



The ERP Advantage. Unleashing the Power Within to Conquer the Business Battlefield: A Systematic Review

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ABSTRACT

Enterprise Resource Planning (ERP) systems are critical components for integrating business processes and enabling competitive advantage; however, the human and cultural aspects of ERP use are insufficiently researched in the literature, particularly in the Asia-Pacific (APAC) region. This study adds originality to the literature by focusing on the people factor and investigating the impact of user age, involvement, teamwork, and cultural alignment on ERP adaptation and performance outcomes. A conceptual model has been developed with the help of Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA-2020). Guidelines were followed during all stages of this review from May 2021 to January 2022. A total of 502 research papers published after 2000 were inspected to determine which 44 publications to include, using the PRISMA data flow diagram. The research has been conducted for SMEs in the Asia Pacific (APAC) and gathered data using a survey tool, targeting companies that have already implemented ERP systems in their production processes. PLS-SEM was used to analyse the data quantitatively, and Hypotheses were tested. The results indicated positive relationships with the hypothesis. We have concluded that the high adaptation of the ERP system significantly influences ($\beta = 0.163$, $t = 2.963$, $p = 0.003$) the Competitive Advantage as a value-added benefit to business organisations. This paper provides an interpretation of ERP implementations in the APAC region, exploring relatively undiscovered stories about People, Power, Politics, and Competitive Advantages.

Keywords: Competitive Advantage, ERP Projects, ERP Use, Systematic Review (SR), People, PLS-SEM, PRISMA 2020.

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INTRODUCTION

Background and Context

Enterprise Resource Planning (ERP) refers to a comprehensive business software that cross-functionalizes various core business functions within an organisation. These functions typically include Production/Manufacturing, Production Planning and Controlling, Purchasing & procurement, Sales and Delivery, Finance, Collection of Final Payment, Cost Accounting, Fixed Assets Accounting, Inventory Management, Warehouse Management, Customer Relation Management (CRM), and Business Intelligence (BI), which are the standard and general modules in such a system. Vendors and implementers suggest that ERPs streamline operations, improve efficiencies, and provide seamless integration into business processes. An ERP user refers to individuals or end-users within an organisation who interact with the ERP or utilise it as part of their daily work activities. These staff members from various departments complete their respective tasks as defined. In the ERP system, this is referred to as configuration.

Competitive advantage refers to the exclusive characteristics or capabilities that set a company apart from its competitors and contribute to its success in the marketplace. An ERP system can provide several competitive advantages (CA) to organisations that effectively leverage its capabilities. In this research, researchers focus on how ERP can contribute to a company's competitive advantage.

It is critical to remember that an ERP system's ability to function effectively and provide a competitive edge depends on both the software and other elements, such as procurement optimisation, organisational alignment, and user training. ERP users can significantly enhance an organisation's competitive edge in the market with the help of a well-designed and effectively deployed ERP system.

Research problem and significance

Research Problem

Even with the widespread adoption of ERP systems by businesses, it remains necessary to assess how effectively using ERP systems helps firms achieve a competitive edge in the fiercely competitive business environment. Although the potential advantages of ERP systems have been studied in previous research, little is known about how the successful use of ERP systems results in real CA for businesses. Thus, the purpose of this study is to investigate the relationship between competitive advantage and ERP system adaptation, as well as the tools that ERP systems can use to assess organisational performance and provide long-term CA.

Significance of the research

Practical Implications: Businesses considering or already using ERP systems can benefit from the study's insightful conclusions and recommendations. Strategic decision-making can be enhanced by considering the relationship between the use of ERP systems and competitive advantage. This can also improve the deployment and utilisation of ERP systems, ultimately improving organisational performance. **Competitive Landscape Understanding:** This analysis can enhance knowledge of the competitive dynamics in various industries by examining how the adaptation of ERP systems helps achieve a competitive advantage. It can shed light on how organisations can utilise ERP systems as strategic tools to differentiate themselves.

Performance Improvement

By investigating how ERP system practices impact operational effectiveness, supply chain management, customer relationship management, cost reduction, and productivity enhancement, organisations can identify areas for improvement and streamline their procedures. Performance and competitiveness may rise as a result.

Knowledge Advancement

The research can contribute to the current body of knowledge by bridging the gap between ERP system research and concepts of competitive advantage. It can enhance the theoretical understanding of how ERP systems impact organisational performance and provide empirical evidence to support or refine current theories and models.

By identifying the importance of this research study, it is clear that it may make a significant contribution to the academic, theoretical, and practical sides of the area, offering insightful advice and valuable insights to implementers, strategic managers of clients, and researchers.

Research objectives

1. To examine the role of the ERP system in enabling top management to compete in the market and strategic planning.
2. To examine the impact of ERP system adaptation on business performance and effectiveness within organisations.
3. To examine the relationship between the ERP system, use and standard business operations.
4. To examine the effects of the ERP system, use on cost reduction and productivity improvement within organisations.
5. To examine the relationship between ERP system, use and competitive advantage, considering financial and non-financial indicators.
6. To examine ERP adaptation challenges associated with ERP project implementation and post-implementation.
7. To examine practical recommendations and IS strategies for organisations to use ERP for competitive advantage.
8. To examine the contribution of this study to the existing body of knowledge by bridging the gap between ERP system research and competitive advantage theories.
9. To examine the extent of ERP system implementation and utilisation in organisations across different industries.

Research Questions

In this work, we aim to compile a comprehensive list of elements and constructs that ERP uses and its competitive advantage (CA) in the marketplace. Researchers pay special attention to the relationship between human and social factors, as well as the use of ERP and CA. The summary of the research questions is as follows;

- 1) What is the impact of ERP system use on operational efficiency and effectiveness in organisations?
- 2) How does the integration of an ERP system promote information exchange and decision-making processes in the organisation?
- 3) What is the relationship between the use of the ERP system and the standard business process, and how does this help to get a competitive advantage?
- 4) What is the impact of the ERP system on the cost reduction and performance of the organisation?
- 5) How does the use of the ERP system help to achieve competitive advantage in consideration of both financial and non-financial performance indicators?
- 6) What are the main factors of success and problems related to the implementation and use of ERP systems to secure a competitive advantage, with special reference to project culture and people?
- 7) What practical recommendations and IS strategies can be provided to the organisation to achieve a competitive advantage using the ERP system?
- 8) How does this study contribute to the existing body of knowledge by bridging the gap between ERP system research and competitive advantage theories?
- 9.) How does the level of ERP system implementation and utilisation vary across different industries, and what factors contribute to this variation?

The research objectives and questions were developed as two perspectives on the same constructs:

Objectives express what the study aims to achieve (e.g., examining the role of ERP in strategy, assessing the impact of ERP on cost/productivity, and identifying challenges).

Research Questions translate those objectives into operational inquiries (e.g.,

“What is the impact of ERP use on operational efficiency?” aligns with the objective “to assess the impact of ERP systems on business performance”). The table below summarises both aspects:

Table 1: *Table of Alignment of Research Objectives and Research Questions*

Research Objective (Revised)	Corresponding Research Question
To examine the role of the ERP system in enabling top management to compete in the market and in strategic planning.	RQ2: How does the integration of an ERP system promote information exchange and decision-making processes?
To examine the impact of ERP system adaptation on business performance and effectiveness within organisations.	RQ1: What is the impact of ERP system use on operational efficiency and effectiveness in organisations?
To examine the relationship between the ERP system, use and standard business operations.	RQ3: What is the relationship between ERP use and standard business processes, and how does this help achieve CA?
To examine the effects of ERP systems on cost reduction and productivity improvement within organisations.	RQ4: What is the impact of the ERP system on cost reduction and performance of the organisation?
To examine the relationship between ERP systems, use, and competitive advantage, considering both financial and non-financial indicators.	RQ5: How does ERP use help to achieve CA, considering both financial and non-financial performance indicators?
To examine ERP adaptation challenges associated with ERP project implementation and post-implementation.	RQ6: What are the main success factors and problems related to ERP implementation and use for competitive advantage?
To examine practical recommendations and IS strategies for organisations to utilise ERP for a competitive advantage.	RQ7: What practical recommendations and IS strategies can be provided to organisations to achieve CA using ERP?
To examine the contribution of this study to the existing body of knowledge by bridging the gap between ERP system research and competitive advantage theories.	RQ8: How does this study contribute to the existing body of knowledge by bridging ERP research and CA theories?
To examine the extent of ERP system implementation and utilisation in organisations across industries.	RQ9: How does the level of ERP implementation/utilisation vary across industries, and what factors contribute to this?

Following an overview of the study's background and goals, the following section examines the body of literature to pinpoint important ERP implementation success factors and draw attention to the gaps this investigation fills.

LITERATURE REVIEW & THEORETICAL PERSPECTIVES

A systematic Literature Review was used to identify relevant and critical research papers. Business case studies, conceptual modelling, the Competitive Advantage of

ERP, and the post-implementation review process were conducted through a structured approach. The reporting of this systematic literature review was done in line with the "Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) guidelines. Furthermore, this research has been registered in the PROSPERO database under the registration number CRD42021243116.

Definition and characteristics of ERP systems

According to Handoko (2015), ERP is a comprehensive transition management system that integrates various management processing capabilities and consolidates data from multiple business units within a single business entity into a central database. Davenport (1998) identified the ERP system as the most important development in enterprises' use of software systems.

Sarker (2002) pointed out that in today's competitive world of business, ERPs are considered to be "the process of entry for running a business". Further, he has pointed out that larger growth rates have been seen in the SMEs and mid-size companies.

Its primary purpose is to minimise data and process redundancy and bridge the gap between the respective business processes. In a manufacturing organisation, customers place orders, i.e., will take make-to-order. Material and respective resources should be allocated and should be in stock; otherwise, the production plant won't be able to complete the work order (on time). If they have to wait for ordered raw materials to arrive at the warehouse from suppliers, Production staff, machines, and other resources remain idle. In such a situation, it will be an additional cost for the plant. Missing opportunities, waiting time, restarting the stopped machines, unhappy customers, and a bad reputation may have a negative impact on marketing. Loss of orders and loss of revenue are all in the

chain and linked together. Maybe the root cause, in this case, is improper raw material handling/stock level/buffer stocks. These types of complex calculations are common and can be performed within several hours of business. Vendors have added these standard functionalities, tested, and implemented them for thousands of similar clients in the same industry. This is the advantage that businesses seek in a new ERP system. This has been highlighted by researchers. Handoko (2015) studied this, and he pointed out that, according to Klause, ERP systems manage both information and resources by supporting the execution of operational transactions and advanced planning, as well as real-time data access.

ERP, the extended material requirement planning (MRP) and manufacturing resources planning (MRP II), is now the standard business software application in industries.

ERP is the core of Management Information Systems (MIS). ERP becomes one of the most important strategic tools for running a business, regardless of its type. However, ERP vendors focus on selected dimensions or specialised market segments (abasERP, 2023; SAP, 2023; Pentana,2023). In this digital era, information technology has become a primary necessity for all nationwide companies, with no exceptions. Markets are becoming more transparent. Online sales, trends, and patterns analytics are a fast-growing industry need.

ERP systems help companies achieve their competitive advantage by enhancing the information flow of processes through connected functional systems between suppliers, distributors, manufacturers, final payment collectors, third-party logistics providers (TPLs), and even end users. Like many other technological innovations, ERP systems were initially implemented primarily in large or very large organisations. Researchers strongly believe

that this may be the reason for the research focus on such big companies. Although small and medium-sized enterprises (SMEs) have implemented ERP systems for many years, the literature reveals that little attention has been given to research on ERP in SMEs, and even less to cross-national studies (Ruvio, 2012). SMEs are the backbone of the economy, playing a crucial role in increasing productivity and gaining a competitive advantage. Furthermore, ERP systems are essential drivers of innovation and business transformation. Therefore, studying ERP at the SME level across continents is also important.

Overview of competitive advantage and its dimensions

Competitive advantage is the term used to describe the special skills, assets, or capacities that enable a business to perform better and outperform its rivals in the marketplace. It is the key advantage that allows a company to create business value for its clients while maintaining profitability.

Competitive advantage can be defined as a firm's ability to deliver products or services that are perceived as superior to those of its competitors. It goes beyond just being better than competitors; it comprises creating and sustaining a unique position in the market that is difficult for others to replicate (Porter, 1985).

According to Barney, J. (1991), there are **two main types**. i.e., Cost advantage and Differentiation advantage.

i. **Cost Advantage:** This sort of advantage is accomplished by offering products or services at a lower cost compared to competitors. It can result from economies of scale, efficient operations, streamlined processes, or access to low-cost inputs.

ii. **Differentiation Advantage:** The advantage of differentiation is due to the provision of products or services that are

different and recognised in terms of quality, function, innovation, branding, customer service or organisation from competitors.

CA are derived from **various sources**. According to Barney, J. (1991), Teece, D. J. (2007), Day, G. S. (1994), and Hitt et al. (2012), key resources and capabilities include innovation and Technology, Customer Focus, and Operational Efficiency.

i. **Resources and Capabilities:** Exclusive and valuable resources, such as intellectual property, technology, product reputation, skilled workforce, or strategic partnerships, can give a business a competitive power.

ii. **Innovation and Technology:** The capability to innovate, progress with new technologies, and stay ahead of business trends can provide an essential advantage by offering fresh and cutting-edge products or service delivery.

iii. **Customer Focus:** Companies that recognise customers' requirements and preferences and apply proposals accordingly can create a competitive advantage to provide customers with excellent value and experience.

iv. **Operational Efficiency:** Effective and practical operations, supply chains and cost management can contribute to the advantages of costs and increase competitiveness.

A stable competitive advantage is a long-term advantage that competitors find difficult to imitate or surpass. Here is the creation of barriers to the entrance, the development of intense loyalty to customers, continuous innovation, and strategic letters between the organisation and its environment (Barney, 1991; Peteraf, 1993; Grant, 1991; Porter, 1996; Barney & Hesterly, 2010). Competition advantage is closely related to strategic management (Barney, 2001). Strategic choices, such as

target markets, value propositions, positioning, and differentiation strategies, have created and supported competitive business advantages. Understanding the competitive advantage is essential because it enables the formulation of an effective strategy, the reasonable allocation of resources, and adaptation to dynamic business situations. Companies can utilise their unique strengths to create value for customers, resulting in greater efficiency compared to competitors.

Competitive Advantage Theories

Michael Porter developed Porter's Generic Strategies. It is proposed that organisations can gain a competitive advantage by hunting one of three *broad strategies*: product diversity (offering exclusive and valued products or services to the market), product focus (targeting a specific market segment, customer base, or niche market), or cost leadership (achieving the lowest costs in the trade).

i. Resource-Based View (RBV) suggests that the company's competitive advantage is the result of exclusive and valuable resources and abilities. According to this theory, companies must create and utilise domestic resources, such as intellectual capital, technical expertise, business support systems, and brand reputation, to establish a sustainable competitive advantage.

ii. Dynamic Capabilities emphasise the ability of the organisation to adapt and respond to changes in market conditions and functions. Dynamic functions include the ability to integrate, generate, create, and reconstruct internal and external systems, as well as to identify new opportunities, resources, and competitive advantages for growth and development.

iii. Blue Ocean Strategy Companies suggest that they can create a strategy of creating an incomprehensible market space or "blue sea" to distinguish themselves

from participants and create new demands. This theory emphasises the valuable innovation of the organisation, which strives for differentiation and low costs to capitalise on new market opportunities.

iv Resource Dependency Theory. It will focus on the connection between the business organisation and external conditions. This assumes that the competitive advantage of the organisation is influenced by its ability to manage and control essential resources and dependencies, such as suppliers, customers, and other external stakeholders.

These theories offer dissimilar perspectives on how organisations can gain and sustain a competitive advantage. They provide a model for examining industry dynamics, strategic positioning, resource allocation, and value-making. By understanding these theories, researchers and practitioners can make informed decisions and develop fundamental strategies to enhance their competitive position in the marketplace.

Previous empirical studies on ERP system use and competitive advantage

ERP systems have become an essential tool for business organisations to manage their operations and gain a competitive advantage in the market / among the competitors. Several researchers (Ahmed et al., 2013; Vemuri and Palvia, 2006; Spathis and Constantinides, 2003; Ram et al., 2014) have conducted studies to investigate the benefits of competitive advantage in ERP projects.

Ahmed et al. (2013) found the impact of ERP systems on competitive advantage in the context of small and medium enterprises (SMEs) in Australia through their research. Furthermore, they revealed that this is achieved through cost reduction, improved operational efficiency, and enhanced decision-making. Implementing an ERP system can deliver a competitive advantage to the organisation. Strategic management needs to understand and align

some means of competitive edge that ERP implementation projects can contribute to winning.

Vemuri and Palvia (2006) discussed the improvement of operational efficiency. ERP optimises and automates business processes to improve efficiency and performance. By eliminating manual and excessive work, companies can optimise their operations, reduce costs, and deliver products or services faster and more effectively than their competitors.

According to Microsoft Dynamics (2023), Real-Time Data and insights are an additional factor that provides a competitive advantage with an ERP system. ERP systems provide real-time visibility into various aspects of the business, including inventory levels, sales data, production status, and financial information. Then, with correct and updated information, better judgments may be made. Business organisations that have access to current data have an advantage over competitors that rely on outdated or incomplete data, as they can respond more rapidly to market fluctuations, changing customer demands, and new opportunities. Ram et al. (2014) found that having an ERP system provides a competitive edge when implementing data-driven decision-making. ERP systems generate a vast amount of data and provide analytics tools that enable firms to make informed decisions. By analysing trends, identifying patterns, and gaining insights into customer behaviour and market dynamics, businesses can make informed strategic decisions, innovate more effectively, and stay ahead of competitors who rely on intuition or limited information.

Oracle NetSuite (2023) says that Streamlined Supply Chain Management (SCM) is a significant competitive advantage in the SCM industry. ERP enables efficient SCM through the cross-functional coordination of activities across procurement, production, and delivery. By

establishing adequate controls, monitoring inventory levels, and fostering strong supplier relationships, ERP users can reduce lead times, enhance SCM efficiency, and outperform competitors in a competitive market space.

Enhanced Customer Experience is also vital in the context of competition (Spathis & Constantinides, 2003). ERP systems enable management to view customer interactions, preferences, and purchase history, including patterns, customer complaints, future bookings, and future purchasing behaviour. This enables personalised and targeted marketing, improved order fulfilment, and better customer service. Business Systems enable seamless and personalised customer experiences, allowing businesses to differentiate themselves from competitors and build customer loyalty for those who have not implemented respective business functions and features.

ERP systems do more than help companies automate and simplify administrative tasks. They also help improve operational agility, enabling you to respond quickly to industry trends and customer needs (Panorama Consulting, 2023). i.e., Agility and Adaptability. ERP systems are adaptable and scalable. Furthermore, it enables organisations to scale their operations up or down in response to shifting market conditions and environments. ERP provides a solid foundation for agility and adaptation, whether it involves entering new markets, introducing new products or services, or modifying business processes. Companies that can respond quickly and effectively to market changes have a competitive advantage over slower and less dynamic competitors.

The researcher observed during the active involvement and engaged with thirteen (13) different real-world ERP projects that gaining a competitive advantage from an ERP system goes beyond the Technology,

Process, Roles, and tasks themselves. It requires effective change management, including Business Process Reengineering (BPR), process optimisation, Integration, user training, a knowledge base, and strategic management alignment, to fully leverage its potential benefits and differentiate your business from competitors.

The development of the conceptual model and hypotheses is predicated on the knowledge gathered from the literature review. The approach used to thoroughly examine earlier research and test the model empirically is explained in the section that follows.

CONCEPTUAL MODEL AND RESEARCH HYPOTHESES.

We reviewed the literature to identify the constructs and research gaps, as well as to understand the methods and tools used by other researchers. During the preliminary studies, it was determined that many of the behavioural characteristics of the subject were. In the meantime, researchers observed an extensive amount of studies on the technical, role, and process-related aspects. None of the sources on ERP that we came across specifically addresses people and cultural elements in the context of the competitive advantage of ERP systems. Hence, researchers have chosen the literature review with the help of “Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA-2020).

Guidelines were followed throughout all stages of this review, from May 2021 to January 2022. A total of 502 research papers published after 2000 were reviewed to identify which 44 publications utilised the PRISMA data flow diagram (Liberati et al., 2009). Please see Figure 1. However, only 19 were directly related to the competitive advantage.

According to a study by Ram (2013), Project Management has consistently shown associations with the use of ERP systems. Training and Business Processes Reengineering were identified as related to the ERP System by Ram (2012) and Ruivo (2013). Ruivo (2013) reported that Best Practices are an essential dimension of the system's competitiveness. According to this literature, the competitiveness of the system is defined with five different constructs, and we can summarise as follows:

- i. Project Management (PM)
- ii. Training and Knowledge Base (TK)
- iii. Business Process Reengineering and Change Management (BPR)
- iv. User Interfaces (UIs) & User Friendliness (UF)
- v. Industry Standards & Best Practices (IS)

However, Ruivo recognises that Compatibility and complexity are associated with IS adoption. According to Davenport (1998), the adoption of IS/IT systems differs significantly from ERP project implementations. In contrast to other IT systems, which frequently automate pre-existing processes, Davenport (1998) contends that ERP systems are Special because they enforce uniform business procedures throughout the company. Because of its process-centric design, ERP implementation is much more. Disruptive and transformative. The researcher critically evaluated these constructs together with the thirteen different empirical ERP systems and then identified them as irrelevant for ERP use. Therefore, researchers have not added compatibility and complexity to the conceptual model. A draft summary table of constructs, definitions, and measurement items is included below. This table will address “variables” and “operationalisation”.

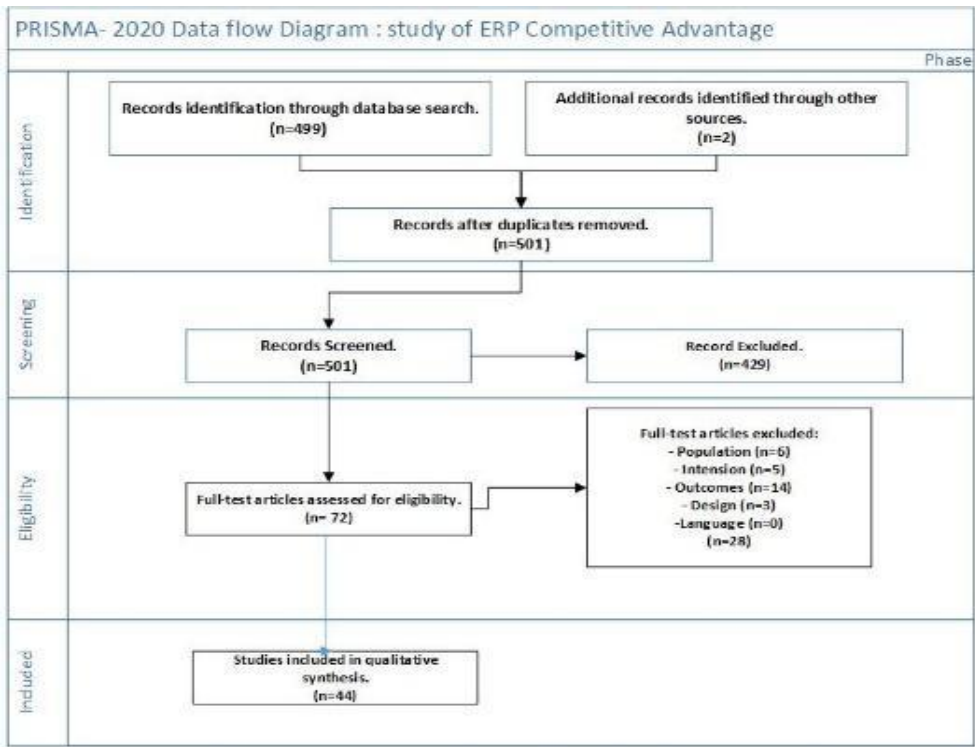


Figure 1: PRISMA 2009/2020 DFD

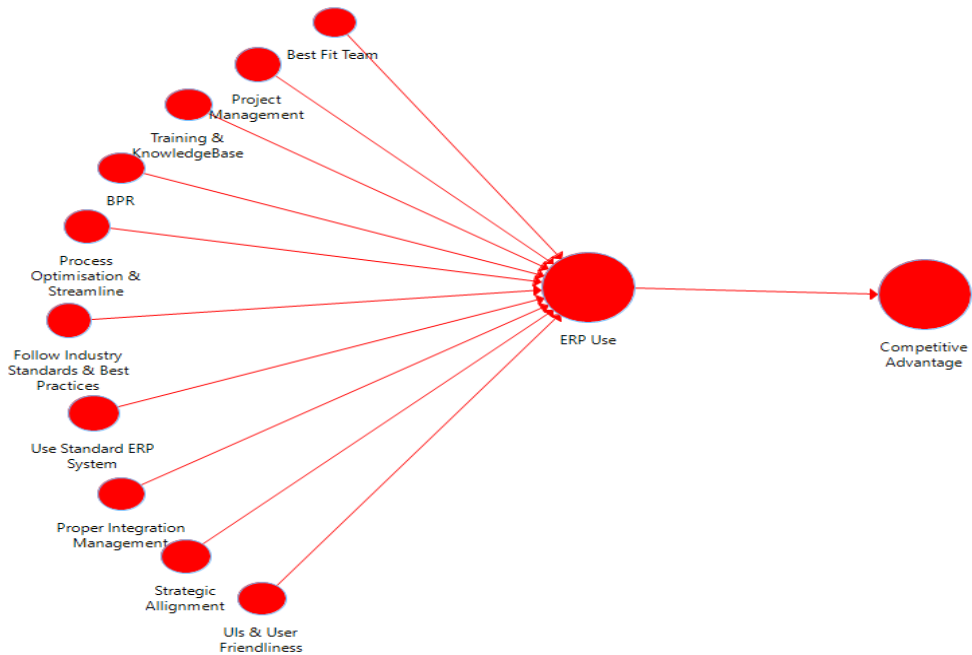


Figure 2: Conceptual Model

Table 2: *Constructs, Definitions, and Measurement Items*

Construct	Definition (as per literature)	Example Measurement Items (5-point Likert: 1 = Strongly Disagree to 5 = Strongly Agree)	Key References
Project Management (PM)	Application of PM principles, maturity, and practices to ERP implementation and post-implementation.	PM activities improved ERP rollout efficiency; Use of PM maturity models enhanced ERP outcomes.	Ram (2013); PMI (2022)
Training & Knowledge Base (TK)	Quality and adequacy of user training, knowledge transfer, and institutionalised knowledge repositories.	Users received sufficient training; the Ongoing knowledge base helps resolve ERP issues.	Ruivo (2013); Bradford & Florin (2003)
Business Process Reengineering (BPR)	Redesign of business processes to align with ERP best practices, reducing inefficiencies.	ERP prompted process redesign; ERP aligned with reengineered workflows.	Ram (2013); Davenport (1998)
User Friendliness (UF)	Ease of use and the quality of the user interface influence the willingness to adopt an ERP.	The ERP interface is easy to navigate, and ERP increases user productivity without requiring extra effort.	Ruivo (2012)
Industry Standards & Best Practices (IS)	The extent to which ERP was implemented with industry-accepted standards and vendor best practices.	ERP implementation adhered to industry best practices; the system is updated to vendor standards.	Ruivo (2013); SAP (2023)
Best Fit Teams (BT)	Presence of well-structured ERP project teams, including key stakeholders.	Our ERP project team had the right mix of roles; Stakeholders were engaged throughout the project.	Herath et al. (2022); PMI (2022)
Process Optimisation (PO)	The degree to which ERP adoption streamlined operations and eliminated redundancies.	ERP reduced duplicate processes; ERP optimised supply chain/inventory processes.	Lean Six Sigma; Kanban, JIT
Standard System & Minimum Customisations (SS)	ERP adoption with minimal modifications to standard vendor configurations.	ERP used with limited customisations; Vendor-provided modules fit most of our needs.	SAP (2023); Microsoft Dynamics (2023)
Integration Management (IM)	Extent of ERP integration with internal and external systems (e.g., weighbridges, CRM, third-party apps).	ERP integrates seamlessly with other systems, and data sharing across departments has improved.	Handoko (2015); Oracle Netsuite (2023)

Strategic Alignment (SA)	Alignment of ERP project goals with organisational strategic objectives.	The ERP project was aligned with strategic business goals; the ERP improved decision-making at the top mgmt.	Poli & Shenhar (2014)
ERP Use (EU)	The degree to which employees actively and effectively use ERP in their daily operations.	ERP is widely used across departments, and its usage has improved job performance and collaboration.	Ram (2013); Ruivo (2012)
Competitive Advantage (CA)	Sustainable performance benefits (cost, differentiation, efficiency) gained from ERP adoption.	ERP use improved cost efficiency; ERP helped differentiate our services/products in the market.	Porter (1985); Barney (1991); Handoko (2015)

This research framework promises that the cultural aspects of ERP system users have an impact on their competitive advantage.

Conceptual Model

Based on the pieces of literature, the expected relationship between ERP system uses and CA is discussed, and hypotheses related to these variables are developed. Please refer to Figure 2.

Hypotheses Development

This research framework is based on the assumption that the use of ERP systems will have a significant impact on a business's competitive advantage and organisational performance. Not only that, but some empirical evidence also shows the ERP system's effect on the staff of organisations and their personal development. According to Handoko (2015), there are five (5) different constructs that define ERP system implementations and their use. Those are 1.) System Quality 2.) Information quality 3.) The system uses 4.) Functional Impact 5.) Organisational Impact. However, according to the researcher's industry experience and PMBOK 7 (PMI, 2022), the above can be grouped into "Project Management". Based on this literature support, the expected relationship between

ERP systems and competitive advantage is discussed, and hypotheses related to these variables are developed, considering empirical projects and pieces of evidence. The researcher has identified and proposed the following construct as per the conceptual model. 1.) Project Management (PM) 2.) Training and Knowledge Base (TK) 3.) Business Process Reengineering and Change Management (BPR) 4.) User Interfaces (UIs) & User Friendliness (UF) 5.) Industry Standards & Best Practices (IS) 6.) Best Fit Teams (BT) 7.) Process Optimisations & Streamline (PO) 8.) Standard System & Minimum Customisations (SS) 9.) Integration Management (IM) 10.) Strategic Alignments (SA).

Project Management (PM)

The role of project management is to influence the success of ERP project implementation (abasERP, 2023; SAP, 2023; Panorama, 2023). The evidence suggested that applying project management techniques and principles to manage ERP projects could bring additional value to the organisation. Some shreds of evidence indicated that project management maturity is instrumental in gaining a strategic advantage (Ram, 2013; PMI-PMBOK V7, 2023)

A framework called the Project Maturity Model (PMM) is used to assess the effectiveness and maturity of a company's project management procedures. It provides a systematic approach to understanding and enhancing project management skills.

The project management maturity (PMM) is often measured using a set of criteria or dimensions. Project planning, risk management, stakeholder management, communication, resource management, quality management, and other factors are examples of these characteristics. As a progression from haphazard or chaotic practices to clearly defined and optimised processes, the model may also incorporate multiple levels or stages of maturity (PMI - PMBOK V6, 2023).

With the help of the PMM, businesses can assess their current project management procedures, identify areas for improvement, and develop a roadmap for enhancing their project management capabilities. When it comes to project management maturity, it helps firms assess their current standing and provides recommendations on how to progress to higher levels of maturity.

The "Organisational Project Management Maturity Model" (OPM3) from the Project Management Institute-USA (PMI) is one well-known yardstick for project maturity. Nevertheless, there are also a variety of additional models and frameworks that have their special characteristics and stages of development.

Overall, project maturity models serve as valuable tools for organisations to enhance their project management practices, increase project success rates, and achieve greater efficiency and effectiveness in delivering projects (PMI – PMBOK V7, 2023).

Therefore, researchers have developed the following hypothesis:

Hypothesis 1: *The use of project management is positively and significantly associated with achieving competitive advantage by successful ERP project implementation and ultimate use (of the new ERP system by the employees/ staff).*

Training and Knowledge Base (TK)

Ruivo (2013) noted that other research (O'Leary, 2003; Bradford and Florin, 2013; Maguire et al., 2010) has also identified user training as the primary determinant for successfully adopting, using, and benefiting from ERP systems. Staff's (end-users') readiness to use the new system is having a positive impact on business operations. Vendors and implementers are generally using standard user manuals and conference room training (face-to-face). LMS and virtual platforms have gained significant popularity in recent years due to technological advancements. Brain drains, staff resignations, and staff changes/duty changes are standard in companies. Maintaining a knowledge base is quite important. Recorded video sessions and YouTube are also trends in the subject. We therefore postulate that an ERP system with a higher level of end-user training enhances employees' preparedness to use the new ERP system. In line with research, we construct the 2nd hypothesis:

Hypothesis 2: *The level of the new system's training and Knowledge Base (TK) has a positive and significant relationship with ERP use.*

Business Process Reengineering and Change Management (BPR)

Typically, BPR is carried out to restructure non-value-adding operations, reduce the complexity of business processes, and eliminate inefficient processes (Ram, 2013). Furthermore, he has referred to other researchers who suggest that effective management of business process changes can facilitate post-implementation performance gains and the effective use of ERP systems. Researchers could expect

that redesigning business processes will improve the chances of ERP project success and utilisation, lead to efficient system use, and contribute to post-implementation performance, ultimately offering the possibility of achieving a competitive advantage.

Taking this background into account, we construct our 3rd hypothesis;

Hypothesis 3: Business organisations having ERP systems that use BPR for their implementation and deployments are more likely to use ERP systems.

i.e., A well-conducted BPR is positively and significantly associated with achieving competitive advantage by implementing ERP systems.

User Interfaces (UIs) & User Friendliness (UF)

When users find it challenging to obtain the desired result from the ERP, frustration and unwillingness to use the system generally result (Ruivo, 2012). Further, Empirical projects have shown us that when users are comfortable using ERP systems, it scales up the users' knowledge of the new system and their skills in manipulating the system in practical ways. Moreover, it prepares users to comprehend the system trends sufficiently and comprehensively (Ruivo, 2012). Based on these findings, researchers state the fourth hypothesis:

Hypothesis 4: Organisations have user-friendly ERP systems that have a positive and significant relationship with ERP use. *(i.e., ERP systems that are user-friendly/easy to use will increase the adoption of ERP.)*

Industry Standards & Best Practices (IS)

Implementing and managing an ERP system effectively requires industry best practices. Standard business processes are embedded in the ERPs. Continuous improvements, regular system updates and maintenance, configuration and

customisations, data cleansing & and customisation are also common industry standards among ERP vendors. Companies that implement industry standards and best practices significantly reduce risk and time-consuming tasks in the project. Therefore, companies that opt to implement ERP systems based on best practices will utilise the system more effectively.

Hypothesis 5: Companies with a greater degree of industry standards & and best practices are more likely to use ERPs

Best Fit Teams (BT)

The composition of the best-fit team for an ERP system may vary depending on the organisation's specific requirements and goals. However, several key roles and responsibilities are generally important for an ERP implementation team. According to PMI-PMBOK (2023), project teams typically consist of vendors, implementers, sponsors, clients, end-users, customers of the client, statutory bodies, and other stakeholders. Many researchers (Poli. M & Shenhar A, 2014; Poser M & Bittner E, 2020; Mints A, Kamyshnykova E, 2019; Ali et al, 2022) have discussed stakeholders in their studies, but upon reviewing and comparing their lists, it was found that they were incomplete for ERP project stakeholders. Thus, a comprehensive and exhaustive list of ERP project stakeholders was needed. As part of our primary research, researchers (Herath et al., 2022) developed a list of 32 stakeholders relevant to ERP project teams. Some of the crucial team members identified include the Project Manager, Business Analysts, Functional Consultants, System Developers/Engineers, Change Managers, End-users, Management Consultants, Sponsors, and the Steering Committee. However, this is not an exhaustive list. Additionally, we have taken an extra step in classifying the ERP stakeholders based on a specific set of criteria (Herath et al., 2022).

Ruivo (2012) referred to the fact that some other researchers have found that user fit in ERP is critical in explaining ERP usage and successful adaptation with business processes.

Hypothesis 6: Organisations that have the best-fit ERP teams have a positive and significant relationship with ERP use.

Process Optimisations & Streamline (PO)

There are several common approaches and reference points for optimising and streamlining ERP system implementation. Business process mapping (BPM) and Lean Six Sigma are some of the methodologies. Kanban, JIT (Just-in-Time), TPS (Toyota Production System), Lean, etc., are some of the common industry standards used by implementers and consultants.

Hypothesis 7: Organisations that have appropriately optimised their business processes and streamlined them have a positive and significant relationship with ERP use.

Standard System & Minimum Customisations (SS)

Research and findings on standard system implementations have revealed that the benefits of cost, time, and live systems are among the tangible outcomes. However, implementers are facing real challenges in meeting customisation requirements from clients/sponsors and process owners. Trick the project manager/product owner to balance this situation (abasERP, 2023; SAP, 2023; Microsoft, 2023). Many ERP vendors (abasERP, 2023; SAP, 2023; Microsoft, 2023) recommend a standard system approach, as it provides pre-configured solutions designed to meet industry requirements and best practices. Vendors thoroughly test those standard

systems. However, they are keeping a provision for localisation to include statutory requirements.

Adopting a standard system approach involves implementing the ERP system with minimal modifications to leverage these pre-configured functionalities. Standard systems are typically quicker to implement than customised solutions. Further, customisations can be time-consuming and costly. By minimising customisations, organisations can save on implementation, maintenance, and upgrade expenses. Standard systems are designed to be compatible with future upgrades and new releases, reducing the complexity of system upgrades.

However, implementers have identified the challenges of standard systems as Fit-gap, process Alignment, and unique business requirements versus customisations. To mitigate the risk of customisation and balance the situation is the paramount need. The researcher discovered from empirical evidence and personal experiences that the reasons why projects are customised are due to an improper definition of apparent ERP project objects, a lack of engagement with vendor/implementer expertise, and a lack of thorough evaluation.

Hypothesis 8: Organisations that have chosen a standard system or gone for minimum customisations have a positive and significant relationship with ERP use.

Integration Management (IM)

It is inherent that business functions and departments are connected to minimise data and operational redundancy. This enables seamless integration within the same organisation. Furthermore, ERP integration management refers to the process of bridging external systems together with the ERP system. For a cement manufacturer, it is critical to integrate their ERP system into weighbridges, Entry-exit gate barrier arms, plant and machinery, etc. This enables

seamless data sharing. Not only does system integration open a unified and consolidated ERP environment that eliminates data silos and enhances operational efficiency. Developing custom interfaces, using middleware tools or integration platforms, or leveraging application programming interfaces (APIs) adds complications to the project, as they utilise different protocols, vendors, languages, etc.

Hypothesis 9: *Organisations that have properly integrated systems and peripherals have a positive and significant relationship with ERP use.*

Strategic Alignments (SA)

The journey to ERP project adaptation is crucial for effective collaboration with strategic management alignment. According to Poli. M & Shenhar A. (2014), there are six (6) elements in project strategy. Project objectives, product definition, competitive advantage/value, business perspective, project definition, and strategic focus. Business organisations set strategic plans to achieve their goals (Poli, M., & Shenhar, A., 2014). This alignment between the ERP project and the strategic management will drive the project to the organisation's goals. This is a mindset (Poli & Shenhar, 2014). It defines the behaviour needed to achieve a competitive advantage and business values (Poli, M., & Shenhar, A., 2014).

Hypothesis 10: *Organisations that have properly aligned strategic management with the implemented ERP system have a positive and significant relationship with ERP use.*

Competitive Advantage (CA)

When a business entity sustains profits that exceed the average for its industry, the company is said to possess a competitive advantage over its rivals (Handoko, 2015). If a production company can reduce its

customer order cycle time, it results in a quicker turnover time, which leads to winning customers in a competitive environment. The primary goal of many business strategies is to achieve a sustainable competitive advantage.

A business has a cost advantage when it can manufacture and distribute goods and services more affordably than its rivals. Economies of scale, effective supply chain management, technical breakthroughs, or access to low-cost resources are some of the ways it can be achieved. The use of an ERP system will help companies achieve this.

Differentiation advantage offers unique and distinct service functions that are valued more highly by customers. Further, differentiation advantage can be achieved through factors such as product design, branding, quality, features, customer service, or innovation. Companies with running ERP systems gain a competitive advantage. Technological advantages leverage advanced technologies, proprietary systems, or intellectual property to gain a competitive edge. This may include ERP systems, patents, trade secrets, or technical inspections, which ensure the ability to provide innovative solutions, including efficiency improvements, cost reductions, higher product quality, and unique opportunities, thereby outperforming competitors. The company, which has succeeded in proximity to its customers, is focusing on optimising operations to provide strong relationships with customers, meeting individual demands and preferences, and offering more efficient products or services than its competitors. Surgical superiority includes excellent operational efficiency and effectiveness of the entire tissue. This can be achieved by implementing internal processes, lean methods, and continuous improvement and optimisation of operations to deliver more efficient products or services than competitors.

Hence, researchers can formulate the last hypothesis as:

Hypothesis 11: More ERP system use has a positive and significant impact on competitive advantage. Or less use of ERP systems has a negative effect on achieving competitive advantage.

Following the establishment of the methodology, the PLS-SEM analysis findings are presented in the following section, which progresses from measurement model validation to structural model testing.

RESEARCH METHODOLOGY

This study aims to verify and investigate the impact of ERP systems on competitive advantage among APAC companies that have implemented ERP systems. The methodology employed in the literature review was a systematic review process. i.e. Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA-2020). Followed by the identification of constructs and the formation of the conceptual model. Initial data survey tools were developed. Pilot data gathering helped us to fine-tune the data survey instruments. Participants were interviewed, and the clarity of the data survey tool was assessed after the initial version was revised. Mass data gathering was followed afterwards. At least one question was included to cover one variable. All constructs were added to the survey tool. More details are available in the following sessions.

Instruments, Instrument Development, Data Survey Planning

A survey methodology has been proposed for data collection to validate the research model and test its ten (10) hypotheses. Each survey question was reviewed for content validity by ERP subject matter experts and consultants. The initial data survey tool was pilot-tested on five companies in Fiji,

involving five participants from each firm. (i.e. 25 executive-level ERP team members participated. Some of them were Project Directors, CEOs, General Managers, IT Managers, Project Champions, etc). Responses were critically evaluated, and some participants were interviewed to clarify their understanding of the survey tool. The finalised questionnaire was designed with the help of review comments from the pilot survey data. To ensure the generalisation of the survey results, the sampling was stratified by countries in the Asia Pacific (APAC), by firm size (SMEs, to very large), and by industry (any). The questionnaire was in English and sent only to firms that use ERP systems in the operation of their business. The target population consisted of ERP project users across industries in the APAC region. Planned to get involved with 60 different companies and could target 10 ERP team members. Respondents were targeted using purposive sampling, targeting organisations known to have ERP systems in place. Seventy-two (72) valid responses were received from the survey participants. These were comprised of 42 different companies. This sampling strategy, while non-probabilistic, was appropriate given the specialised nature of the respondent pool (ERP project team members). Sample characteristics were analysed. The wide range of respondents and industry types suggests the sound quality of the data source.

The constructs were operationalised based on a Systematic literature review. Constructs were measured using survey instruments and multiple indicator items to strengthen reliability and validity. Constructs were measured by item responses on a five-point Likert scale ranging from 1 = Always / Strongly Agree to 5 = low / Strongly Disagree. The control variables used included country, company size, industry type, and others.

Measures, Sampling, and Data Collection

This study employed empirically tested, well-established indicators from previous studies, as well as the researcher's experiences, to measure each of the twelve latent variables, as shown in Figure 2. We used a five-point Likert-type scale to measure the variables—some of the indicators used in prior studies. We hope to increase the content validity and reliability of our results.

After constructing the survey questionnaire based on these items, we pilot-tested the instrument in two stages. In the first stage, the researcher sought feedback and responses from the 25 manager-level ERP users from 5 different companies. In the second stage, five randomly selected participants were interviewed. The pilot testing resulted in considerable improvement in the content—format and presentation of the data survey instrument.

Researchers invited candidates from APAC organisations to respond to our survey. Data gathering was conducted from March 1, 2022, to October 31, 2022. Candidates were professionals, executives, and managers who had been involved in ERP projects, either implementing them or using them in their daily operations. Two weeks later, follow up with a courtesy call, a personal visit, or a resend of the message via Viber, WhatsApp, Messenger, email, or LinkedIn. According to the records, nobody had shown up. Again, the second reminder had gone another two weeks later. This time, a few candidates returned with the responses. Some said they were too busy with their projects. It is said, to look into the data survey from tomorrow/ next Monday/ following week. But some of those have not returned to date. The researcher repeatedly followed up and made a concerted effort to collect as much data as possible. Seven months from the first deployed date, the researcher decided to conclude the data gathering.

Seventy-two (72) completed questionnaires were found. This gives a response rate typically similar to those of small and similar studies.

According to Wu MJ (2022), the average response rate for data surveys is around 44%. His results indicated that sending data-gathering tools to more participants did not generate a higher response rate. However, he suggested that more results can be achieved if the researcher focuses on pre-contacting potential participants by using and combining collaboration tools with data surveys, such as phone calls and emails. At this stage, we utilise virtual meeting apps (such as Zoom, Teams, and Skype) and communication tools (like Viber, WhatsApp, and Imo) to connect with candidates. During this data survey, data were collected, and a fair effort was made to gather as many responses as possible.

Furthermore, Mu MJ (2022) noted that the use of incentives did not have a significant impact on the response rate of the data gathering results. The recommended sample size for Partial Least Squares Structural Equation Modelling (PLS-SEM) may vary depending on several factors, such as the nature of the conceptual framework and the number of latent variables and elements. Traditionally, PLS-SEM has been considered for small to moderate sample sizes, particularly when compared to covariance-based structural equation modelling (CB-SEM).

However, there is no fixed rule for determining an optimal sample size for PLS-SEM (Hair et al, 2011). Some researchers suggest a rule of thumb of at least 10 times the maximum number of indicators for each latent variable in the conceptual model. Some other researchers recommend a minimum sample size of 200, considering the complexity of the model. It's essential to note that these guidelines are not definitive and should be considered general recommendations (Hair et al.,

2011). Ultimately, the appropriateness of sample size depends on the specific context, research objectives, and the aim to be achieved (Hair et al., 2011).

The findings are now analysed in light of earlier studies, emphasising how this investigation supports, expands upon, or contradicts those findings.

RESULTS

This study employed Partial Least Squares-Structural Equation Modelling (PLS-SEM) for data analysis. PLS-SEM is a causal modelling approach aimed at maximising the explained variance of the dependent latent constructs.

Assessment of Measurement Model

Measure Validity and Reliability

To test the validity and reliability of the data gathered before further analysis for hypothesis testing. Validity and reliability tests were conducted, including 33 measured items across 12 latent variables. According to the factor loading, it should preferably be greater than 0.70. For this reason, seven (7) questions, i.e., “BF1, BP1, UF1, PE1, CA1, EU2, EU3 “were excluded from our research model following the PLS/SEM model estimation due to low loadings. In the next step, we calculate the reliability and validity of the model.

Construct Reliability and Validity (Composite Reliability and Average Variance Extracted) Reliability:

Table 3: Reliability Result

Construct	CR(ρ_c)	AVE
01. BT Best Fit Teams (BT)	0.898	0.815
02. PM Project Management (PM)	0.984	0.969
06. IS Follow Industry Standards & Best Practices (IS)	0.886	0.796
09. IM Proper Integration Management (IM)	0.916	0.785
10.SA Strategic Alignments (SA)	0.920	0.794
11. EU ERP Use (EU)	0.961	0.924
12.CA Competitive Advantages (CA)	0.917	0.847

The reliability of each variable is tested using Cronbach's Alpha value. All variables' "Cronbach's Alpha" values in this research are more than 0.7, which means that all variables are reliable and eligible to test hypotheses. From Table 3, it can be seen that the means and standard deviations are within the expected ranges, too. It is also evident from the correlation analysis that all the constructs, each differing from one another as a factor, are significantly related to each other when one-to-one correlations are considered. The results of these statistical validity and reliability tests have proved that the factors of the variables are eligible, valid, and reliable for further hypothesis tests.

Standard Factor Loading (Outer Loadings)

Table 4: Standard factor loading

Factor	Outer Loadings	Cronbach's Alpha	Composite Reliability (ρ_c)	AVE
01.BF1 <- 01.BF	0.928	0.777	0.898	0.815
02.BF2 <-01.BF	0.878			
03.PM1 <-02.PM	0.985	0.968	0.984	0.969
04.PM2 <-02.PM	0.984			
06.TK2 <- 03.TK	1.000			
07.BP1 <-04. BP	1.000			
09.PO2 <- 05.PO	1.000			
10.IS1 <- 06.IS	0.807	0.780	0.886	0.796
11.IS2 <- 06.IS	0.970			
12.SS1 <-07. SS	1.000			
13.UF1 <-08. IF	1.000			
14.IM1 <-09.IM	0.784	0.859	0.916	0.785
15.IM2 <-09.IM	0.904			
16.IM4 <-09.IM	0.962			
17.SA1 <-10.SA	0.833	0.869	0.920	0.794
18.SA2 <-10.SA	0.903			
19.SA3 <-10.SA	0.935			
20.EU1 <-11.EU	0.950	0.920	0.961	0.924
22.EU3 <-11.EU	0.973			
26.CA3 <-12.CA	0.911	0.820	0.917	0.847
27.CA4 <-12.CA	0.930			

Construct Reliability and Validity

After analysing the measurement model, we found that all the designs of the model have appropriate internal reliability. This is because the complex reliability (CR) of each design exceeds 0.70 as recommended by Nunnally and Bernstein (1994) and Hair et al (2006).

Table 5: Construct Reliability and Validity

	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
01.BF	0.777	0.810	0.898	0.815
02.PM	0.968	0.969	0.984	0.969
06.IS	0.780	1.261	0.886	0.796
09.IM	0.859	0.870	0.916	0.785
10.SA	0.869	0.869	0.920	0.794
11.EU	0.920	0.983	0.961	0.924
12.CA	0.820	0.828	0.917	0.847

The average distributed value is extracted for 0.50 or more, encompassing all hidden variables of the model, indicating that the structure exhibits appropriate convergence reliability. Assessment of the discriminant validity of the constructs was done by calculating the square root value of the AVE for each construct. The results show that all the square root values are

greater than the correlation values with the other constructs, confirming that the constructs possess adequate discriminant validity (Fornell & Larcker, 1981).

In addition, the analysis of the factor loadings of each item for all the constructs in the model shows that all the measurement items are significant at $p < 0.001$.

With AVE values greater than 0.500, yes, our convergent validity has been established.

Assessment of the Structural Model

Table 6: Assessment of the structural model

	R Square	R Square Adjus...
CA	0.256	0.246
EU	0.845	0.820
PE	0.159	0.147
PM	0.846	0.839
SA	0.453	0.429

Discriminant Validity

Fornell–Larcker Criterion with the Fornell–Larcker criterion values, Discriminant validity has been established (Table 7).

Table 7: Fornell -Larcker Criterion

	01.BF	02.PM	03.TK	04.BP	05.PO	06.IS	07.SS	08.UF	09.IM	10.SA	11.EU	12.CA
01.BF	0.903											
02.PM	0.704	0.985										
03.TK	-0.154	-0.207	1.000									
04.BP	0.381	0.491	0.021	1.000								
05.PO	0.113	0.302	0.057	0.285	1.000							
06.IS	0.693	0.586	-0.167	0.440	0.153	0.892						
07.SS	0.672	0.495	-0.218	-0.088	-0.056	0.372	1.000					
08.UF	-0.402	-0.331	0.266	0.225	0.071	-0.366	-0.655	1.000				
09.IM	0.840	0.786	-0.260	0.263	0.096	0.527	0.751	-0.505	0.886			
10.SA	0.636	0.786	-0.087	0.632	0.246	0.712	0.350	-0.353	0.497	0.891		
11.EU	-0.106	-0.045	0.070	-0.206	0.097	-0.110	-0.155	0.129	0.004	-0.275	0.961	
12.CA	0.055	0.070	-0.013	0.099	-0.126	-0.030	0.061	-0.037	-0.006	0.124	-0.165	0.921

Tested Model

The conceptual model was tested with SmartPLS 4, as given below.

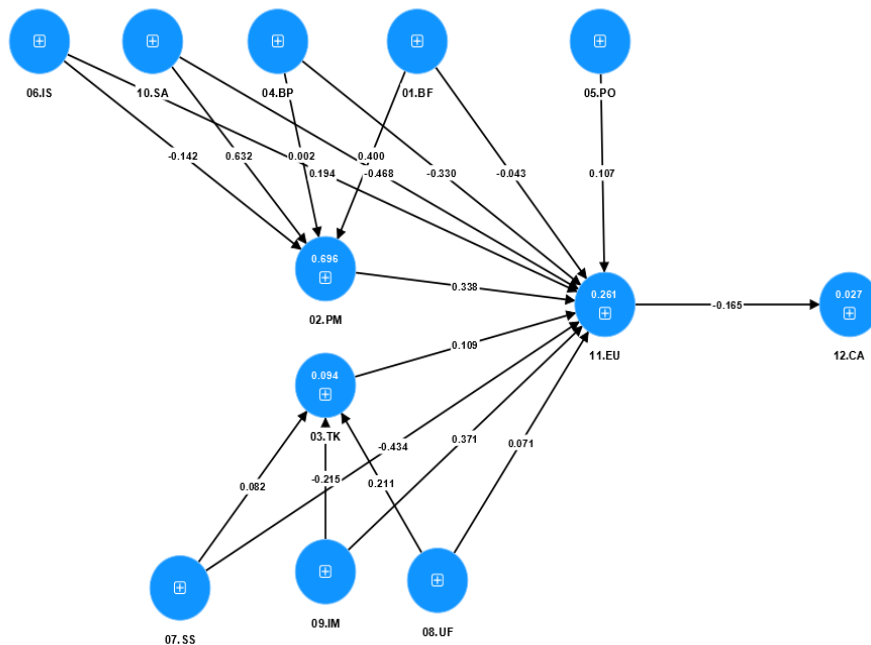


Figure 3: *Tested Model*

The Assessment of Structural model (LOC & HOC), and Hypotheses testing

Hypotheses were tested in this research using the Structural Equation Model (SEM) method. We constructed the composite scores of twelve (12) constructs. We used SmartPLS 4.0 path modelling to conduct the data analysis. Ram et al. (2013) referred to other researchers. They pointed out that Partial Least Squares (PLS) are considered relatively less sensitive to violations of the assumptions of normality and can estimate complex models with a relatively small sample size. According to Hair et al. (2011), PLS-SEM is a "silver bullet" for addressing empirical research challenges, such as smaller sample sizes.

Validating Lower Order Constructs – LOC (Reflective – Formative Model)

Outer Loadings, Construct Reliability and Convergent Validity, VIF, AVE

Some issues have been sighted at the IM2 and IM3 indicators. However, Cronbach's Alpha value was over 0.7, and we decided to keep the indication due to IM's reliability.

Discriminant Validity: Fornell and Lacker Criterion

Discriminant validity was tested with the Fornell and Larcker Criterion. As shown in Table 7, we can conclude that discriminant validity has been established.

Table 8: *Outer Loadings, Construct Reliability, and Convergent Validity*

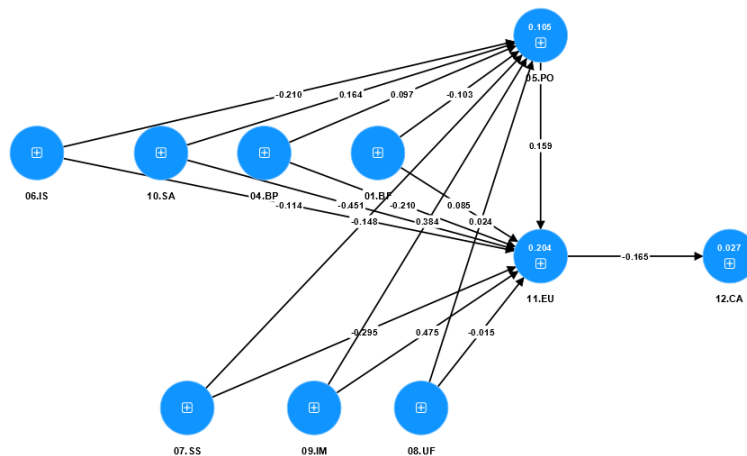
	BF	VIF	Cronbach's Alpha	ρ_{ccc}	AVE
01.BF1 <- BF	0.934	1.677	0.777	0.897	0.814
02.BF2 <- BF	0.869	1.677			
07.BP1 <- BP	1.000	1.000			
09.PO2 <- PO	1.000	1.000			
10.IS1 <- IS	0.762	1.694	0.780	0.872	0.776
11.IS2 <- IS	0.985	1.694			
12.SS1 <- SS	1.000	1.000			
13.UF1 <- UF	1.000	1.000			
14.IM1 <- IM	0.987	1.880	0.859	0.806	0.595
15.IM2 <-IM	0.519	4.936			
16.IM3 <- IM	0.737	6.620			
17.SA1 <- SA	0.792	1.770	0.869	0.918	0.790
18.SA2 <- SA	0.937	3.406			
19.SA3 <-SA	0.931	4.094			
20.EU1 <- EU	0.944	3.636	0.920	0.960	0.923
22.EU3 <- EU	0.977	3.636			
26.CA3 <- CA	0.911	1.938	0.820	0.917	0.847
27.CA4 <- CA	0.930	1.937			

Table 9: *Fornell and Lacker (1981) –Discriminant Validity*

	BF	BP	PO	IS	SS	UF	IM	SA	EU	CA
01. BF	0.902									
04. BP	0.379	1.000								
05.PO	0.113	0.285	1.000							
06. IS	0.701	0.441	0.157	0.881						
07.SS	0.671	-0.088	-0.056	0.368	1.000					
08.UF	-0.405	0.225	0.071	-0.381	-0.655	1.000				
09.IM	0.865	0.505	0.192	0.883	0.535	-0.358	0.772			
10.SA	0.628	0.652	0.233	0.739	0.347	-0.341	0.742	0.889		
11.EU	-0.121	-0.214	0.093	-0.138	-0.163	0.135	-0.115	-0.326	0.960	
12.CA	0.054	0.099	-0.126	-0.021	0.061	-0.037	0.001	0.124	-0.165	0.921

*Heterotrait – Monotrait Ratio (HTMT)***Table 10:** *HTMT - Higher Order Discriminant Validity*

	BF	BP	PO	IS	SS	UF	IM	SA	EU	CA
01. BF										
04. BP	0.441									
05.PO	0.128	0.285								
06. IS	0.835	0.484	0.156							
07.SS	0.761	0.088	0.056	0.421						
08.UF	0.442	0.225	0.071	0.356	0.655					
09.IM	1.038	0.302	0.110	0.629	0.803	0.539				
10.SA	0.753	0.677	0.264	0.804	0.376	0.378	0.595			
11.EU	0.234	0.195	0.110	0.297	0.142	0.119	0.215	0.322		
12.CA	0.069	0.108	0.135	0.069	0.066	0.048	0.055	0.147	0.190	

Lower Order Construct (LOC) Model**Figure 4: Structural Model - LOC**

Above, Figure 4 is the tested structured model with LOC.

5.4 Validating Higher Order Constructs: HOC (Reflective – Formative model)

These higher-order constructs are also validated as part of the measurement model assessment. Each of these constructs was tested for discriminant validity against another lower-order construct in the study, as recommended by Sarstedt et al. (2019). The results for the reliability and validity of the higher-order constructs indicate that both reliability and validity were established. The reliability and convergent validity for all other constructs are established, as the value for reliability is greater than 0.70 and the AVE is greater than 0.50, respectively (Table 7). Further to the assessment of reliability and validity, the discriminant validity of the higher-order construct with the lower-order constructs is also assessed. The result of the Fornell & Larcker (1981) criterion shows that the square root of the AVE of the constructs is higher than its correlation with all other

constructs (Table 9), whereas HTMT is also lower than 0.90 (Table 10).

Project Management, training, and knowledge base are the higher-order constructs in the study, based on four (Best Fit Team-BF, Business Process Re-engineering-BP, Strategic Alignment-SA, and Industry Standards-IS) and three (Standard System-SS, User Interfaces & User Friendliness-UF, and Integration Management-IM) lower-order constructs, respectively. To establish the higher order construct validity: "Outer Weights, Outer Loadings, and VIF to be tested. The outer weights were found to be significant (Hair et al, 2016). Furthermore, outer loadings were found to be greater than 0.50 for each of the lower-order constructs (Sarstedt et al, 2019). Finally, VIF values were assessed to check multicollinearity; all VIF values are less than the recommended value of 5 (Hair et al, 2016). Since all criteria are met, the HOC validity is established.

Structural Model

The next step in structural equation modelling is an assessment of the

hypothesised relationships to substantiate the proposed hypotheses.

Assessment

Hypothesis 1: *The use of project management is positively and significantly associated with achieving competitive advantage by successful ERP project implementation and ultimate use (of the new ERP system by the employees/staff).*

H1 evaluates whether Project Management (PM) has a significant impact on the ERP Use (EU). The results revealed that PM has a significant effect on the EU ($B = 0.291$, $t = 0.944$, $p < .001$). Hence, H1 was supported. Further, BF-H6, BP-H3, IS-H5, and SA-H10 are subdimensions of PM. Hence, H3, H5, H6 & and H10 are also supported.

Hypothesis 2: *The level of the new system's training and Knowledge Base (TK) has a positive and significant relationship with ERP Use (EU).*

H2 evaluates whether Training & Knowledgebase (TK) has a significant impact on the ERP Use (EU). The result

revealed that TK has a significant effect on the EU ($B = 0.159$, $t = 0.682$, $p < .001$). Hence, H2 was supported. According to the tested model, H8, UF-H4, and IM-H9 are sub-dimensions of TK. Hence, H8 and H9 are also supported.

Hypothesis 7: *Organisations that have appropriately optimised their business processes (PO) and streamlined them have a positive and significant relationship with ERP Use (EU).*

H7 evaluates whether Process Optimisation (PO) has a significant impact on the ERP Use (EU). The result revealed that PO has a significant effect on the EU ($B = 0.097$, $t = 0.783$, $p < .001$). Hence, H7 was supported.

Hypothesis 11: *More ERP system use (EU) has a positive and significant impact on competitive advantage (CA).*

H11 evaluates whether ERP System Use (EU) has a significant impact on the Competitive Advantage (CA). The result revealed that the EU has a significant effect on CA ($B = 0.097$, $t = 0.783$, $p < .001$). Hence, H11 was supported.

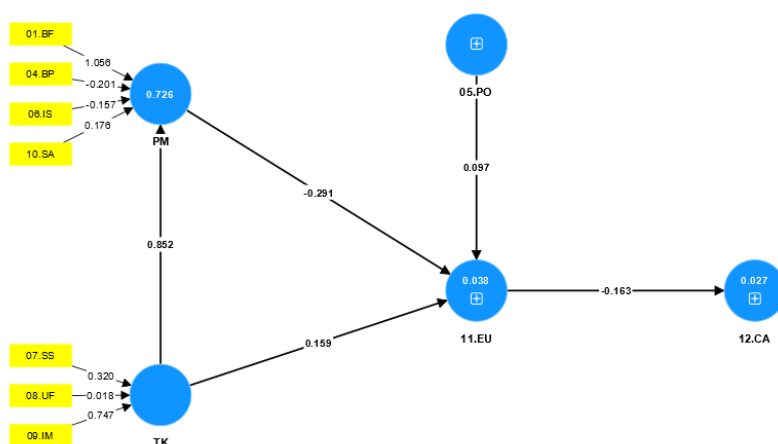
Table 11: *Order Construct Validity*

HOCs	LOCs	Outer Weight	t Statistics	p Values	Outer Loadings	VIF
PM	BF	1.056	4.947	0.000	0.083	2.089
	BP	-0.201	0.679	0.000	0.244	1.666
	SA	0.176	0.568	0.000	0.609	2.919
	IS	-0.157	0.909	0.000	0.611	2.525
TK	SS	0.320	1.340	0.000	0.870	2.998
	IF	0.018	0.075	0.000	-0.569	1.752
	IM	0.747	2.906	0.004	0.979	2.299

Table 12: *Hypotheses test result (Direct Relationship Result)*

	Original Sample (O)	STDEV	t Statistics	p Value
H1: PM -> EU	0.291	0.309	0.944	0.000
H2: TK -> EU	0.159	0.233	0.682	0.001
H7: PO -> EU	0.097	0.124	0.783	0.001
H11: EU -> CA	0.163	0.055	2.963	0.003
TK -> PM	0.852	0.075	11.306	0.000

A structural model with HOC is given below.

**Figure 5.** *Structural Model – HOC*

DISCUSSION OF FINDINGS

This section presents a discussion of the study's results in alignment with its stated objectives, methodology, and overall purpose. The title highlights the role of ERP in achieving competitive advantage, with emphasis on people and cultural dimensions. To investigate this, the study first conducted an SR under PRISMA 2020 guidelines to identify critical constructs and formulate hypotheses. These hypotheses were then empirically validated through a quantitative phase using PLS-SEM, a method suitable for

complex models and relatively small samples. The results reported and discussed below, therefore, represent the empirical testing of the conceptual model derived from the literature review, directly addressing the research objectives and ensuring consistency between the title, purpose, methodology, and findings.

Impact of Project Management (PM) on ERP usage towards Competitive Advantage (CA)

The findings demonstrate the importance of incorporating strong PM practices in

ERP projects to maximise the benefits of ERP system adaptation and gain a competitive advantage. Organisations should capitalise on developing PM skills and align them with ERP initiatives to ensure seamless implementation, effective utilisation, and strategic alignment with business objectives. Ultimately, a well-managed ERP system project coupled with efficient PM can significantly increase organisational efficiency and competitiveness, empowering sustainable growth in the dynamic business environment.

The results indicate that project management has a significant impact on competitive advantage in ERP projects. This is also tallied with preliminary evidence produced in previous research, as discussed in 3.3.1. A significant relationship ($B = 0.291$, $t = 0.944$, $p < .001$) between PM and EU was found in this study.

Some of the project management activities could have a significant impact on how the ERP system was implemented, which could ultimately affect post-project operations, system usage, and the resultant performance outcomes of implementing the system.

It demonstrates that employing established project management principles, best practice guidelines, and procedures is effective in enhancing the project's chances of success; however, it does not guarantee project success as measured by achieving a competitive advantage (Table 9).

Impact of Training & Knowledge Base (TK) on ERP usage towards Competitive advantage (CV)

The result that training and education are significant predictors of competitive advantage seems credible. Training programs that build user confidence in

using the system and improve the level of user engagement (Table 9) would be expected to result in better utilisation and improved system adaptation. The benefits derived from effective training programs, ranging from system operation to System administration levels, can translate into improved decision-making processes, BI reports, CRM, SCM, and customer service enhancements, as well as, most importantly, increased profit, ultimately leading to a competitive advantage (Table 9). Hence, Training Managers, knowledge base, etc., need to devote resources, leadership, and attention accordingly.

RESEARCH IMPLICATIONS, MANAGERIAL RECOMMENDATIONS, LIMITATIONS, AND FUTURE DIRECTIONS

Practical implications for organisations adopting or considering ERP systems

This research makes several contributions to the theory. 1) This piece of work provides empirical evidence of the role of ERP system use in the journey of competitive advantage in the market domain. 2) Further, we could identify a comprehensive list of constructs that influence the ERP system use in a business organisation. 3) This empirical evidence demonstrates that ERP system use highly depends on the activities and actions during the post-implementation period. Ram et al. (2013) revealed a significant effect on competitive advantage during the post-implementation period.

This research work highlighted that Project management's (PM) contribution to system use is vital and significant since PM is an HOC, and under PM, there are four (4) subdimensions. The preparation of end-users is also a considerable

construct and vital for a production system. TK is also an HOC in the tested model and has three (3) subdimensions. It has been sighted that business entities that know (and are learning management systems as part of the ERP system / as a module) assist them to survive in a situation like staff turnover. Staff resignation is unavoidable. At times, proper handover processes have not been followed. Maintaining a knowledge base is crucial for continuous improvement. Additionally, PM & TK, together with the PO, ultimately influence the use of the ERP system.

Ram et al. (2013) reveal that project management, Training and education, business process re-engineering, and system integration are critical success factors that influence an organisation's competitive advantage. In this research, we argue that the relationship to competitive advantage is mediated through the use of ERP systems and Constructs in higher-order and Lower-Order Contexts. The model was empirically tested, and the results supported the arguments, which could contribute to the development of the theory.

According to Ram et al. (2013), training, learning, and knowledge development will continue after the implementation of ERP and may contribute to achieving a competitive advantage. However, Ram et al (2013) couldn't claim this relationship. They left it for future studies. In this research, we studied the Higher-order construct of TK. Test results revealed a strong and significant relationship between the EU and its impact on CA.

Ruivo et al. (2012) discuss the relationship between the EU and business values. According to their model, business values were taken as "collaboration and analytics". The systematic literature review process revealed that collaboration

is an indicator variable in the Project management construct. However, analytics were found in many constructs and supported as an indicator variable rather than a business value.

Limitations and Future Research Directions

Identification of limitations in the study design or data collection

None of the reviewed studies could be rated as having a systematic review process or as following the PRISMA 2016/2020 statements or guidelines. This expressed the need for new research and design. Furthermore, only studies published in English were included, which may have introduced potential bias. A more comprehensive search may have identified additional studies, providing a broader range of results. The present terms, however, were considered relevant in relation to the objectives. This research and its results are based on the APAC region. The test environment is also applicable to the APAC region. The differences between one APAC region and another are not considered in this research. It is tested CA as a business value that organisations use in their ERP systems. This is another limitation of the research: we were unable to test other possible business values beyond CA.

Suggestions for future research to address the identified limitations

Since this research and its results are based on the APAC region, the test environment is also related to APAC; it is proposed to study "How does the APAC region vary from other regions in the world?" Another future study area we can highlight at this stage is the relationship between ERP use and business value. We specifically narrowed down our study in the EU to CA. Hence, Performance, efficiency, Return On Investment (ROI),

and similar business values should be empirically tested in future research.

It is agreed that a brief discussion of generalizability is warranted. While PLS-SEM is robust for exploratory models with smaller samples, the relatively small sample size may limit the external generalizability of the findings.

To address this, we will clarify that the study's contributions are primarily theoretical and methodological (developing and validating constructs and a model linking ERP use and competitive advantage), with practical implications that should be further tested in larger samples and diverse industry contexts in future research.

The final sample of 72 respondents was determined based on both practical and methodological considerations. Data collection was conducted within a bounded professional community (ERP project managers, IT managers, and staff users), and while outreach was broad, only 72 fully completed and usable responses were obtained.

For PLS-SEM, however, this sample size is acceptable. According to Hair et al. (2011, 2017) and Cohen's (1992) "10-times rule" and power analysis guidelines, PLS-SEM is well-suited for small to medium samples when the model involves higher-order constructs. With 72 observations, the model met the minimum threshold for statistical power of 0.80, as indicated by the reported effect sizes.

7.3 Recommendations for effective ERP system use and utilisation, and Strategies for gaining a Competitive Advantage through ERP System utilisation.

In today's economic environment, business organisations looking for a competitive edge must leverage technology. An ERP system is a highly effective instrument that can help you

achieve a competitive advantage. In terms of strategy, an ERP system can enhance productivity, efficiency, and numerous other business benefits. The following are key strategies to make the most of an ERP system use and obtain a clear competitive advantage:

1). Continual Training, Knowledgebase, Training Manager:

Invest in employee upskilling and training to enable them to utilise the ERP system effectively. By ensuring that the system is used efficiently, a trained workforce can inspect and adopt innovations that promote operational efficiency.

2) Regular System Performance Evaluation and IS audit check:

Evaluating the ERP's effectiveness and how well it aligns with the organisation's strategies should be monitored regularly. Users of the system will be delighted and encouraged to use it more with the help of optimised business processes. The Information System (IS) audit will ensure high system usage and verify that users adhere to established methods. The Project Management Office (PMO) and top management will be able to identify areas for improvement with the aid of the output and results of the IS audit process.

3) Project management, Lean & Agile implementation:

An ERP system that enables quick response to shifting market conditions and changing consumer expectations. Businesses can gain a competitive edge in sustaining consumer loyalty and staying one step ahead of the competition by having a mature ERP system in place. Lean and Agile practices can help you stay up-to-date.

4) Streamlined and Efficient Operations:

Use the ERP system to streamline and integrate business processes. By eliminating operational bottlenecks and enhancing efficiency, you can deliver

products and services more quickly and cost-effectively than your competitors.

5) Readiness audit, Epics, Enhanced Customer Experience:

Implement a customer relationship management system to enhance customer engagement, satisfaction, and loyalty, thereby fostering closer relationships with existing customers and attracting prospective ones. Most business organisations struggle with scoping, identifying the correct epics, and creating effective business cases. The client's readiness to implement an ERP system is also a significant factor in project success.

The conclusion finally summarises the study's key findings, applications, constraints, and future research directions.

CONCLUSION

Conclusion of study

This study attempted to fill the gap that exists in ERP Project Management. The literature lacks theoretical evidence for identifying various cultural challenges in ERP projects at specific stages of the project. To the best of my knowledge, this is the first systematic review in the APAC region that aims to provide a comprehensive overview of the cultural implications of ERP project use and its impact on competitive advantage. The results of this research support the proposed relationship in the conceptual model. During the systematic review, the researcher identified inconsistencies and challenges associated with ERP system use (EU) and its indicators, as well as the relationship between ERP system use and competitive advantage (CA). There was little evidence on the definition of the criteria for indicator variables for the EU, CA, and cultural challenges in the ERP project stages. A gap in the EU's relationship with CA has been identified in the literature. The researcher had planned to model the indicator variables

and constructs as dependent constructs in a linear model. During the model testing, the researcher discovered that it was not linear. After several iterations of the same model, we identified higher-order constructs (HOCs) and lower-order constructs (LOCs) that should clarify the relationship between independent elements and dependent elements within the model. Further investigation is required to understand how to mitigate and the best methods to control the formative-formative or formative-reflective model. At this stage, it is highly beneficial for the author to utilise identified protocols to proceed with the research. Accordingly, this analysis provides a helpful, in-depth understanding of project cultural challenges from the perspective of implementing an ERP system, particularly in relation to conflict management and risk-averse environments during the ERP post-implementation stage.

Many researchers (Ram et al., 2013; Ruivo, 2012; Halim et al., 2018; Wong & Tein, 2003; Bannerman, 2008) have investigated the factors influencing the success of ERP implementation. However, limited literature was found on how and what influences the use of ERP systems and their value to the organisation. This research has been limited to identifying possible constructs related to ERP system use (EU) and ultimately determining its role as a competitive advantage (CA) to the organisation. In an effort to fill this knowledge gap, this research has empirically established the factors that drive the use of ERP systems, ultimately enabling businesses to achieve a competitive advantage in the market space.

The conceptual model underwent several iterations, and finally, it was tested as LOC was finalised with a formative-formative model and HOC was finalised

with a formative-reflective model. Further, we can identify higher-order constructs (HOC) and Lower-order constructs (LOC) that are related to the EU. We found 1) Project management (PM) and 2) Training & knowledge (TK) as HOC and its subdimension (i.e., LOC) as “BF, BP, SA, and IS”; “SS, UF, and IM” respectively. However, PO to EU remains the lower-order construct. It is expected that staff learning and knowledge development will lead to the effective and efficient use of the system, which will occur post-implementation of the ERP system, thereby generating a competitive advantage (CA). We calculated the goodness of fit (GoF) value for the model by using the procedure recommended by Hair et al (2019, 2023). The GoF value for our model is 0.44, indicating a strong model fit. Hair et al. (2014) recommended GoF values of 0.1, 0.25, and 0.36 as cut-offs for small, medium, and large goodness of fit. The substantially large goodness-of-fit (GoF) value of 44% for the model also demonstrated the robustness of the study's results.

Executive Summary

This study investigated the role of ERP implementation in achieving competitive advantage, with particular emphasis on the influence of people- and culture-related factors. Using a SR (PRISMA 2020) to identify constructs and hypotheses, followed by quantitative validation through PLS-SEM, the research confirmed that dimensions such as project management, training, process optimisation, and teamwork play a crucial role in strengthening ERP use and delivering a sustainable competitive advantage.

From a theoretical perspective, the study extends established frameworks such as the Resource-Based View and Dynamic Capabilities Theory by integrating human

and cultural dimensions into ERP adoption research. This contribution broadens the understanding of ERP-driven competitive advantage beyond purely technical and process-based explanations.

From a practical perspective, the findings highlight that organisations should prioritise capacity building, training, leadership development, and cultural alignment alongside technological investments. Managers are encouraged to form best-fit teams, align ERP projects with strategic objectives, and minimise unnecessary customisations to maximise ERP effectiveness and organisational performance.

While the study makes significant contributions, limitations must be acknowledged. The relatively small sample size and regional focus constrain generalizability, and the reliance on self-reported survey data may introduce bias. Future research should build on this study by expanding to larger and cross-regional samples, applying longitudinal designs to capture dynamic effects over time, and integrating qualitative approaches to deepen insights into the cultural and behavioural aspects of ERP adoption.

In summary, this study advances both theory and practice by demonstrating that ERP success and competitive advantage depend not only on systems and processes but also—crucially—on people and culture.

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Australia, New Zealand, Fiji, Singapore, India, Sri Lanka, Malaysia, Indonesia, Thailand, Vietnam, UAE, Japan), and contributed to the data gathering.

Author's Contribution

Authors are responsible for the idea, concepts and design. The figures were taken from SmartPLS4 and MS Visio. All authors contributed to the manuscript writing and approval of the final version.

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