malaysia</th>
<th>p-Value</th>
<th>USA</th>
<th>p-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost Performance</td>
<td>4.387</td>
<td>0.004</td>
<td>4.544</td>
<td>0.008</td>
</tr>
<tr>
<td>Quality Performance</td>
<td>4.127</td>
<td>0.028</td>
<td>4.394</td>
<td>0.030</td>
</tr>
<tr>
<td>Delivery Performance</td>
<td>4.400</td>
<td>0.026</td>
<td>4.479</td>
<td>0.032</td>
</tr>
<tr>
<td>Flexibility Performance</td>
<td>4.154</td>
<td>0.018</td>
<td>4.414</td>
<td>0.013</td>
</tr>
</tbody>
</table>

Note: Both country has scores greater than 3 with significant p-Values for each measures. The critical measures are derived from the literature review and feedback on pilot studies. Total samples = 90 (42 from Malaysia, 48 from the USA), 5 point scale was used where 1 = Strong Negative Impact 2 = Negative Impact 3 = Neutral/No Impact 4 = Positive Impact 5 = Strong Positive Impact. Since all p values < 0.05, all responses are statistically significant.
TABLE 4.24 COMPARATIVE IMPACT OF ERP ON CRITICAL MEASURES BETWEEN MALAYSIA AND USA

<table>
<thead>
<tr>
<th>Samples</th>
<th>Malaysia</th>
<th>USA</th>
<th>p-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost Performance</td>
<td>4.387</td>
<td>4.544</td>
<td>0.010</td>
</tr>
<tr>
<td>Quality Performance</td>
<td>4.127</td>
<td>4.394</td>
<td>0.035</td>
</tr>
<tr>
<td>Delivery Performance</td>
<td>4.400</td>
<td>4.479</td>
<td>0.028</td>
</tr>
<tr>
<td>Flexibility Performance</td>
<td>4.154</td>
<td>4.414</td>
<td>0.017</td>
</tr>
</tbody>
</table>

Note: USA performed better significantly on all measures. The critical measures are derived from the literature review and feedback from pilot studies. Total samples = 90 (42 from Malaysia, 48 from the USA), 5 point scale was used where 1 = Strong Negative Impact 2 = Negative Impact 3 = Neutral/No Impact 4 = Positive Impact 5 = Strong Positive Impact. Since all p values < 0.05, all responses are statistically significant.

4.2.5 Hypotheses 8 and 9

Finally, the following hypotheses were aimed to investigate the direct impacts of ERP on overall firm performance. Further, the moderating effects of size, ERP length, work climate, cost, quality, delivery and flexibility on firm’s overall performance were also investigated. Hence:

HA-8: There is a significant impact of ERP on overall performance in Malaysia and the USA.

HA-9: There are significant impacts of size, length of ERP, work climate, cost, quality, delivery and flexibility on overall performance in Malaysia and the USA.
As shown in Table 4.25, Student’s t-test for a single independent sample was employed to confirm the impact of ERP on overall firm performance is positive (significantly different from neutral score) for both Malaysia and the USA.

### TABLE 4.25 IMPACT OF ERP ON OVERALL FIRM PERFORMANCE AGAINST NEUTRAL SCORE

<table>
<thead>
<tr>
<th>Samples</th>
<th>Malaysia</th>
<th>p-Value</th>
<th>USA</th>
<th>p-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall Firm Performance</td>
<td>4.155</td>
<td>0.008</td>
<td>4.643</td>
<td>0.006</td>
</tr>
</tbody>
</table>

Note: Both country has scores greater than 3 with significant p-Values. Total samples = 90 (42 from Malaysia, 48 from the USA), 5 point scale was used where 1 = Strong Negative Impact 2 = Negative Impact 3 = Neutral Score 4 = Positive Impact 5 = Strong Positive Impact. Since all p values < 0.05, responses are statistically significant.

To confirm the impact of ERP is significantly different between Malaysia and the USA, Student’s t-test for two independent samples was conducted as shown in Table 4.26:

### TABLE 4.26 COMPARATIVE IMPACT OF ERP ON OVERALL FIRM PERFORMANCE BETWEEN MALAYSIA AND USA

<table>
<thead>
<tr>
<th>Samples</th>
<th>Malaysia</th>
<th>USA</th>
<th>p-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall Firm Performance</td>
<td>4.155</td>
<td>4.643</td>
<td>0.008</td>
</tr>
</tbody>
</table>

Note: Overall, USA performed better than Malaysia with significant p-Value. Total samples = 90 (42 from Malaysia, 48 from the USA), 5 point scale was used where 1 = Strong Negative Impact 2 = Negative Impact 3 = Neutral Score 4 = Positive Impact 5 = Strong Positive Impact. Since p value < 0.05, the response above is statistically significant.
Tables 4.25 and 4.26 show that both groups perceived a significantly positive impact of ERP on overall measures with USA performing better than Malaysia. This is expected as USA scored better on four operational measures stated in the previous hypothesis. The finding supports previous studies on the contingent nature of ERP with different countries having different impacts of ERP. The different score discovered between Malaysia and the USA is a fertile ground for future research. It can be speculated that high cost and high technological requirement of ERP implementation may challenge Malaysia due to its lower technology level, lack of professional expertise and relatively shorter history with ERP. Given that, the alternate Hypothesis 8 is strongly supported.

To test Hypothesis 9, a multiple regression test was necessary. “In general, multiple regression analysis follows a three-step process namely model specification (which involves finding relevant theory and prior research to formulate a theoretical regression model based on literature), model identification (which refers to deciding whether a set of unique parameter estimates can be estimated for the regression analysis) and finally model estimation (which involves estimating the parameters in the regression model by computing the sample regression weights for the independent variables)” (Schumacker & Lomax, 2004). “Based on the standardized beta coefficients of independent variables and the model explanatory power ($R^2$ values), the results of multiple regression should show the overall explanatory power of all predictor variables along with the relative importance of individual predictors” (Musil et al, 1998). “Values of $R^2$ indicate the amount of variance in the outcome explained by all predictors taken together. Particularly powerful when dealing with various forms of correlated errors and model testing, multiple regression analysis has been one of the popular statistical techniques to test theory in a number of IT-related academic disciplines” (Hair et al, 1998; Schumacker & Lomax, 2004). “Multiple regression analysis is generally robust to moderate measurement error and model misspecification. It usually assumes good measurement of variables, yet perfect reliability of instruments is seldom obtained in
social sciences” (Musil et al, 1998). Hence, the lack of explanatory power of predictive variables in the multiple regression analysis may suggest lack of association between variables, poor reliability of measurement or simply lack of sound theoretical justification (Schumacker & Lomax, 2004). This study employs multiple regression analysis to assess the explanatory power of the Dehning and Richardson (2002) model in predicting a firm’s overall performance.

The Dehning and Richardson (2002) model predicts the coexistence of several forces (non-ERP), rather than the presence of a single force (ERP), which influences a firm’s overall performance. Step-wise multiple regression analysis was used to compute the regression coefficients of the model using computer software SPSS 15.0. The results of multiple regression analysis as indicated in Table 4.27, Table 4.28 and Table 4.29 confirms that all predictors (SIZE1, SIZE2, LENGTH, CLIMATE, COST, QUALITY, DELIVERY, FLEX) have statistically significant positive standardized regression coefficients which means they are positively correlated with the firm’s overall performance. The t-values generated for each predictors ranged from 2.521 to 7.422 which produced statistically significant p-values between 0.000 to 0.018. In other words, the results suggest: the bigger the firm’s size, the better work climate, the longer ERP been implemented, the better cost performance, the better quality performance, the better delivery performance and the better flexibility performance, the better will be the firm’s overall performance.

Given that, the results suggest that apart from the length of ERP, other variables such as firm’s size (size1 for amount of revenue, size2 for no of employees), work climate, cost, quality, delivery and flexibility significantly influenced (p < 0.05) the firm’s overall performance. The results are true for Malaysia, USA and their combination (Table 4.27, Table 4.28 and Table 4.29). This provides further evidence that ERP impacts on firm performance are moderated by several contextual factors and operating variables. Interestingly, length of ERP and quality are the two most important variables with highest standardized regression coefficients for all cases. This would
suggest that length of ERP and quality are the most crucial variables in explaining firm performance and judging overall ERP project success. The results show that the longer ERP has been implemented and the better the product quality, the more favourable will be the overall firm performance. It is obvious why longer ERP implementation and better quality firm experience perceived better overall performance. It takes time for an ERP project to deliver benefit. It could also be that longer time gives more opportunity for the firm to handle the complexities of the ERP project and hence maximise its benefits. Similarly, firms with better quality products are more likely to offer better functionalities and better response to end user needs. This means better quality performance will lead to higher customer satisfaction and higher overall firm performance. This is especially true in the modern environment where customers are demanding, complex and have sophisticated needs. A close look at the results shows that the explanatory power ($R^2$ values) are good and relatively reasonable (Malaysia = 44.7%, USA = 52.8%, Combined = 45.3%) implying the proposed model account for fair variance of firm performance. Significant overall ANOVA F-tests however suggest that all variables are significant (at $p < 0.05$), unbiased and meaningful predictors of ERP success. The results show that the alternate Hypothesis 9 is supported and the proposed Dehning and Richardson (2002) model is therefore well accepted.
TABLE 4.27 MULTIPLE REGRESSION ANALYSIS: SIZE, LENGTH OF ERP, WORK CLIMATE, COST, QUALITY, DELIVERY, FLEXIBILITY AGAINST OVERALL FIRM PERFORMANCE (MALAYSIA ONLY)

MODEL SUMMARY

a. Predictors: (Constant), SIZE1, SIZE2, LENGTH, CLIMATE, COST, QUALITY, DELIVERY, FLEX
b. Dependent Variable: OVERALL

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.669</td>
<td>.447</td>
<td>.313</td>
<td>1.16792</td>
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ANOVA TEST

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<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>p-Value</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Regression</td>
<td>8</td>
<td>4.555</td>
<td>3.339</td>
<td>.007</td>
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<tr>
<td></td>
<td>Residual</td>
<td>33</td>
<td>1.364</td>
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<td></td>
<td>Total</td>
<td>41</td>
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REGRESSION COEFFICIENTS

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>p-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Std. Error</td>
<td>Beta</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>(Constant)</td>
<td>5.787</td>
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<tr>
<td></td>
<td>SIZE1</td>
<td>2.695</td>
<td>.845</td>
<td>.729</td>
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<tr>
<td></td>
<td>SIZE2</td>
<td>1.670</td>
<td>1.025</td>
<td>.563</td>
</tr>
<tr>
<td></td>
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<td>CLIMATE</td>
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<td>.734</td>
</tr>
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<td>COST</td>
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<td>.701</td>
</tr>
<tr>
<td></td>
<td>QUALITY</td>
<td>3.373</td>
<td>1.278</td>
<td>1.141</td>
</tr>
<tr>
<td></td>
<td>DELIVERY</td>
<td>1.095</td>
<td>.763</td>
<td>.364</td>
</tr>
<tr>
<td></td>
<td>FLEX</td>
<td>1.231</td>
<td>.727</td>
<td>.439</td>
</tr>
</tbody>
</table>

Note: Size1 = Size based on amount of revenue, Size2 = Size based on number of employees, Numbers bold are significant at p < 0.05
TABLE 4.28 MULTIPLE REGRESSION ANALYSIS : SIZE, LENGTH OF ERP, WORK CLIMATE, COST, QUALITY, DELIVERY, FLEXIBILITY AGAINST OVERALL FIRM PERFORMANCE (USA ONLY)

MODEL SUMMARY

a. Predictors: (Constant), SIZE1, SIZE2, LENGTH, CLIMATE, COST, QUALITY, DELIVERY, FLEX 
b. Dependent Variable: OVERALL

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
</tr>
</thead>
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<td>1</td>
<td>.727</td>
<td>.528</td>
<td>.431</td>
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ANOVA TEST

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<th>Mean Square</th>
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<th>p-Value</th>
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<td>33.170</td>
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<td>Residual</td>
<td>237.233</td>
<td>39</td>
<td>6.083</td>
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<td></td>
<td>Total</td>
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REGRESSION COEFFICIENTS

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>p-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Std. Error</td>
<td>Beta</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>(Constant)</td>
<td>39.643</td>
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</tr>
<tr>
<td></td>
<td>SIZE2</td>
<td>.862</td>
<td>.382</td>
<td>.195</td>
</tr>
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<td></td>
<td>LENGTH</td>
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<td>.675</td>
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<tr>
<td></td>
<td>CLIMATE</td>
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<td>.744</td>
<td>.092</td>
</tr>
<tr>
<td></td>
<td>COST</td>
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<td>.728</td>
<td>.064</td>
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<td></td>
<td>QUALITY</td>
<td>1.908</td>
<td>.664</td>
<td>.758</td>
</tr>
<tr>
<td></td>
<td>DELIVERY</td>
<td>1.741</td>
<td>.693</td>
<td>.306</td>
</tr>
<tr>
<td></td>
<td>FLEX</td>
<td>1.504</td>
<td>.653</td>
<td>.270</td>
</tr>
</tbody>
</table>

Note : Size1 = Size based on amount of revenue, Size2 = Size based on number of employees, Numbers bold are significant at p < 0.05
TABLE 4.29 MULTIPLE REGRESSION ANALYSIS: SIZE, LENGTH OF ERP, WORK CLIMATE, COST, QUALITY, DELIVERY, FLEXIBILITY AGAINST OVERALL FIRM PERFORMANCE (MALAYSIA AND USA)

MODEL SUMMARY

a. Predictors: (Constant), SIZE1, SIZE2, LENGTH, CLIMATE, COST, QUALITY, DELIVERY, FLEX
b. Dependent Variable: OVERALL

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
</tr>
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<td>.399</td>
<td>.50182</td>
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ANOVA TEST

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<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>p-Value</th>
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</thead>
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<td>8.381</td>
<td>.000</td>
</tr>
<tr>
<td>Residual</td>
<td>20.397</td>
<td>81</td>
<td>.252</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>37.282</td>
<td>89</td>
<td></td>
<td></td>
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</table>

REGRESSION COEFFICIENTS

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>p-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Std. Error</td>
<td>Beta</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>(Constant) .417</td>
<td>.821</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SIZE1 .156</td>
<td>.098</td>
<td>.141</td>
<td>.3200</td>
</tr>
<tr>
<td></td>
<td>SIZE2 .180</td>
<td>.095</td>
<td>.176</td>
<td>.3280</td>
</tr>
<tr>
<td></td>
<td>LENGTH 1.247</td>
<td>.103</td>
<td>.815</td>
<td>.490</td>
</tr>
<tr>
<td></td>
<td>CLIMATE .158</td>
<td>.082</td>
<td>.205</td>
<td>.3041</td>
</tr>
<tr>
<td></td>
<td>COST .105</td>
<td>.106</td>
<td>.098</td>
<td>.3011</td>
</tr>
<tr>
<td></td>
<td>QUALITY 1.133</td>
<td>.099</td>
<td>.913</td>
<td>.4310</td>
</tr>
<tr>
<td></td>
<td>DELIVERY .196</td>
<td>.105</td>
<td>.219</td>
<td>2.905</td>
</tr>
<tr>
<td></td>
<td>FLEX 1.514</td>
<td>.663</td>
<td>.280</td>
<td>2.621</td>
</tr>
</tbody>
</table>

Note: Size1 = Size based on amount of revenue, Size2 = Size based on number of employees, Numbers bold are significant at p < 0.05
4.3 SUMMARY OF KEY FINDINGS

Finally, this chapter concludes with the following observations:

1. The results demonstrate that both groups had many common characteristics. Respondents in the USA and Malaysia were from various sectors of the economy (Table 4.2) and had similar distributions across their demographic characteristics (Table 4.5, Table 4.6).

2. Results show that Malaysia and the USA displayed relatively similar size distributions in terms of level of revenue and number of employees (Table 4.3, Table 4.4). Hence, there is no material size difference between the two groups that can bias the results.

3. Both groups however had varying histories in implementing ERP ranging from less than a year to more than 5 years with the USA having a slightly longer history (Table 4.7). Further, the study shows that the USA has implemented and completed ERP earlier than Malaysia (Table 4.7).

4. Generally, both groups were satisfied with the overall implementation of ERP with American perceiving better performance than Malaysia (Table 4.19).

5. There was a greater agreement in the USA on the concept of ERP as compared with Malaysia. It is clear that important concept such as definition of ERP was more uniformly understood and practised by the USA than Malaysia (Table 4.11).

6. There were more training programmes perceived in the USA than Malaysia (Table 4.16). This was not surprising given the longer history and wider experience of
many American firms. This result confirms the assertion that training is essential for implementing ERP process.

7. Financial, operational, strategic and market factors were common motivations that lead to ERP implementation in both countries (Table 4.22, t-test with \( p < 0.05 \)). Both the USA and Malaysia have different motivational factors with Malaysian more motivated by technological factor while the USA was strongly stimulated by organizational and intra organizational factors.

8. The USA and Malaysia perceived different types of major problems and hence faced different difficult aspects in their ERP projects (Table 4.21, t-test with \( p < 0.05 \)). The USA faced mainly people and organizational problems in implementing ERP projects. In contrast, Malaysia confronted more knowledge, technical and resource problems while running ERP projects. However, there is considerable evidence to suggest that market, business process and strategic issues are common major problems faced by both groups.

9. The findings show that the USA had a more creative climate than Malaysia (Table 4.18, t-test with \( p < 0.05 \)). Ekvall’s Creative Climate Questionnaire (CCQ) which is used in Part B of the research questionnaire (see Appendix A), reported that the climate scores varied sharply with the USA having a higher index than Malaysia in eight categories of Ekvall’s Creative Climate measures.

10. Both groups were found to have different critical success factors for ERP implementation (Table 4.20, t-test with \( p < 0.05 \)). Factors such as proper rewards, management openness to new ideas, human motivation and good crisis management are more important in the USA while appropriate operational technology, relationship of trust, gradual approach and ample time before deadline are more important in Malaysia.
11. Both groups perceived positive impacts of ERP on four important measures of operational performance namely cost, quality, delivery and flexibility with the USA scored higher on all measures (Table 4.23, Table 4.24, t-test with p < 0.05). While Malaysia perceived a marginally weaker impact on delivery measures, the USA perceived a stronger impact of ERP on other measures.

12. The study confirmed the positive impact of ERP on overall performance in both countries with USA performing better than Malaysia (Table 4.25, Table 4.26, t-test with p < 0.05). Further, the study confirmed that ERP is not the only variable that influenced firm’s overall performance. Other variables such as firm’s size, length of ERP implementation, work climate, cost, quality, delivery and flexibility significantly influenced the firm’s overall performance (Table 4.27, Table 4.28, Table 4.29, F-test with p < 0.05). The findings demonstrated that length of ERP implementation and quality performance are the two most important variables in explaining firm’s overall performance. The study concluded that ERP impacts on firm’s overall performance are moderated by contextual factors (size, length of ERP and work climate) and operational factors (cost, quality, delivery and flexibility). The results therefore lend support to Dehning and Richardson (2002) model proposed earlier in the study.
CHAPTER 5

DISCUSSION

5.1 THEORETICAL IMPLICATIONS AND CONTRIBUTIONS

5.1.1 This research provides an understanding of ERP practices by publicly listed firms in the USA and Malaysia. This is important since little empirical research has been conducted on ERP in Malaysia. Further, this study examined major aspects of ERP practices (CSFs, problems faced, managerial strategies, underlying motivation, impacts on operational measures etc). This is vital as most of the previous research had a tendency to focus on direct impacts of ERP on firm’s profitability particularly from developed countries. Though there has been much interest in the process of technological innovation and project, it has not matched adequate empirical research (Tornatzky et al, 1983).

5.1.2 Zain (1995) conducted case studies in the Malaysian manufacturing industry. This present study extended his findings using a quantitative approach. It demonstrated that firms actually implement ERP using multiple strategies, introduce various types of training programmes, use various project structures and maintain a good psychological climate to support their ERP activities.

5.1.3 By using Ekvall’s Creative Climate Questionnaire (CCQ), the study provides a way of measuring and comparing innovative climate between ERP implementers from various countries. This questionnaire was used since no better method of measuring creative climate was available. Further, much research has validated, refined and improved this questionnaire (Zain, 1995). This study confirms the validity of CCQ in measuring work climate between
firms from Malaysia and the USA. This is important since previous ERP studies have not used CCQ for comparison between Asia and the USA.

5.1.4 The findings demonstrate the contingent nature of ERP. The study confirms that each ERP project has different characteristics in terms of strategies, problems, motivation and CSF to maintain its success. Hence, each ERP project is unique in its requirements. This is important since some research employed the universal theory of innovation i.e. all types of innovation are similar and one theory can be applied to all circumstances (Dewar & Dutton, 1986; Damanpour, 1990). This study confirms that no specific strategies can be applied to all ERP projects under all circumstances. In other words, the choice of strategy should depend on contextual factors of ERP (eg firm’s size, length of ERP implementation, work climate, firm’s culture, employee attitudes, sum of investment needed, total risk involved, profits expected, level of technology required, broader business environments, industrial complexities, leadership attitude towards new projects etc).

5.1.5 Much research has shown that behavioural and organizational problems were among the main problems which caused the failure of implementation of technological projects. This leads to many researchers advocating the use of a behavioural approach to implement innovations eg Lewin’s (1952) three phase’s method : unfreeze, change, and refreeze. This study confirmed that more firms in the USA actually face greater people and organizational problems than those in Malaysia. Some of the possible reasons that may account for the difference in problems are:

i. Both countries have different education systems with different values and educational facilities. It is possible that more concern is given in the American education system to solve technical rather than behavioural problems as
compared with Malaysia due to higher technological advancement in the USA (Zain, 1995).

ii. Both countries have different stages of social development which may influence the societal values. Harris et al (2004) say that “different countries have different culture and work values. The presence of cultural differences across different countries has led to different working habits and conventions which influence the overall corporate climate”. Harris et al (2004) note that “corporate work values affects working style, working outcome and productivity”. Rashid et al (2004) confirm that “the USA has different work values compared to Asian countries. The USA working environment is traditionally dominated by aggressive, fast paced, formal deadline-based assignments with individual work achievement emphasized over collective achievement. In contrast, Asian countries place more emphasis on team based work with informal personal relationships encouraged throughout the organization”. Despite the popular flexible and boundariless work schedule in the west, Rashid et al (2004) conclude that “there is a more formal laissez-faire individualistic environment in the USA compared to Asian countries” (Rashid et al., 2004). Given the argument above and the fact that the USA is more advanced economically and technologically, it is likely that American society may emphasize more on material interest than interpersonal/behavioural in working life. On the other hand, Malaysian society may be more conservative, have stronger mutual respect and enjoy wider collective interest which leads to lower behavioural problems in the ERP implementation.

iii. Since many firms in the USA have a longer history than in Malaysia, it is possible that the American employees are more experienced in managing ERP, more knowledgeable in mobilising resource for ERP and therefore have greater diverse views which leads to more people conflicts in ERP projects than those in Malaysia.
5.1.6 This study adopts country as the unit of analysis rather than the business firms as most scholars did before in many case studies (Yusuf & Gunasekaran, 2004; Zain, 1995; Siti Maimon, 1991; Ekvall & Tangeberg-Anderson, 1986). This is important as no comparative study has been conducted before which involved Malaysia. Therefore, the findings from this study can be regarded as useful to the ERP community, particularly for researchers in Malaysia.

5.1.7 The research provides support to the Dehning and Richardson (2002) model. There is a strong evidence to suggest that ERP influenced firm’s overall performance and gave impacts on cost, quality, delivery and flexibility performance. Further, the study suggests the coexistence of non-ERP forces which influences firm’s overall performance. The results show that ERP impacts on firm performance are moderated by several contextual factors such as size and work climate and operating factors such as cost, quality, delivery and flexibility. Future researchers are therefore cautioned to study the interaction effect of ERP and non-ERP factors in measuring the true effect of ERP on firm performance.

5.1.8 This study adopts comparative study set ups as a theoretical approach. Several researchers recommend the use of comparative study as a research strategy (Berger et al, 2009; Deshpande and Webster, 1989; Redding, 1994). Comparative research, as a research methodology, allows for the ability to compare and control similar variables (Berger et al, 2009). Comparative research is useful in technology studies that explore product similarities, benefits, and effectiveness across a wide variety of industries across different countries. For instance, Berger et al (2009) have noted that the comparative research method is highly useful in the medical field for its ability to provide information on prescription drugs across sectors and countries. On the corporate side, Deshpande and Webster (1989) have highlighted comparative research as being useful in analyzing the impacts of different management
styles and organizational structures on technology and marketing structure. Comparative research has also widely been used in examining the influence of certain variables such as management practices, government policies, leadership styles and organizational structure on corporate performance as noted by Redding (1994).

5.2 MANAGERIAL IMPLICATIONS AND CONTRIBUTIONS

5.2.1 This research provides managers with an insight into various ERP implementation activities, its implementation problems and the range of factors that contribute to its success. Hence, it is hoped that managers will use the results to improve the implementation of ERP in their firms.

5.2.2 Managers should be cautious in formulating ERP implementation strategies. There is no simple strategy that applies to all ERP projects. Strategy should be formulated according to the nature of ERP and firms themselves.

5.2.3 A favourable work climate was found in all successful ERP projects. Hence, managers should strive to create a conducive psychological climate, allow more ideas, encourage innovative work and stimulate creativity. This is important to solve problems, speed up process and ensure success in implementing ERP.

5.2.4 Managers should focus on minimising behavioural problems during the implementation of innovation. This can be achieved by regularly introducing training programmes to all employees. Further, managers should ensure that the concept of ERP is well communicated to all employees possibly through office meetings, training and seminars. By doing so, firms can produce a creative, resourceful and more committed workforce to speed up ERP projects.
5.2.5 To enhance the success of ERP projects, managers should pay attention to critical success factors. The relative importance of these factors varies among firms which may include the following: management openness to new ideas, top management support and commitment to innovation, well designed project schedule and plan, proper rewards system to encourage ideas and innovation, well qualified staff, proper employee skills and expertise, adequate control system, good customer acceptance, clear project mission, good communication among affected parties, effective management techniques, good human motivation and support, use appropriate operational technology, inculcate a progressive corporate culture and work climate, good change management and organizational adaptability, positive relationship of trust among all parties concerned, have ample time before deadline etc.

5.2.6 The study shows that ERP influenced cost, quality, delivery and flexibility (p < 0.05) which in turn influenced overall firm performance. Further, company size in terms of revenue and number of employee, length of ERP and work climate also had significant impacts on overall firm performance (p < 0.05). To ensure the success of ERP projects, managers therefore must be patient and give more attention on business processes and contextual factors particularly on the length of ERP implementation and quality performance to maximise ERP benefits.

5.3 METHODOLOGICAL IMPLICATIONS AND CONTRIBUTIONS

5.3.1 While many researchers used qualitative case studies to investigate ERP (Yusuf & Gunasekaran, 2004; Tchokogue & Bareil, 2005) this research contributed by using quantitative methods to conduct a similar study of ERP. Thus, the study supported and enhanced their findings by using a different research approach.
5.3.2 The study provides exploratory findings and is among the earliest ERP empirical studies to be conducted in Malaysia. There were various new angles adopted by the study. The study used subjective perception based data instead of the common aggregated, publicly available financial accounting data to measure performance. The study used the non-traditional directors’ views instead of the narrow one sided management centric views on ERP and firm performance. Further, the study clearly distinguished between overall firm performance and business process performance in measuring the impacts of ERP. This study used an extended model with various contextual factors such as size, length of ERP and work climate and business process performance, all treated as moderating variables between ERP and overall performance relationship.

5.4 METHODOLOGICAL LIMITATIONS

5.4.1 There were several methodological limitations to this research, most of which are concerned with the use of comparative study as a research strategy (note that these limitations do not deny the significance of the results. It only cautions any researchers against allocating excessive statistical confidence on the findings). The research was conducted in a natural environment with no treatments or control groups. The subjects in this study were liable to various factors which may confound the results (eg varying language skills, cultural differences and individual work experience may influence questionnaire response). Further, as the study deals with the perception of directors on ERP projects, their responses are always subjective. However, the author tried to ensure that the directors involved were experts and had direct experience in the company ERP projects. Given that, their responses and operational knowledge should be good, reliable, authoritative and hence close to scientific, although subjective.
5.4.2 This study compared publicly listed firms from two countries: the USA and Malaysia. The results therefore may not be widely generalizable to firms from other countries. Further, the findings may not be applicable to non-listed private firms. However, it should be noted that publicly listed companies in the USA and Malaysia firms represent many major ERP implementers with huge markets (Siemens Malaysia, 2006). Thus, even without extrapolation, the results can stand as relevant to some firms particularly multinationals from various industries.

5.4.3 The focus of this study is only on the general aspects of broad ERP projects. Again, the findings may not be specific or deep enough for certain major breeds of ERP such as SAP and Oracle. Though more specific research is encouraged to shed light on ERP, this research provides a basic framework and contributes at least some general understanding of ERP practices employed by many firms from the USA and Malaysia.

5.4.4 This study conducted multiple regression test to confirm the coexistence of several forces that influences firm’s overall performance. The results however shows that R-squared values (the percentage of variance explained by the model) is not large (Malaysia = 44.7%, USA = 52.8%, Combined = 45.3%) implying the proposed model account for limited variance of firm performance. More research is therefore suggested to identify other significant variables to predict ERP and firm’s overall performance.

5.4.5 Further, this study did not employ a multi-source method to collect data (Sekaran, 1992). Results and hypotheses testing were entirely based on survey research and not on various sources such as interview, observation and secondary data. The use of multi-source method is very useful as it gives more confidence in the goodness of data being collected and minimises bias in the research results.
(Sekaran, 1992). The findings in this study were based largely on what had been reported by directors in the questionnaire. Given extra time, the data employed in this study might have been enhanced through the author’s further observation and longer experience working in firms of ERP implementers either in the USA or Malaysia.

5.5 SUGGESTIONS FOR FUTURE RESEARCH

5.5.1 The scope of this study is restricted to publicly listed firms from two countries. Future research topics covering private firms from other countries are therefore suggested to extend and enrich the results. Further, most respondents participating in this study were companies which may have operations in many countries and cultural environments. Therefore, it would be interesting to examine systematically the impact of these cultures on the ERP practices. For example, it may be interesting to conduct a study of culture and ERP in manufacturing firms from the USA and Japan. Further, the implementation of ERP, particularly those with advanced technologies, at present involves importing foreign technologies (particularly from the USA and Germany) to the local business process. Therefore, another possible research area is to examine the process of transferring such technologies to the firm’s employees which involves licensing, franchising and other sensitive use of intellectual properties.

5.5.2 This study relied on data from directors to examine ERP practices. The results therefore may be open to bias since directors may have a tendency to overrate their company’s performance. It is therefore recommended that future research obtains a more balanced feedback from various parties (eg. customers, suppliers, employees, regulators, ERP consultants or industrial experts) before judging the firm’s ERP implementation.
5.5.3 Given the scale of ERP implementation projects as well as the possibility for having more intelligent functions in the near future, it is reasonable to expect that quantity, scope and types of ERP components installed have a significant and measurable effect on firm performance. There are various sources of literature which document the benefits of ERP components mostly in the form of individual case studies (e.g., Dolmetsch, et al., 1998; McAfee, 2002), product testimonials (SAP Press Release, 2002) and industry surveys (MSDW CIO Surveys on Enterprise Software, 2001). While both costs and potential benefits vary with different ERP components, it is possible that greater components implemented may result in higher productivity for the firm. In addition, as ERP is getting more complex and ‘intelligent’, firms that are successful in implementing more ERP components may gain competitive advantage over other firms that implemented fewer components. In this study, the author explored the operational performance effects of ERP with various firms using various forms of components. The author did not explicitly differentiate companies based on the number of ERP components installed. It is recommended that future researchers systematically study the effects of various degrees of ERP implementation on overall firm performance. The individual benefits of each ERP components must be investigated so as to better understand the economics of ERP implementations particularly those that involve large-scale ERP systems projects.

5.5.4 As the study relied on data from directors to examine ERP practices, the results may be open to bias since directors may have a tendency to overestimate their company’s potential. Hence, future research should combine both approaches namely the subjective opinion of directors with more objective facts from the operational data. Future study is also recommended to get a more balanced feedback (subjective and objective) from various parties (e.g. customers, suppliers, employees, government regulators, ERP consultants or industrial experts) before judging the firm’s ERP implementation.
5.5.5 This study used a long questionnaire with 26 pages. “Given that individuals are turned off by the idea of completing lengthy questionnaires, it becomes necessary to edit the length of questionnaires in order to attract more feedback from participants” (Dillman et al, 1993). “A popular method of reducing the length of questionnaires is by reducing the scope of study and taking out unnecessary variables in order to reduce the length. A further method is by splitting the questionnaires into two parts and conducting it at two separate times” (Salisbury et al, 2005). “The two methods are the most common measures utilized to shorten the length of research questionnaires. Despite a longer study time frame, research has concluded that conducting multiple shorter questionnaires receive an overall higher response rate in comparison to a single lengthy questionnaires. Therefore, breaking the study questionnaire into smaller parts and conducting it at two different times are recommended to future researchers to garner a higher response rate without losing the questionnaire’s original essence” (Dillman et al, 1993).

5.5.6 This study did not consider the varying level of learning and experience that may affect ERP implementation. “Technology management is a set of management disciplines that allows organizations from various levels to manage its technological fundamentals in order to create a competitive advantage. The implementation of technology management between developed countries and developing countries has resulted in differential returns due to varying level of learning curves” (Dewan & Kraemer, 2000). Odendaal (2003) suggests the use of comparative study involving mature, intermediate and novice users in technology research to explain the impacts on learning curves on technology adoption. Dewan and Kraemer (2000) found that information technology implementation has resulted in higher returns from capital investments in developed countries compared to developing and third world countries, primarily due to varying skills and experience involved in utilizing the information technology. “Despite that,
the technology gap between developed countries and developing countries as well as third world countries are expected to narrow down due to globalization and growing technology transfers” (Dewan and Kraemer, 2000). Due to the rapid rate of multilateral technology transfer, the author strongly recommends the use of mature-intermediate-novice users dichotomy for future researchers so as to identify the varying impacts of learning curves on future ERP implementation.
CHAPTER 6

CONCLUSIONS

The study concludes that the USA was more successful than Malaysia in implementing ERP projects as it scored higher on the overall performance (t-test, p < 0.05), perceived more positive impacts on various operational measures (t-test, p < 0.05) and had a better creative climate (t-test, p < 0.05). The research shows that adequate training programmes and psychological atmosphere are essential in the implementation of ERP. The results demonstrate that the USA has a longer history and more ERP experience than Malaysia. The findings show that the USA implemented and completed ERP earlier than Malaysia. The study reveals that the ERP concepts followed by the USA and Malaysia were similar but different critical success factors were applicable to each country (p < 0.05). Proper rewards, management openness to new ideas, human motivation and good crisis management are more important in the USA while appropriate operational technology, relationship of trust, gradual approach and ample time before deadline are more important in Malaysia. Further, the study shows that the USA and Malaysia perceived different key roles that influence ERP projects. In addition, no universal strategies were followed by the two countries with regard to the implementation of ERP. Rather, the study discovers that strategies were adopted according to the circumstances and characteristics of ERP. The study highlights the contingent nature of ERP and does not support the universal theory of ERP as claimed by some researchers (Dewar & Dutton, 1986; Damanpour & Evan, 1984). There is sufficient evidence that Malaysia faced more knowledge, technical and resource problems compared to the USA who had more people and organizational problems. Both groups were satisfied with the overall implementation of ERP with the USA perceiving much better performance than Malaysia (p < 0.05). The study confirms that ERP delivered positive impacts on cost, quality, delivery and flexibility in Malaysia and the USA (t-test, p < 0.05). Multiple regression test shows that the size, length of ERP, work
climate, cost, quality, delivery and flexibility performance had significant impacts on overall performance (F-test, p < 0.05). Finally, the study shows that ERP impacts on firm performance are moderated by contextual and operating variables. The Dehning and Richardson (2002) model is therefore supported.
APPENDICES

APPENDIX A : RESEARCH QUESTIONNAIRE

This questionnaire is designed to examine the critical success factors of successful ERP implementation and to explore the impact of ERP on operational performance measures. Each of the questions below will provide us with description about ERP practices of your organisation. Your co-operation to give us the most accurate and appropriate responses is therefore highly appreciated. Please be assured that your response will be handled with strict confidentiality.

PART A : DEMOGRAPHICS AND ERP IMPLEMENTATION

Please tick the appropriate box or boxes that truly reflect yourself and your company for the following items (a tick implies yes and a blank implies no). Please tick several options where indicated:

1. What is your gender?
   - Male
   - Female

2. What is your qualification?
   - PhD
   - Master
   - Degree
   - Below Degree

3. What type of directorship you are holding in the company?
   - Executive Directors
   - Non Executive Directors
4. How long is your working experience?
   - Working Experience is more than 20 years
   - Working Experience is between 10 to 20 years
   - Working Experience is less than 10 years

5. How do you view your working background?
   - IT Background
   - Non IT Background

6. What is the number of ERP projects you have been involved in?
   - No of ERP project involved is more than 5
   - No of ERP project involved is between 1 to 5
   - Not a single ERP project has been involved

7. What is your company industrial classification?
   - Airlines
   - Banks
   - Computer Service and Software
   - Electronic and Electrical
   - Energy
   - Engineering and Construction
   - Entertainment
   - Food and Drug Store
General Merchandisers

Healthcare

Hotel, Tourism and Hospitalities

Insurance, Life and Health

Metal

Mining

Motor Vehicles and Parts

Retailers

Semiconductors

Telecommunication

Trading

Utilities

Others :

8. What is your company size in terms of revenue and number of employees? (please tick more than once, note that dollar revenue is based on the exchange rate quoted on January 2nd, 2006 at 3.7517)

Revenue is more than RM 1 billion (more than USD270 million)

Revenue is between RM 100 million to RM 1 billion (between USD27 million to USD270 million)

Revenue is less than RM 100 million (less than USD27 million)

No of employees is greater than 1000

No of employees is between 100 to 1000
No of employees is less than 100

9. How long ERP has been implemented in the company?

- Implementation is in progress
- Implementation was completed less than a year ago
- Implementation was completed between 1 to 3 years ago
- Implementation was completed between 3 to 5 years ago
- Implementation was completed more than 5 years ago
- Implemented but scrapped

10. Which modules are installed in the ERP project? (Tick more than once)

- Production
- Accounting
- Procurement
- Distribution
- Field Service
- Material Planning
- Capacity Planning
- Production Planning
- Sales Planning
- Sales Order Processing
- Customer Service
### Business Planning

Others:

**11. What is the cost of ERP implementation as a percentage of annual revenue?**

- Percentage of the annual revenue is more than 100%
- Percentage of the annual revenue is between 50% to 100%
- Percentage of the annual revenue is between 20% to 50%
- Percentage of the annual revenue is between 10% to 20%
- Percentage of the annual revenue is less than 10%

**12. What is the financial achievement of your company following ERP implementation? (please tick more than once)**

- Revenue increased more than 50%
- Revenue increased between 20% to 50%
- Revenue increased between 0% to 20%
- Revenue unchanged
- Revenue decreased
- Net profit increased more than 50%
- Net profit increased between 20% to 50%
- Net profit increased between 0% to 20%
- Net profit unchanged
- Net profit decreased
Operating expense decreased more than 30 %

Operating expense decreased between 0 % to 30 %

Operating expense unchanged

Operating expense increased

13. What is the best definition of ERP ? (please tick more than once)

1. a computer-based system and enterprise wide database that is designed to process an organization’s transactions and facilitate integrated real-time planning, production and customer response that is designed for a client server environment, that integrates majority of business process, that processes majority of organizations transactions and allow access to data in real time

2. a package of computer application that support most aspects of company’s information needs

3. the broad set of activities supported by multi module application software that helps management to manage important parts of the business

4. an information system that manages through integration all aspects of a business

5. a business system that link all areas of a company with external suppliers and customers into a tightly integrated system with shared data and visibility

6. an enterprise system that provides efficient feedback, extensive information and coordination of supply chain functions which facilitates enterprise wide integration by tying together suppliers, distributors and customers without geographical restrictions

7. an integrated computer system that uses relational database management system and client server network architecture which integrates individual functional systems, standardizes information flow and captures valuable management data

8. an enterprise wide set of management tool that balances demand and supply, that contains the ability to link suppliers and customers into a complete supply chain, that employs proven business processes for decision making, that provides higher degree of cross functional integration, that provides foundation for e-commerce and enables people to run their business with high levels of customer service, high level of productivity, low level of cost and inventory

9. Others :
14. How important is ERP implementation?

Extremely important

Very important

Important

Marginally important

Not important

15. How do you view the relationship between ERP and company strategy?

ERP led to strategy

Strategy led to ERP

ERP and strategy influenced each other

The two processes largely unconnected

16. What are the primary means of evaluating the success of ERP implementation?
(please tick more than once)

Financial Performance (Revenue, Net Profit, Operating Expense etc)

Operational Performance (Throughput, Productivity, Yield, Response Time, Lead Time, Inventory Turnover, Asset Turnover etc)

Technological, Application and Software Performance

Strategic Performance Management Planning and Control

Organizational Integration, Communication and Flexibility

Intra Organizational Integration, Communication and Flexibility (Supply Chain Efficiency etc)

Customer Satisfaction
Employee Satisfaction

Others:

17. What are the key roles in ERP implementation? (please tick more than once)

Top Management

Customers

Team leader

Team members

Consultants

Outside Sponsors

Employees

Intrapreneurs

ERP Champion

ERP Initiators

ERP Academics

Business Partners

Government and Regulators

Others:

18. How do you view the training and development programmes conducted to support ERP implementation?

Very few programmes have been introduced
Few programs have been introduced
Fair amount of programs have been introduced
Many programs have been introduced
Too many programs have been introduced

19. Which of the following are true about your company strategies in implementing ERP? (please tick more than once)

- Customise and develop in house
- Customise but outsource to third party
- Use off the shelf software
- Use high level ERP executive steering committee
- Use cross-functional project team
- Use special department to monitor ERP implementation
- Use fund specifically allocated for ERP project
- Fund not allocated but applied from time to time
- Pre-implementation education conducted with participation from top management and ERP team members
- ERP vision statement prepared and communicated to all employees with highest priority
- Cost benefit analysis and ERP schedule prepared on a joint venture basis with participation from all related parties
- Full time experts used in ERP project team
- Technical consultants (software and system experts) with good track record employed
- Managerial consultants (business process and change management experts) with good track record employed
Phased transition strategies used from legacy system to ERP system

Big bang transition strategies used from legacy system to ERP system

Prototyping and pilot-testing used before implementing ERP

Others:

20. Which of the following are critical success factors of ERP implementation? (please tick more than once)

Management openness to new ideas

Top management support and commitment to innovation

Well designed project schedule and plan

Proper rewards system to encourage ideas and innovation

Qualified staff, skills and expertise

Having awareness that innovations are important to the organizational survival and competitiveness

Adequate control system, monitoring and feedback

Customer acceptance, user participation and commitment

Having clear project mission, vision, strategies, objectives and direction

Organizational structure that is less hierarchical

Need to constantly scan the external environment

Good project communication among affected parties

Use of effective management techniques

Good crisis management and ability to handle surprise
Gradual approach to innovation

Human motivation, support and consideration

Appropriate operational technology

Progressive corporate culture and work climate

Good change management and organizational adaptability

Relationship of trust among all parties concerned

Ample time before deadline

Compatibility with corporate strategies

Compatibility with other managerial techniques being implemented

Others:

21. Which of the following are the underlying motivations in implementing ERP? (please tick more than once)

- Financial (Profit, Revenue etc)
- Operational (Business Process etc)
- Technological (IT Platform, Software etc)
- Strategic (Information, Planning, Competitors etc)
- Functional (Departmental Needs etc)
- Organizational (Firm-Wide Communication, Collaboration etc)
- Intra Organizational (Industry-Wide Communication, Collaboration etc)
- Market/Customer (Customer Needs and Satisfaction etc)
22. How do you view the overall performance of ERP after its implementation?

Excellent

Good

Moderate

Poor

Extremely Poor

For questions 23, please write the appropriate number in EACH BOX:

1 = Not important
2 = Marginally Important
3 = Important
4 = Very Important
5 = Extremely Important

If you think OTHERS are applicable, please comment. DO NOT WRITE if you are not sure.

23. Which of the following are critical success factors of ERP implementation?

Management openness to new ideas

Top management support and commitment to innovation

Well designed project schedule and plan

Proper rewards system to encourage ideas and innovation

Qualified staff, skills and expertise
Having awareness that innovations are important to the organizational survival and competitiveness

Adequate control system, monitoring and feedback

Customer acceptance, user participation and commitment

Having clear project mission, vision, strategies, objectives and direction

Organizational structure that is less hierarchical

Need to constantly scan the external environment

Good project communication among affected parties

Use of effective management techniques

Good crisis management and ability to handle surprise

Gradual approach to innovation

Human motivation, support and consideration

Appropriate operational technology

Progressive corporate culture and work climate

Good change management and organizational adaptability

Relationship of trust among all parties concerned

Ample time before deadline

Compatibility with corporate strategies

Compatibility with other managerial techniques being implemented

Others:
For questions 24 and 25, please write the appropriate number in EACH BOXES provided:

1 = Strongly Disagree
2 = Disagree
3 = Neutral
4 = Agree
5 = Strongly Agree

If you think OTHERS are applicable, please comment. DO NOT WRITE if you are not sure.

24. What are the major problems faced during ERP implementation?

Knowledge: Lack of ideas, information and experience

Technical: Limited skill and expertise, lack of time

People: Problem with attitudes, employee resistance to change

Markets: Difficulties in understanding markets and customers

Business Process: Lack of fit with business procedures

Strategic: Problem with leadership and management, lack of fit with corporate strategies

Organizational: Lack of support structure, bureaucracy and too much politics

Resource: Lack of funds and time

Others:

25. What are the underlying motivations of implementing ERP?

Financial (Profit, Revenue etc)

Operational (Business Process etc)

Technological (IT Platform, Software etc)

Strategic (Information, Planning, Competitors etc)
Functionional (Departmental Needs etc) 

Organizational (Firm-Wide Communication, Collaboration etc) 

Intra Organizational (Industry-Wide Communication, Collaboration etc)

Market/Customer (Customer Needs and Satisfaction etc) 

Others: 

For questions 26 and 27, please write the appropriate number in EACH BOX provided:

1 = Strong Negative Impact 
2 = Negative Impact 
3 = Neutral/No Impact 
4 = Positive Impact 
5 = Strong Positive Impact 

26. What are the impacts of ERP on the following critical measures?
   
   Cost Performance 
   
   Quality Performance 
   
   Delivery Performance 
   
   Flexibility Performance 
   
   Overall Firm Performance 

27. What are the impacts of the following critical measures on overall firm performance?

   Size Of The Firm In Terms Of Amount Of Revenue 
   
   Size Of The Firm in Terms Of No Of Employees
Length Of Time ERP Has Been Implemented

Level Of Creative Work Climate

Cost Performance

Quality Performance

Delivery Performance

Flexibility Performance
28. Any other comments (you may attach additional pages if this page is not enough for comments) :
PART B : CREATIVE CLIMATE

This part is designed to measure the extent of perceived creative climate in your organization. The questions are taken from Ekvall Creative Climate Questionnaire (CCQ) which has been validated in many countries. Each of the questions below provides descriptions on the perceived work climate in your organisation. Your co-operation in giving the most accurate and appropriate responses is highly appreciated.

Using the scale listed below, please indicate your choice of how applicable you see the item for your work environment by circling the appropriate number.

0 = Not at all applicable
1 = Applicable to some extent
2 = Fairly applicable
3 = Applicable to a high degree

1. Most people here enjoy contributing to the success of the company

2. People here make decisions on their own to a fairly large extent

3. People generally risk sharing their ideas because they are listened to and encouraged

4. There is no fear of being stabbed in the back
5. Most people have time to think through new ideas here

6. There is a lot of activities here

7. There is a good deal of tension here due to prestige conflicts

8. There are many new ideas floating around here

9. A playful atmosphere is prevailing here

10. Novel ideas are quickly adopted into the operation

11. People here usually enjoy their jobs
12. People here take the time to discuss new ideas

0 1 2 3

13. Most people here prioritise their work themselves to a rather large extent

0 1 2 3

14. Initiatives often receive a favourable response, so people feel encouraged to generate new ideas

0 1 2 3

15. People do not talk behind each other's back

0 1 2 3

16. A lively atmosphere prevails here

0 1 2 3

17. One can usually see many cheerful faces here

0 1 2 3

18. People here are anxious to talk about their ideas

0 1 2 3
19. It is common here to have people plot against each other

\[
\begin{array}{cccc}
0 & 1 & 2 & 3 \\
\end{array}
\]

20. There is a clear tendency for risk taking here

\[
\begin{array}{cccc}
0 & 1 & 2 & 3 \\
\end{array}
\]

21. Most people here consider their work meaningful and stimulating

\[
\begin{array}{cccc}
0 & 1 & 2 & 3 \\
\end{array}
\]

22. People here seek information in the company on their own initiative to solve problems

\[
\begin{array}{cccc}
0 & 1 & 2 & 3 \\
\end{array}
\]

23. People here dare to take the initiative even if the outcome is uncertain

\[
\begin{array}{cccc}
0 & 1 & 2 & 3 \\
\end{array}
\]

24. You will receive support and encouragement if you present new ideas

\[
\begin{array}{cccc}
0 & 1 & 2 & 3 \\
\end{array}
\]

25. People here are confident and act quickly

\[
\begin{array}{cccc}
0 & 1 & 2 & 3 \\
\end{array}
\]
26. People trust each other

0 1 2 3

27. The atmosphere here is exciting

0 1 2 3

28. You feel welcome when presenting new ideas

0 1 2 3

29. Many different points of view are expressed here

0 1 2 3

30. There are power and territory struggles in my unit

0 1 2 3

31. The pacing of work allows for the testing of new ideas

0 1 2 3

32. Most people here strive to do a good job

0 1 2 3
33. It is common for people here to take the initiative to solve problems

0 1 2 3

34. There is an informal atmosphere here

0 1 2 3

35. Conflicts and opposition are dealt with openly and usually cleared up that way

0 1 2 3

36. To come up with ideas is looked upon as an important part of the operation here

0 1 2 3

37. There is a lot of energy and push in the operation

0 1 2 3

38. People tend to joke quite a bit

0 1 2 3

39. There is a great variety of views here

0 1 2 3
40. There are quite a few people who cannot tolerate one another

41. People feel deeply committed to their jobs

42. One has the opportunity to stop work in order to test new ideas

43. There is quite a lot of freedom here

44. This unit is usually accepting of new ideas

45. The communication between people is open and straightforward

46. There are many people here who are full of ideas
47. People here have a sense of humour

0 1 2 3

48. Unusual ideas often come up in discussions

0 1 2 3

49. There are quite a few personal conflicts here

0 1 2 3

50. There is follow through on new ideas here

0 1 2 3

NAME :

POSITION :

COMPANY :

NO OF EMPLOYEES :

SIZE OF REVENUE :

YEAR ERP COMPLETED / EXPECTED TO BE COMPLETED :

TELEPHONE NO :

DATE :
How do you feel after completing this questionnaire? Tick the following that truly reflect your feelings:

1 = Extremely Bad
2 = Fairly Bad
3 = Just OK
4 = Fairly Happy
5 = Extremely Happy

THANK YOU FOR FILLING UP THE QUESTIONNAIRE
Dear Respondent,

My name is Mohd Nazri Khan Bin Adam, presently a doctoral student in the Faculty of Management, Multimedia University, Malaysia. I am doing a PhD thesis on “The Critical Success Factors Of Enterprise Resource Planning (ERP) And Its Impact On Operational Performance : The Malaysian And American Experiences”. This study is important as it provides academics and managers with an insight into various ERP implementation activities, problems, motivations, critical success factors and impacts on the company’s performance. It is hoped that other firms will use the results to maximise the benefits of ERP projects and minimise the ERP failure. As a researcher, I strongly appreciate your honest opinion to fill up this questionnaire. I strongly believe that your firm must have gained considerable experience after implementing ERP initiatives. I suppose your role as a member of the board of directors will be very helpful in identifying potential ERP critical success factors and possible impacts of ERP on various operational measures in the company. Once the research has been done, in exchange for your honest participation, I will be happy to provide you with a post feedback gift and a copy of the results. Please be assured that your response will be handled with strict confidentiality. Should you have any queries on this matter, feel free to contact me through email at nazri.khan@mmu.edu.my or 006 03 8312 5655. Further, to increase the accuracy of the results, we need the right people to participate in the survey. If you know any director that happen to be an ERP professional or has better experience in supervising ERP project in your firm, kindly forward the original questionnaire. Thank you.

Best Regards

MOHD NAZRI KHAN BIN ADAM
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Multimedia University
Malaysia
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LIST OF PUBLICATIONS


