Overall Success Factors Affecting the Performances of Hybrid Cloud ERP: A Case Study of Automobile Industries in Thailand

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Abstract

The hybrid cloud ERP system is widely used in automobile companies in Thailand. It is a popular and effective strategic tool that aids in boosting organization's competitiveness. However, because of their complexity, high risk, high resource requirements, and high investment costs, ERP projects still have a significant failure rate. It is widely acknowledged by academics and practitioners alike to be an extremely challenging endeavour. This study proposes a conceptual paradigm for postmodern ERP implementation across the entire life cycle. Mixed methodologies for this model's theoretical development included case study observation, literature review, semi-structured interviews with ten IT experts and ERP consultants, and online questionnaires. Based on information gathered from 455 system users from 114 automobile industries sector, it was analysed by using Structural Equation Modelling (SEM). For data analysis, the partial least squares (PLS) method was employed. Out of the eighteen (18) hypotheses, fifteen (15)

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were supported by the PLS-SEM results. The conceptual model from the study that was presented can be put to use or helpful in the organization's management, or project managers can utilize it as a framework and direction for hybrid cloud ERP implementation. The findings of the study can also be used to create a conceptual framework for the actual use of ERP systems for automobile industry, such as the incorporation of blockchain and postmodern ERP systems in many sectors of business. There is discussion of the findings' implications for practical and research, and potential study areas are proposed.

Keywords: Hybrid cloud, ERP, success factors, automobile industries, performances.

1 Introduction

Thailand was the fifth-biggest producer in Asia, the first in the ASEAN region, and the 11th largest producer globally in 2019 thanks to its overall vehicle output. However, Thailand ranks 17th globally, 6th in Asia, and 2nd in the ASEAN region in terms of unit sales. The market is divided among the following kinds of vehicles: Transport for people: These make up 46% while commercial vehicles make up 54% [1]. survey findings for The usage of digital technology in the industrial including automobile sector has an upward tendency, according to a 2020 poll, which shows that Thailand is moving faster into the Industry 4.0 era and that the digital industry is continuously expanding. The digital technologies adopting in industry 4.0 era for instance business intelligence, big data analytics, internet of thing, cloud technology and ERP system [2].

ERP combines processes and functions inside an organization to execute business operations in a seamless, effective, and more transparent manner. In order for enterprises to use ERP, there are primarily two types of ERP being used: on-premise ERP solutions and cloud-based ERP services [3, 4]. A collection of comprehensive business process management tools known as an ERP system was created to allow real-time transaction management in a single system with a database that supported external system integration [5, 6]. The importance of ERP is rising for contemporary businesses worldwide, in both the public and commercial sectors of every industry [7]. ERP system are core technology and backbone of the organization [8]. It like a core business tool effective tool or weapon that boosts an organization's competitiveness [9, 10]. The impact of effective implementation on the relationship between survival and improved organizational performance [11] in terms of development and long-term competitive advantages [12].

However, although ERP is useful to organizations and is widely used. The hybrid cloud ERP implementation is a complicated [13], risk, high resource and investment budget [5, 14–17]. Hongyi Sun [18] demonstrate that 66% of the businesses using ERP software efforts accomplish less than 50% of the promised verifiable benefits, Cost overruns are reportedly present in 54% of ERP projects and 72% to be time overrun. According to the study examined 7,400 IT projects, 34% delayed or overspread, and 31% cancelled, and only 24% of projects were completed on time and within budget [5, 15]. ERP failure rates remain high, which is of concern [5, 11], the failure factor and risk in ERP Project is classified into various factors such as Organizational risk factors, Project Management, Human Resource Management, Managerial, ERP Software, and Vendor and Consultants [15, 19].

Previous researches, there are numerous studies involving success factors (CSFs) in implementing ERP systems [18]. However, determining the success factor may not be enough because success in one phase does not imply success in other phase [18], which should consider additional project control issues at all ERP life-cycle stages in term of pre-implementation, implementation, post-implementation and overall postmodern ERP performance outcome as shown in Figure 1. Most studies have shown that such research focuses on determining the factors at a specific time [20, 21]. And focuses on KSSs affect to each outcome such as (a) ERP Project Success, (b) ERP System Quality, and (c) Organizational Performance or specific in traditional erp. However, a few research illustrated that Key Success Strategies (KSSs) have an overall impact on performance. To fill an important gap in this study on hybrid cloud ERP that conceptualizes from two research questions (RQs), RQ1: What are holistic key success factors from full life hybrid cloud ERP implementation? And RQ2: How these KSSs affect overall hybrid cloud ERP Performance?

According to the research questions, the research design presented that has passed through and added to the limitations of these prior research areas to fill research gaps further described in Tables 1 and 2. As a result of all the foregoing, it is necessary to continue the study in practice and theory. Therefore, the objective of this paper is to purpose a conceptual PLS-SEM model to first, explain a holistic view of KSSs and the ERP life-cycle perspective utilized for postmodern ERP implementation. Second, empirically examine the multi-dimensional relationship between specifically chosen Key Success Strategies (KSSs) and ERP Implementation Success is defined as

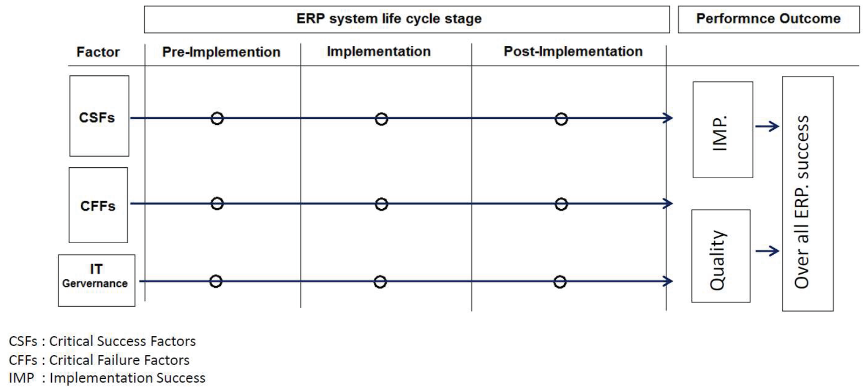

Figure 1 Full life postmodern ERP implementation.

(a) ERP Project Success, (b) ERP System Quality, and (c) Organizational Performance. Based on the foregoing, ERP studies continue to be critical and challenging in terms of how to effectively install an ERP based on the organization's objectives.

There are seven sections to this paper. A review of related literature and theories is presented in Section. 2. Research model and hypotheses are illustrated in Section 3. In Section 4, we describe and detail for research methodology. In Section 5, analysis and findings are presented. The discussion in Section 6 includes practical implications, research implications, and limitations, and suggestions for future research. Finally, conclusions are then presented in Section 7. As a result of the foregoing, if ERP failure rates remain high, the study must be continued, both practically and theoretically.

2 Literature Review and Background Theory

2.1 Technology-Organization-Environment (TOE) Framework

TOE represents how organizations embrace technology and how these adoptions are influenced by the environmental, organizational, and technological contexts. The technological context is all the technologies that a technology company uses, both inside and outside of the company. This can include equipment and procedures [22–24]. The organizational context includes information on the company's resources and character, particularly its size, the degree of management and control, the degree of approval, the human resource management structure, the number of sagging resources, and the connections between employees [22, 23]. The contextual environment consists of the size and structure of the industry [22, 23, 25]. Schniederjans and Yadav [22] summarized that Technology-Organization-Environment are factors for successful ERP implementation.

2.2 People-Process-Technology (PPT) Framework

PPT describes Information Governance (IG) consists of (1) setting strategies, (2) resource management, (3) building an information technology infrastructure, and (4) performance measurement and risk management. Many organizations can manage risks while applying technology. Especially, Risks in information system management arose from records management, a system that manages data from its inception to its destruction, such as documents. In the form of paper and electronic data, etc., when the information is complex [26–31].

In summary, the background theory of the KSSs illustrated in Table 1 can be described as follows: (a) Absorptive capacity theory characterize the capacity of an organization to locate, absorb, transform, and apply important outside knowledge. (b) Organizational information processing theory represents requirements and capacity for information processing. (c) Stakeholder Theory: every person or group participating in the activities of a firm. (d) Resource dependency theory: defined as organizations maximizing their power. (e) The resource-based view: firms possess resources, a subset of which enable them to achieve competitive advantage.(f) Contingency theory: a leadership style that is effective in some situations may not be successful in others or be external to organization's performance. (g) Knowledge-based firm theory: heterogeneous knowledge bases and capabilities and competitive advantage, firm performance. (h) Strategic choice theory represents the function that leaders perform in influencing an organization through political decision-making.(i) Organizational Culture Theory describes organizational culture strength, organizational culture type, and cultural congruence. (j) Delone and McLean IS success model: criteria for evaluate Information System Quality. (k) Balanced Scorecard. (l) Theory of organizational readiness for change. (m) Theory of contingent business process management.

TOE and PPT framework was constructed from the background theory in Success factor of hybrid cloud ERP implementation as show in Table 1. The proposed concept was conceptualized from the research question and develop to the research model and hypothesis. that can be summarized in Table 2 and described in Section 3.

Table 1 Background theory in success factor of hybrid cloud ERP implementation

Background Theory	Success Factors					
x = *matching factors*	People Contexts	Process Contexts	Technology Contexts	Organization Contexts	External Environment	References
Theory of the success factors						
Absorptive capacity theory	x	x		x	x	Cohen and Levinthal [32]
Organizational information processing theory			x			Galbraith [33]
Stakeholder Theory	x			x	x	Parmar, Freeman, Harrison, Wicks, Purnell and de Colle [34]
Resource dependency theory		x		x	x	Ulrich, D. and J. B. Barney (1984)
The resource-based view	x	x	x	x		Barney, Wright and Ketchen [35]
Contingency theory	x	x	x	x		Weill and Olson [36]
Knowledge-based of the firm theory				x		Sveiby [37]
Strategic choice theory	x	x				Child and John [38]
Organizational Culture Theory		x		x		Schein [39]
Theory of organizational readiness for change		x		x		Weiner [40]
Theory of contingent business process management		x		x		Zelt, Recker, Schmiedel and vom Brocke [41]
Theory for Overall Outcomes						
Delone and McLean IS success model			x			Delone and McLean [42]
Balanced Scorecard		x	x	x		Kaplan and Norton [43]
IT strategy implementation matrix			x	x		Gottschalk [44]
This proposed concept	x	x	x	x	x	Note that : No one has proposed

3 Research Model and Hypothesis

3.1 Research Model

The hypothesis formulation as shown in Table 2 was conceptualized from background theory as shown in Table 1. The overall success factor such as people context, process context, technology context, organization context and external environment context. It was constructed from the relation of the success factors and overall outcomes such as ERP project success, ERP system quality and organization performance can be described in Section 3.2 the hypothesis.

The research model illustrated in Figure 2 was conceptualized from previous research [3, 11, 22, 52, 53, 55]. It was categorized into three groups: The first group was to study the relationship between KSSs and hybrid cloud ERP project. The second group was to study the relationship between KSSs and organization performance. The third group was to study the relationship between ERP system quality and organizational performance, as shown in Table 1. There are numerous studies of CSFs or KSSs. However, there are a few studies of some KSSs multiples related to hybrid cloud ERP project success, hybrid cloud ERP system quality, and organization performance. For instance, Ram, Corkindale and Wu [11] indicated that some KSSs in terms of project management, training and education, business process re-engineering and system integration influence to both ERP Project and organization performance. To contribute, this research proposes overall KSSs in holistic view perspective and these affecting overall hybrid cloud ERP Projects outcome such as system quality, project success, and organizational performance.

3.2 Hypothesis

According to the summary of related research, this study conceptualizes the research model from failure and risk, as well as the KSSs from previous research from 2005 to 2020, to fill research gaps. This model was developed with the hypotheses in sense of these contexts: people, process, technology, organization, and external environment were constructed from various theories and can be classified as holistic KSSs as described in Section 2, shown in Table 1, and a conceptual research model as shown in Figure 2.

3.2.1 People context factors

People context factors constructed from any perspective, for instance experience, contingency, knowledge-based and leadership [22, 27, 31, 56–61] as can be seen the summarize Theory in Table 1 and the previous research in

Table 2 Hypothesis formulation summarized

		Success Factors					Outcomes		
Authors	Study Factors	People Context	Process Context	Technology Context	Organization Context	Ext. Environment Context	ERP Project Success	ERP System Quality	Organization Performance
Motwani, Subramanian and Gopalakrishna [45]	1. strategic initiatives 2. learning capacity 3. cultural readiness 4. IT leveragability and knowledge-sharing capability 5. network relationships 6. change management practice 7. process management practice	x	x				x	–	–
Bernroider [46]	1. System Quality 2. Information Quality 3. Service Quality			x			–	–	x
Ngai, Law and Wat [47]	1. IT legacy systems, 2. Business plan/vision, 3. Business process reengineering, 4. Change management, 5. Communication, 6. Data management, 7. Top management support	x	x		x		x		

(*Continued*)

Table 2 Continued

		Success Factors					Outcomes		
Authors	Study Factors	People Context	Process Context	Technology Context	Organization Context	Ext. Environment Context	ERP Project Success	ERP System Quality	Organization Performance
Chuck C.H. Law [9]	1. Implementation Strategy 2. Organization & Infrastructure 3. Client–Vendor Alignment 4. Support & Participation 5. Ability to Leverage ERP Expertise 6. Communication & Co-ordination 7. M&S Strategy and Focuses 8. Quality of ERP Implementation	x	x		x	x	x	x	–
R., Woosang and A. [48]	1. ERP Implement 2. Business Strategy 3. Organizational Capabilities		x		x		x	–	x
Ram, Corkindale and Wu [11]	1. Project management 2. Training and education 3. Business process re-engineering 4. System integration		x				x	–	x
Schniederjans and Yadav [22]	1. Technology 2. Organization 3. Environment			x	x	x	x	–	–

(*Continued*)

Table 2 Continued

Authors	Study Factors	Success Factors					Outcomes		
		People Context	Process Context	Technology Context	Organization Context	Ext. Environment Context	ERP Project Success	ERP System Quality	Organization Performance
Galy and Sauceda [49]	1. Technological competence 2. Outside experts or consultants 3. Engaged top management support 4. Knowledge of the strategic emphasis	x					x	–	x
Garrison, Wakefield and Kim [27]	1. Managerial IT capability 2. Technical IT capability 3. Managerial capability	x			x		x	–	x
Ahmadi, Papageorgiou, Yeh and Martin [50]	1. Social readiness 2. Organizational readiness 2.1 Planning readiness 2.3 Structural readiness 2.3 Strategy readiness 3. Technical readiness	x	x		x		x	–	–
Yung-Chi Shena [7]	1. Financial perspective 2. Customer perspective 3. Innovation and learning 4. Internal business process	x	x				–	–	x

(*Continued*)

Table 2 Continued

		Success Factors					Outcomes		
Authors	Study Factors	People Context	Process Context	Technology Context	Organization Context	Ext. Environment Context	ERP Project Success	ERP System Quality	Organization Performance
Gupta and Misra [51]	1. Organizational Factors 2. People Factors 3. Technological Factors	x	x	x			x		
Li, Chang and Yen [20]	IT governance 1. Strategic Alignment 2. Risk assessment 3. Resource Management		x		x		x	–	–
Gupta, Misra, Kock and Roubaud [52]	1. Organizational 2. Technological 3. Compliance 4. Network 5. Security			x	x		x		
Gupta, Qian, Bhushan and Luo [53]	1. Big data predictive analytics 1.1 Data 1.2 Managerial skills 1.3 Technical skills 2. Organizational factors 3. People factors 4. Technological factors	x		x	x		x		x

(*Continued*)

Table 2 Continued

Authors	Study Factors	Success Factors: People Context	Success Factors: Process Context	Success Factors: Technology Context	Success Factors: Organization Context	Success Factors: Ext. Environment Context	Outcomes: ERP Project Success	Outcomes: ERP System Quality	Outcomes: Organization Performance
Gupta, Meissonier, Drave and Roubaud [54]	1. Organizational 2. People 3. Technological 4. Cloud ERP Project	x		x	x		x		x
This proposed model	1. People, 2. Process, 3. Technology 4. Organization, 5. Environment	x	x	x	x	x	x	x	x

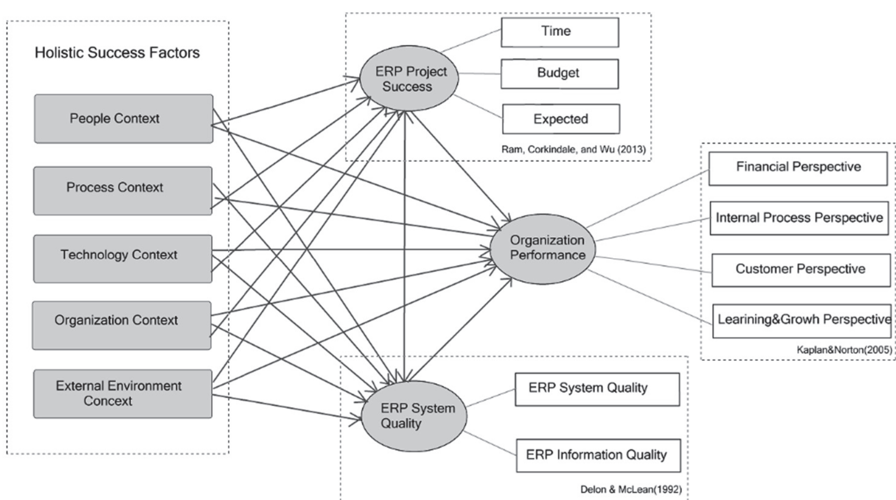

Figure 2 Conceptual research model.

Appendix section in Table A1. All of the aforementioned elements, which are connected to the success of hybrid cloud ERP projects, the quality of ERP systems, and organizational performance, may be explained in terms of human behavior. Therefore, it is imperative to consider the people context in the first issues that inconsistent to above theory can be summarized the related hypothesis as follow:

H1. People Context Factors will positively be associated with hybrid cloud ERP project Success.
H2. People Context Factors will positively be associated with hybrid cloud ERP System Quality.
H3. People Context Factors will positively be associated with Organization Performance.

3.2.2 Process context factors

The organizational information processing theory and the absorptive capacity theory were used to create the process context factors, resource dependency theory, as can be seen the summarize Theory in Table 1 and the previous research in Appendix section in Table A1 for instance, IT scalability and knowledge sharing, reworking and improving business processes, education and training, project planning, and information flow management [22, 27, 31, 56–61]. Each of the aforementioned elements, which are connected to the success of hybrid cloud ERP projects, the quality of the hybrid cloud ERP system, and organizational performance, can be explained in terms of business processes. Consequently, it is crucial to take the Process context into account of the second issues can be summarized the related hypothesis as follow:

H4. Process Context Factors will positively be associated with hybrid cloud ERP Project Success.
H5. Process Context Factors will positively be associated with hybrid cloud ERP System Quality.
H6. Process Context Factors will positively be associated with Organization Performance.

3.2.3 Technology context factors

The innovation context elements, which include IT infrastructure/facilities, ERP package capability and compatibility, data analysis and conversion, and efficient legacy enterprise system, were built using resource-based view theory and diffusion of innovations theory [22, 27, 31, 56–61], as can be seen the summarize Theory in Table 1. The Security parameters, TC6 Relative advantage of Security Technology as shown in Appendix A Table A1. used to make hybrid cloud erp more secure is privacy, integrity, availability, authentication, authorization, and accountability is the major concern [54, 62–65]. The technology background that is related to ERP Project Success, ERP System Quality, and Organization Performance can be used to explain all of the aforementioned elements. Therefore, it is crucial to take into account the technological context aspects in the third difficulties that run counter to the aforementioned idea, which can be summed up as follows:

H7. Technology Context Factors will positively be associated with hybrid cloud ERP Project Success.
H8. Technology Context Factors will positively be associated with hybrid cloud ERP System Quality.
H9. Technology Context Factors will positively be associated with Organization Performance.

3.2.4 Organization context factors

The organization context factors were constructed from strategic choice theory and organizational culture theory, in terms of managing cultural change, corporate culture, clear vision, goal, and objective; management preparedness for change; and cultural readiness. [22, 27, 31, 56–61], as can be seen the summarize theory in Table 1 and the previous research in Appendix section in Table A1. The organization context, which is related to hybrid cloud ERP Project Success, hybrid cloud ERP System Quality, and Organization Performance, can be used to explain all of the aforementioned aspects. Therefore, it is essential to consider aspects of the organizational context in the fourth concern that defy the above theory. The following is the associated hypothesis:

H10. Organization Context Factors will positively be associated with hybrid cloud ERP Project Success.
H11. Organization Context Factors will positively be associated with hybrid cloud ERP System Quality.
H12. Organization Context Factors will positively be associated with Organization Performance.

3.2.5 External environment factors

The external environment context factors which is important for the organization but uncontrollable factors. These were built using the stakeholder theory, taking into account the expertise and skills of the ERP consultant, the selection and relationship of the consultant, the similar partner priorities, the collaborative partner support, the trust between partners, the similarity of partner cultures, the competition, the pressure from regulations, the characteristics of the vendor process mode, the consultant process mode, and the consultant's business and technical knowledge [22, 27, 31, 56–61], as can be seen the summarize theory in Table 1 and the previous research in Appendix section in Table A1. The external environment, which is connected to hybrid cloud ERP Project Success, hybrid cloud ERP System Quality, and Organization Performance, can be used to describe all of the aforementioned elements. Therefore, it is imperative to consider the external environment factors in the fifth issues that inconsistent to above theory can be summarized the related hypothesis as follow:

H13. External Environment Context Factors will positively be associated with hybrid cloud ERP Project Success.
H14. External Environment Context Factors will positively be associated with hybrid cloud ERP System Quality.
H15. External Environment Context Factors will positively be associated with Organization Performance.

3.2.6 Post ERP implementation outcome

The group of hypotheses of Post ERP Implementation Outcome can be classified into 3 factors follow: ERP System Quality, ERP Project Success, and Organization Performance in each group, the relationship can be described in the following cases. (1) If ERP Project Success which constructed from IT strategy implementation matrix Theory Gottschalk (1999) will be affects to both the ERP System quality that constructed from IS success model Delone and McLean (1992) and the organization performance which constructed from Balanced Scorecard Kaplan and Norton (1992), as can be seen in Table 1. Similarly, the ERP System Quality will be related to Organization Performance. Therefore, it is imperative to consider the ERP Project success factors and ERP System Quality in the sixth issues that inconsistent to above theory can be summarized the related hypothesis as follow:

H16. The quality of the hybrid cloud ERP system will be positively correlated with ERP project success.
H17. The success of hybrid cloud ERP projects will be positively correlated with organizational performance.
H18. The hybrid cloud ERP System Quality will be associated with organization performance in a Positive Manner.

4 Research Methodology

This study uses a mixed research method, both qualitative and quantitative. There was a process of collecting data by using a semi-structured interview method and answering an online questionnaire.

4.1 Measurement Instrument and Demographics

Based on the gathered data, this model was examined using structural equation modelling (SEM) with these criteria selection is from 4 ERP Users whose are management level in the automobile industries which implemented ERP System in Thailand at least 2 years. The demographics collected from 455 ERP users from 114 automobile industries organizations. (4 ERP User $\times$ 144 Organizations $=$ 455) some organization have 3 ERP users respond. Survey based technique were using, online questionnaire and specific e-mail in this study. Reflective items on a five-point Likert-type scale with the codes strongly disagree (coded as 1), disagree (coded as 2), neutral (coded as 3), agree (coded as 4), and highly agree (coded as 1) were used to measure the variables (coded as 5). The demographics of the participating from 114 firms, as shown in table 5 and the profile of 455 respondents. The survey questionnaire and their sources as show in Appendix A.

4.2 Research Plan and Data Gathering Process

The research design and data collection procedure as shown in Figure 2. It can be summarizing in eleven steps as follow:

(1) Synthesizing existing literature review from 2005–2020 with keyword searching "the failure and risk of ERP, "the key strategic factors", "ERP Implementation" and "PLS-SEM in management information system" using PPT concept and TOE-framework for categorize these KSSs to constructed from ERP full life cycle, as shown in Appendix Section in Table A1.
(2) Semi-structure interview from ten IT Expertise and ERP Consultants whose have more ten years' experience with fifteen (15) questions for instance: What risk considerations were essential to the ERP project's deployment, according to (a)? and (b) "What organizational (process), financial, and technological (system) inefficiencies were found, and how were they viewed to be limiting current and future business needs?"
(3) Case study observation from the three enterprises from automobile industry companies which implemented ERP System for 2 years ago with period three weeks.

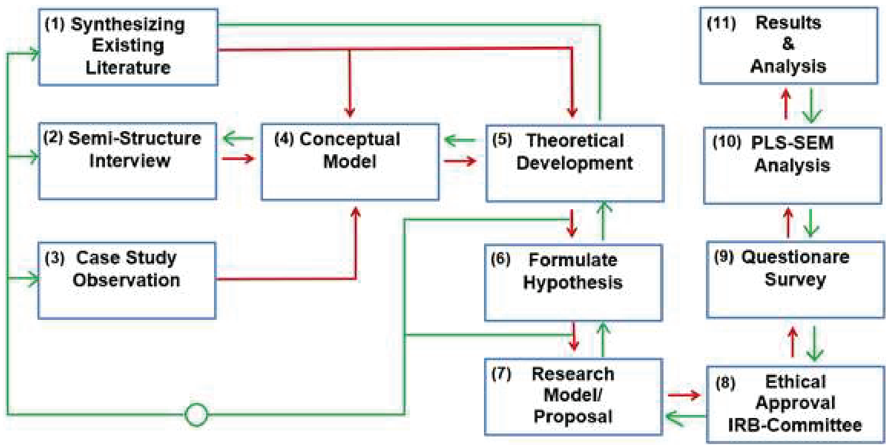

Figure 3 Research design and data collection procedure.

(4) The conceptual model was constructed from the synthesizing existing literature review, the semi-structure interview issues collected and the case study observation for conceptualize the any factors.
(5) This model was theoretical developed in this process form multidisciplinary theory as shown in Table 1 and Table A1 of Appendix section.
(6) 18 hypotheses were formulated in this process as described in Section 3.2 and showed in Figure 1.
(7) The final research model has been proposed in this process.
(8) The measurement instrument, semi-structure interview question and The questionnaire obtained permission from Mahidol University's Institutional Review Board (IRB) and was given the approval code MU-CIRB 2018/073.2203.
(9) The survey process using online questionnaire via electronic mail and An online survey created with Google Form application was shared in ERP user 's Facebook group. The Survey Questionnaire and their Sources, as can be seen in Appendix A in Table A1. The information of automobile industries collected from Department Of Industrial Promotion(DIPROM) [66].
(10) The survey from step 9 was finished and next process, The PLS-SEM (Variance base-SEM) was used for data analysis and last process.
(11) The results and analysis was proceed using Smart PLS as shown in Topic 5.

5 Analysis and Result

The structure equation modeling (SEM) is applied to analyst the propose model using SmartPLS (v.3.3.3) [67], which is suitable for the variance based, composite-based and causal-predictive, the data that are not normally distributed [68], it supports a small sample size and a complex model, which is more suitable for exploratory research in which the goal is to predict statistical models or developing a theory focusing on explaining [69–71]. The results of this study consist of the assessment of the measurement model as summarized in Section 5.1 and the assessment of the structural model as summarized in Section 5.2.

5.1 Assessment Model for Measurement

This paper proposes the measurement model assessment in four statically criteria consist of (a) Research variables and their sources as presented in Table 3. (b) Reliability and validity results as presented in Table 4. (c) Construct Reliability and Validity as presented in Table 5. And (d) Discriminant validity of the measurement model as presented in Table 10 [71]. In summary, the items sources and associated descriptive statistics for the construct

Table 3 Research Variables for the study and their sources

Constructs	Measures Counted	Mean	S.D.	Source
People Context (PP)	4	3.830	0.741	Cohen and Levinthal [32, 72, 73]
Process Context (PC)	4	4.102	0.767	Suresh, Mohamed and K.V. [79, 80]
Technology Context (TC)	6	4.013	0.661	[25, 59, 60, 74]
Organization Context (OC)	2	3.856	0.863	Gangwar, Date and Ramaswamy [58–60, 74]
External Environment (EE)	4	3.591	0.537	Schniederjans and Yadav [22, 58, 60]
Project Success (PS)	4	3.630	0.801	Ram, Corkindale and Wu [11, 22]
ERP System (ES)	6	3.923	0.850	[42, 46], William and Ephraim [75, 76]
Organization Performance (OP)	6	3.809	0.857	[7], Kaplan and Norton [43, 76–78]

are highlighted in Table 6, people context were adapted from Cohen and Levinthal [32, 72, 73]. Process context were adapted from Awa et al., 2016; Baker, 2012; Low, Chen, & Wu, 2011; Yang et al., 2015. Technology context were adapted from [25, 59, 60, 74]. Organization context were adapted from Gangwar, Date and Ramaswamy [58–60, 74]. External environment were adapted from Schniederjans and Yadav [22, 58, 60]. Project success were adapted from Ram, Corkindale and Wu [11, 22], ERP System were adapted from [42, 46], William and Ephraim [75, 76], and Organizational performance were adapted from [7], Kaplan and Norton [43, 76–78]. According to the results of the descriptive statistics, the acquired means fell between the ranges of 3.591 and 4.102, while the standard deviations (S.D.) fell between 0.537 and 0.863.

According to Table 4, each item was tested largely using descriptive statistics. The findings demonstrate that (a) the obtained means fell between 3.433 and 4.501, (b) The range of the standard deviations (S.D.) was between 0.500 and 0.985, (c) Indicator loading is acceptable at a value greater than 0.70 [71], with a range of 0.583–0.933, (d) Outer VIF having a range of 1.278–4.403, acceptable at less than 5.00 [53]. This model were statistically analysed with these software, Based on Cronbach's Alpha, PASW Statistics version 18.0 and SmartPLS version 3.3.3 are acceptable when the values are more than 0.70 [71].

The construct reliability and validity are illustrated in Table 4. The Cronbach's Alpha result are met the standard criterion except theses constructs Organization Context is 0.658 and People Context is 0.691. The Composite Reliability (CR) with suitable values greater than 0.70 [71], there is a range of 0.811–0.956. The range of 0.522 to 0.845 was determined to be the acceptable value for the Average Variance Extracted (AVE) with acceptable value higher than 0.50 [71]. Therefore, Cronbach's Alpha, Composite Reliability, and Average Variance Extracted statistic values for each construct were found to satisfy the three main criteria.

The discriminant validity assessment is shown in Table 6 for analysing associations between latent variables [81]. It can be summarized by using Fornell-Larcker Criterion with a criterion is not less than 0.70 [82], whereby the evaluation using the square root of the extracted average variance (AVE). The Discriminant validity result of this model show that with these dimension: ERP System is 0.836, External Environment is 0.919, Organization Context is 0.863, Organization Performance is 0.746, People Context is 0.723, Process Context is 0.868, Project Success is 0.863, and Technology Context is 0.736.

Table 4 The results of reliability and validity

Construct	Index	Mean	S.D.	Loading (>0.70)	VIF (<5.00)
People Context(PP)	PP1	3.996	0.798	0.583	1.278
	PP2	3.637	0.561	0.699	1.335
	PP3	3.840	0.932	0.860	1.707
	PP4	3.846	0.672	0.723	1.346
Process Context(PC)	PC1	4.160	0.734	0.872	1.906
	PC2	3.993	0.800	0.890	3.336
	PC3	4.253	0.744	0.815	2.546
	PC4	4.002	0.789	0.895	3.214
Technology Context(TC)	TC1	3.637	0.561	0.649	1.442
	TC2	3.884	0.957	0.772	1.638
	TC3	3.857	0.682	0.822	2.855
	TC4	4.141	0.591	0.650	1.791
	TC5	4.501	0.500	0.798	2.734
	TC6	4.057	0.674	0.705	2.097
Organization Context(OC)	OC1	3.859	0.797	0.850	1.317
	OC2	3.853	0.937	0.876	1.317
External Environment(EE)	EE1	3.580	0.528	0.923	4.370
	EE2	3.589	0.535	0.906	3.422
	EE3	3.602	0.553	0.922	4.298
	EE4	3.593	0.534	0.927	4.029
Project Success(PS)	PS1	3.486	0.906	0.933	4.403
	PS2	3.523	0.946	0.895	3.936
	PS3	3.824	0.604	0.904	3.209
	PS4	3.686	0.747	0.699	1.712
ERP System(ES)	ES1	3.754	0.796	0.878	4.091
	ES2	3.771	0.815	0.875	3.862
	ES3	4.305	0.952	0.829	3.205
	ES4	3.857	0.833	0.920	4.395
	ES5	3.943	0.893	0.872	3.100
	ES6	3.910	0.808	0.602	1.572
Organization Performance(OP)	OP1	3.998	0.955	0.607	1.632
	OP2	4.029	0.696	0.769	2.081
	OP3	3.884	0.957	0.828	2.746
	OP4	3.624	0.736	0.626	1.785
	OP5	3.433	0.985	0.841	2.848
	OP6	3.886	0.809	0.774	2.057

Table 5 Construct reliability and validity

Construct	Cronbach's Alpha	rho_A	Composite Reliability	AVE
ERP System	0.909	0.918	0.932	0.699
External Environment	0.939	0.940	0.956	0.845
Organization Context	0.658	0.661	0.854	0.745
Organization Performance	0.837	0.858	0.881	0.557
People Context	0.691	0.728	0.811	0.522
Process Context	0.896	0.967	0.925	0.754
Project Success	0.883	0.915	0.920	0.744
Technology Context	0.831	0.849	0.875	0.541

Table 6 Validity of the measuring model for discrimination (Fornell-Larcker Criterion)

Dimension	ES	EE	OC	OP	PP	PC	PS	TC
ERP System (ES)	**0.836**							
External Environment (EE)	0.570	**0.919**						
Organization Context (OC)	0.674	0.665	**0.863**					
Organization Performance (OP)	0.713	0.835	0.901	**0.746**				
People Context (PP)	0.702	0.680	0.804	0.816	**0.723**			
Process Context (PC)	0.569	0.104	0.379	0.336	0.543	**0.868**		
Project Success (PS)	0.688	0.337	0.493	0.547	0.495	0.509	**0.863**	
Technology Context (TC)	0.588	0.715	0.780	0.851	0.897	0.351	0.602	**0.736**

5.2 Structural Model Assessment

The Structural Model Assessment consists of four evaluations and rules of thumb: Firstly, path coefficient (β) which criteria are not below 0.10, powerful paths have higher path coefficients. Secondly, Effect size (f2), each path model's effect size can be calculated by Cohen's f2 which criteria are $0.02 <$ f2 value <0.15 – small; $0.15 <$ f2 value <0.35 – medium; and f2 value >0.35 – large effect size. Thirdly, criteria for the t-value have t-values greater than 1.96 (significance level = 5%), 2.58 (significance level = 1%), and 3.29 (significance level = 0.1%). And lastly, a P-value of 0.05 ($0.05 - 0.01$ Strong Significant Relationship, 0.01 Significant Relationship) is required [71, 83–85].

Table 7 Summary of results from hypothesis testing

	Path of Hypothesis	Coefficient (β) (>0.10)	f-square	t-value (>2.58)	p-value (<0.01)	Supported
H1	PP -> PS	−1.012	0.282	11.771	0.000	Yes
H2	PP -> OP	−0.268	0.075	4.825	0.000	Yes
H3	PP -> ES	0.859	0.320	10.391	0.000	Yes
H4	PC -> PS	0.589	0.443	15.004	0.000	Yes
H5	PC -> OP	0.068	0.026	3.076	0.002	Yes
H6	PC -> ES	0.009	0.000	0.221	0.825	No
H7	TC -> PS	1.157	0.510	20.430	0.000	Yes
H8	TC -> OP	0.377	0.160	6.189	0.000	Yes
H9	TC-> ES	−0.939	0.451	12.474	0.000	Yes
H10	OC -> PS	0.162	0.020	3.618	0.000	Yes
H11	OC -> OP	0.490	1.108	17.833	0.000	Yes
H12	OC-> ES	0.197	0.059	5.474	0.000	Yes
H13	EE -> PS	0.029	0.001	0.639	0.523	No
H14	EE -> OP	0.350	0.640	10.866	0.000	Yes
H15	EE-> ES	0.318	0.197	6.746	0.000	Yes
H16	PS -> ES	0.620	0.780	19.336	0.000	Yes
H17	PS -> OP	−0.034	0.004	1.277	0.202	No
H18	ES -> OP	0.134	0.057	4.163	0.000	Yes

The PLS algorithm and bootstrapping were then used to assess the structural model's quality. 5000 subsamples were used in this study to make a determination. The case study context can be used to explain the summarized outcomes of the hypothesis testing, as indicated in Table 7 and Section 3.2. It can be summarized in examples of Hypotheses H1, H2 and H3 as follows: People Context Factors: **H1.** People Context Factors not influenced to ERP Project Success: Path coefficient is −1.012, f-square is 0.082, t-value is 11.771 at p <0. 001. **H2.** People Context Factors not influenced to ERP System Quality: Path coefficient is −0.268, f-square is 0.075, t-value is 4.825 at p < 0. 001. **H3.** People Context Factors have influenced to Organization Performance: Path coefficient is 0.859, f-square is 0.320, t-value is 10.391 at p < 0.001. In the same way, hypotheses H3–H18 can be described as similarly H1, H2, and H3 mentioned above which can be summarized in Table 6.

5.3 Model's Quality Assessment

The three factors that make up the model's quality assessment could be represented as follows. Firstly, the determination coefficient (R2), which the

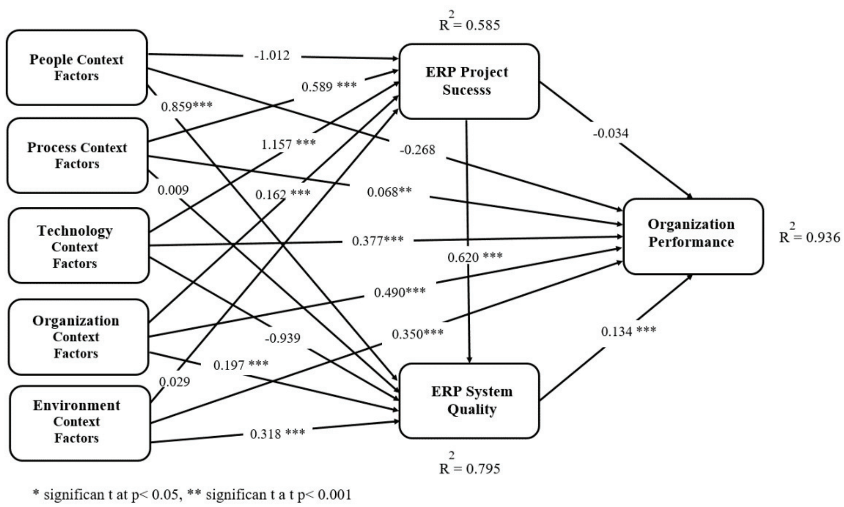

Figure 4 Results of theoretical model with PLS-SEM analysis.

quality criteria are unacceptable at below 0.19, low 0.19–0.33, moderate 0.33–0.67 and good at 0.67 [69]. The result of Holistic KSSs related to ERP Project Success, ERP System Quality and Organization Performance, were approximately 0.585, 0.795 and 0.936. In summary, all KSSs factors have a moderate influence, as shown in Figure 4. Secondly, Standardized Root refers to Square Residual (SRMR). Lastly, There is no standard statistic for goodness-of-fit (GoF) in PLS-SEM like there is in CB-SEM [85, 86]. However calculation of GoF is the square root of multiplication between the mean of the determination coefficient (R2) and AVE, as shown in Equation (1) [86]. These are the GoF criteria: No Fit criteria are values below 0.10, Small criteria are values between 0.10 and 0.25, Moderate criteria are values between 0.25 and 0.36, and High criteria are values above 0.36. At 0.722, this result meets strict standards. As a result, the model in this study receives an excellent Goodness of Fit (GoF) rating [87–89].

$$\mathbf{GoF} = \sqrt{R^2 \times \mathrm{AVE}} = \sqrt{0.772 \times 0.676} = \sqrt{0.558} = 0.722 \qquad (1)$$

6 Discussion

This research aims to investigate appropriate model that describes the holistic view of KSFs and how can re-classification and re-simplify these KSSs. Thus, these KSFs affect overall ERP Performance were proposed in this result of

Theoretical Model with PLS-SEM Analysis as show in Table 11 and Figure 3. Hypotheses discussion and Findings, Theoretical and Practical implications and Limitations and future research as shown in next topic.

6.1 Compare Between a Proposed Conceptual Model and Previous Research

As described earlier in Sections 5.2 and 5.3, the hypothesis testing results are supported fifteen out of the eighteen hypotheses consist of H1, H2, H3, H4, H5, H7, H8, H9, H10, H11, H12, H14, H15, H16 and H18. The not supported hypothesis are H6, H13, and H17, as summarized in Table 7 and shown in Figure 4. In summary, can be summarized three topics as follows.

(1) KSSs factors context:

- (a) People context factors in term of Top Management Leadership, understanding cross function process, Business skills competency and IT Technical skills competency are positively related to overall outcome (ERP Project Success, ERP System Quality and Organization Performance). These results are consistent with previous studies [27, 90, 91].
- (b) Process context factors in term of business and IT alignment plan process, business process improvement (BPI), training and education process and business continuity plan process are positively related to overall outcome. These results are consistent with previous studies [11, 22, 27, 80]. Excepting the Process Context Factor, it does not directly affect the quality of the ERP system, as the resulting process does not necessarily make the quality of the ERP better or worse. The quality of the ERP system is good or bad. Mainly based on ERP technology.
- (c) Technology context factors in term of Relative advantage of Networking Internet technology, Relative advantage of Data center technology, Relative advantage of Virtualization technology, Relative advantage of Web Technology, Relative advantage of Storage Technology and Relative advantage of Security Technology are positively related to overall outcome. These results are consistent with previous studies [4, 52, 64, 65].
- (d) Organization context factors in term of organization cultural ready and trusted and efficiency budget for ERP are positively related to overall outcome. These results are consistent with previous studies [52, 59, 92, 93].

- (e) External environment context factors in term of understanding in business of consultant and implementer, external auditing, image and business competition and government support and collaboration are positively related to overall outcome. These results are consistent with previous studies [23, 58]. Exclusive of the External Environment Factor does not affect the success of the project. For example, External auditing, Image and business competition, Government support, and collaboration.

(2) Outcome contexts.

- (a) ERP System Quality and Organization Performance are positively correlated with ERP Project Success scenario in terms of implementation was finished on time, implementation was completed within budget, implementation was completed as intended, and users are satisfied with the implemented system. These results are consistent with previous studies [11]. Excluding the External Environment Factor does not affect the success of the project. For example, External auditing, Image and business competition and Government support and collaboration.
- (b) ERP System quality context in term of ERP is flexible and allow for customization, ERP fits user requirements and can be integrated with other IT systems. It also provides accurate information, timeliness of information provision, and usefulness of data provision are positively related to Organizational Performance. These results are consistent with previous studies [11, 48, 49, 91, 94].

(3) Overall model and previous studies, results of theoretical model with PLS-SEM analysis as shown in Figure 3 and summarized in Table 1. The hypothesis is supported, and statistic result is significant, these are meet research questions and research objectives. This model in line with Baykasoğlu and Gölcük [95]; Li, Chang and Yen [20]; Schniederjans and Yadav [22].

(4) Risk Interpretation can be compared with the results obtained in Table 11 in case of opposite or negative correlation of factors are as follows:

PP $>$ PS, meaning to the People Context Factor, which has an opposite or negative effect on Project Success. The risks of human beings, as summarized in Table 2, such as Ineffective communication system, Low Key user involvement and poor managerial conduct, etc., may affect project success.

PP > OP, People context has the opposite or negative effect to Organization Performance. This is caused by the same case of People context and Project Success.

TC > ES, meaning to Technology context affects or negatively affects ERP System Quality.

This may be due to technological risk factors such as Ineffective Data Cleansing, Inadequate IT system maintainability and Complexing of existing ERP Module as summarized in Table 2.

6.2 Theoretical and Managerial Implications

Theoretical implication, this research provides empirical research developed a theoretical model conceptualized model for a different approach to illustrated the holistic View of KSFs from ERP life-cycle perspective were constructed from TOE and PPT framework. Summarized, empirical exanimated how this KSSs multi-dimensional relationship between to (a) hybrid cloud ERP system implementation success, (b) hybrid cloud ERP System quality, (c) organizational performance. This research model was conceptualized and developed from multi theory as shown in Table 1. It can be categorized in two groups follow: (1) Theory of the KSSs, including the theories of absorptive capacity, stakeholder theory, organizational information processing, resource dependency, knowledge-based firm theory, strategic choice theory, organizational culture, organizational readiness for change, and contingent business process management. (2) Theory for Overall Outcomes such as Delone and McLean IS success model, Balanced Scorecard and IT strategy implementation matrix. However, in contrast some hypotheses such as H6, H13 and H17 are not supported. Path coefficient of hypothesis such as H1, H2, H9 and H17 are negative value. We suggestion to verify the observer variable in questionnaire and theoretically developed. Possible study areas for the future are suggested in relation to these issues.

Table 8 Comparisons of ERP methodologies

	Vendors Specific	Other ERP	Open Source ERP	This Model
ERP Methodologies	ASAP, OUM, MSSURE	None	None	Holistic KSSs
ERP full life cycle	Yes	None	None	Yes
Maintenance Phase	None	None	None	Yes
Evaluation Phase	None	None	None	Yes

Managerial implications, the holistic view of KSSs and the Failure and Risk factors in this paper are given concerning information for the stakeholder of ERP Project. The result of this PLS-SEM model and the outcome of this research can using for guideline of ERP Project or another IT Project. This proposes model can be used as a managerial tool for IT consultant and business administrative for ERP implementation in the future. The delivery of company value through IT is tied to ERP life cycle management. The holistic view of key success strategies in term of people, process, technology, organization and external environment discussed and integrated from ERP life cycle phase including: pre-implementation, implementation, post-implementation, Maintenance and Overall Performance evaluation. In practical, leading vendors SAP's Accelerated SAP (ASAP), Oracle Unified Method (OUM), and Microsoft Dynamics' Sure Step methodology (MSSURE) for project management and managerial tool are examples of realistic, vendor-specific ERP methodologies. However other ERP software not have ERP Methodologies, as shown in Table 12. This research proposed re-simplify and classification of key strategies in holistic views from full ERP life cycle can be used as a managerial tool for guideline of ERP Project or another IT Project. This model not only project management tool like ASAP, OUM, MSSURE, but also, it is a top of view ERP implementation project.

It can be summarized as practical guideline as follows: (A) Risk and readiness assessment in various fields in the pre-implementation, which are shown in Table 2 and the impact of risks such as Process Failure, Expectation Failure, Interaction Failure, and Correspondence Failure. (B) Consideration of Holistic Key success strategies from ERP full life cycle as follow: (1) People context in term of Project team competencies, Roles and responsibility, Authority and status of IT leader, Business skill and ERP, Transformational Leadership, shared team leadership, IT capability level, In-house IT expertise and Experience, Balanced or cross-functional implementation team, IS Strategist Role Leadership and Business Strategist Role Leadership etc. (2) Process context, for instance: IT leveragability and knowledge-sharing, Business process redesign, Training and Education, Operational efficiency, Project plan & scope, Careful package selection, Information flow management, Minimal customization, testing after Implementation, Progress evaluated and disclosed, Developed clear education and training strategy, education on new business process and clearly defined functional requirement etc. (3) Technology context, for instance: IT Infrastructure/facilitates, Data Preparation, Functionality and Compatibility of ERP package, Data accuracy/integrity, Efficient legacy enterprise system, Data standard consistency, Data analysis and conversion, Software customization, Software development, Technological abilities of competitors. (4) Organization context, for instance: Management readiness, Organizational Culture, Cultural Readiness Organizational resources, a clear vision, goal, and target controlling societal transformation Budget, ERP costs, and sufficient resources. (5) External environment, for instance: Competitive/Regulatory, Business and technical knowledge of Consultant. (C) Evaluation of the ERP Post-implementation outcome criteria for the success of the ERP Project, the ERP System Quality, and Organization Performance from a variety of angles, including financial, internal process, customer, and learning views.

7 Conclusions, Limitations and Future Work

7.1 Conclusions

The specific strategies or suggestions for enhancing the use of hybrid cloud ERP that implemented in automobile industries of Thailand. IT can be summarize to these context: people, process, technology, organization and external environment. People context such as leadership from the top, comprehension of cross-functional processes, business skill proficiency, and IT technical skill proficiency. Process context such as processes for business process alignment, business process improvement (BPI), training and education, and business continuity planning. Technology context such as the relative advantage of networking internet technology, data centre technology, Virtualization technology, web Technology, Storage technology and Security Technology in term of security, confidentiality, integrity, accessibility, authentication, authorization, and accountability. Organization context such as efficiency budget for ERP, organization cultural ready, and trusted of employee. External environment context such as support from and partnership with the government, knowledge of consultants and implementers in business, external auditing, reputation and business competition.

In conclusion, the conceptual model from the study that was presented can be put to use or helpful in the organization's management, or project managers of automobile industries can utilize it as a framework and direction for hybrid cloud ERP implementation. The findings of the study can also be used to create a conceptual framework for the actual use of ERP systems, such as the incorporation of blockchain and postmodern ERP systems in many sectors of business.

7.2 Limitations

The study has specific limitations, including the specific demographics in automobile industries only and the COVID-19 sampling data collection period lasting a long time until the paper's publication. It is recommended that future research should focus on expanding the study's demographics and using a more controlled sampling data collection period to validate the study's results. Future research can also focus on developing a conceptual framework for the practical implementation of ERP systems, such as integrating blockchain and postmodern ERP systems across various industries.

7.3 Future Work

The entirety of your company's data is housed in a conventional ERP store. a single point of contact is provided. connects to additional business process software. Provide precise information to every department in your business. Blockchain-powered ERP is integrating internal business processes and procedures amongst different enterprises. Important functions from several organizations are integrated and enhanced. distributing among several entities an exact data version [96, 97]. In further work applying the results of this study is to develop a conceptual framework for the practical implementation of ERP systems, such as the developing model utilized for integrating blockchain and postmodern ERP systems across industry [98, 99]. Phase of the full ERP life cycle that integrates hybrid cloud ERP with blockchain technology as shown in Figure 4.

Appendix A

Table A1 Survey questionnaire and their sources

Index	Questionnaire Description	Sources
These People Context Factors influencing to ERP Project Success, ERP System Quality and Organization Performance.		
PP1	Top management Leadership	[27, 90–92, 100]
PP2	Understanding cross function process	
PP3	Business skills competency	
PP4	IT Technical skills competency	

(*Continued*)

Table A1 Continued

Index	Questionnaire Description	Sources
These Process Context Factors influencing to ERP Project Success, ERP System Quality and Organization Performance.		
PC1	Business and IT Alignment Plan Process	[11, 79, 80, 101–103]
PC2	Business Process Improvement (BPI)	
PC3	Training and Education Process	
PC4	Business Continuity Plan Process	
These Technology Context Factors influencing to ERP Project Success, ERP System Quality and Organization Performance.		
TC1	Relative advantage of Networking Internet technology	[51, 64, 65]
TC2	Relative advantage of Data centre technology	
TC3	Relative advantage of Virtualization technology	
TC4	Relative advantage of Web Technology	
TC5	Relative advantage of Storage Technology	
TC6	Relative advantage of Security Technology	
These Organization Context Factors influencing to ERP Project Success, ERP System Quality and Organization Performance.		
OC1	Organization Cultural ready and trusted	[52, 104]
OC2	Efficiency Budget for ERP	
These External Environment Context Factors influencing to ERP Project Success, ERP System Quality and Organization Performance.		
EE1	Understanding in business of Consultant and implementer	[23, 58, 59]
EE2	External auditing	
EE3	Image and business competition	
EE4	Government support and collaboration	
These ERP Project Success context influencing to ERP System Quality, Organization Performance.		
PS1	Implementation was completed on time	[11, 105, 106]
PS2	Implementation was completed within budget	
PS3	implementation was completed as expected	
PS4	users are satisfied with the implemented system	
These ERP System Quality context influencing to Organization Performance.		
ES1	ERP is flexible /allow for customization	[76, 106, 107]
ES2	ERP allows for integration with other IT systems	
ES3	ERP is meets users' requirements	
ES4	Information accuracy	
ES5	Timeliness of information provision	
ES6	Usefulness of data provision	

(*Continued*)

Table A1 Continued

Index	Questionnaire Description	Sources
These are ERP system quality influencing to Organization Performance.		
OP1	ERP. increased return on investment	[7, 76, 108]
OP2	ERP. reduced the IT operational costs	
OP3	ERP increased Customers' satisfaction with products/services	
OP4	ERP help the capability to deploy new IS functionality	
OP5	ERP is automating cross-functional processes	
OP6	ERP Improved standard procedures across different locations	

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