

Is it the End Game of Enterprise Resource Planning? Evidence from State-Owned State Enterprises Indonesia

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Acknowledgements:

Funding:

Conflict of Interest:

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Abstract

Implementing an enterprise resource planning (ERP) system is crucial if a company wants to compete globally and keep up with technological advances. This study examines the effect of information sharing and competent personnel on ERP. This study takes a quantitative approach using a questionnaire tested with covariance-based structural equation modelling. The sample includes 338 respondents from several Indonesian state-owned enterprises. The results show that information sharing positively affects the success of ERP system implementation. Next, competent personnel also positively affect the success of ERP implementation. Overall, this research is helpful for firms who want implement an ERP system to manage information and personal arrangements accordingly so that the system can run as expected.

Keywords: ERP, SEM, Indonesia, information sharing, competent personnel.

1. Introduction

Companies must have an information system capable of providing reliable and consistent information on all activities to compete and survive [1], [2]. As a company's leading resource, information needs to be managed such that it provides optimal benefits for managerial decision-making. Likewise, the benefits of information management in state-owned enterprises (SOE), as the main pillars of the national economy, have an essential role because SOEs are tasked with contributing to the development of the national economy [1], [2]. Traditional information governance results in various problems such as data redundancy, late reports, and inappropriate decision-making. Therefore, there is a need for digital transformation in information management [2].

Digital transformation is an important factor in innovation development in today's rapidly and dynamically growing global economy [2]–[5]. One part of digital transformation is data sharing using a system capable of driving economic progress [4], [6]. Companies use digital technology

to create or modify existing business models and processes, or support organisational transformation [7].

Enterprise resource planning (ERP) is a digital information technology innovation used to develop production processes and business financial reporting [2]. ERP is a new and important development for companies that also changes accounting reporting integrated with various other business units within the company [2], [8]. [9] stated that developing and implementing software, such as ERP, requires collaboration between the parties involved in the process. Companies apply information technology to increase productivity and help achieve quality, time standards, and stakeholder satisfaction (Rodrigues et al., 2022). As one of the data and information management solutions that is the prima donna of today's business, ERP can integrate all existing processes within the company's functional areas [10]. This integration can be performed, for example, between departments or different locations.

Essentially, an ERP system can be defined as one that integrates all subsystems, components, or elements that work together to achieve a mutual goal [11]. Many manufacturing companies have successfully applied ERP systems [10]. An ERP system covers all aspects of its business operations. Information technology has changed the receipt of information through data processing and storage [7]. It can change a company's perspective and the way it achieves its organisational goals. Thus, an ERP system can be considered a company-wide information system that integrates all aspects of a business.

It typically includes a database, one main application, and unified interface across the entire enterprise [7]. It encompasses and tightly integrates everything from human resources to sales, manufacturing, distribution, accounting, and supply-chain management. This integration benefits companies in several ways; it enables companies to quickly react to competitive pressures and market opportunities, provide more flexible product configurations, reduce inventory, and tighten supply chains (Plekhanov et al., 2022).

For companies, success is the ability to achieve their goals, organise changes in shape and structure, and focus on processes, methods, and technology [12]. Company managements

increasingly recognise that science-based expertise is conducive to good performance [13]. Successful ERP implementation improves an organisation's performance by integrating all operational aspects. Specifically, the benefits of using ERP [2] include: 1) reducing labour costs in sales, finance, purchasing, human resources, and inventory; 2) reducing customer service cycle times in order, billing, shipping, payroll cycles and supporting supplier activities in ordering, information, and payment; 3) increasing productivity in terms of labour, increased production volume, and reduced overtime; 4) improving quality in terms of data reliability and accuracy; and 5) improving customer service by facilitating access to customer inquiry data [12]. Other benefits include better financial management, for example, of assets.

Information systems are required to collect, process, and report information related to businesses [14]. The accuracy of the information system design is essential. The success of the implementation of an information system reflects a company's intellectual capital (Rodrigues et al., 2022). ERP is a computing system that allows companies to automate raw material inventory, financing, and resource management using a database [12]. This generates real-time information about the corporate environment. The basis of an ERP system is a software application that provides a comprehensive solution for integrating organisational processes by enabling information and data flows. An ERP system administers processes such as financial accounting, customers, human resources, sales, marketing, and supply chains [2]. The five elements are: 1) storage, 2) administration and control, 3) human resources, 4) products, and 5) warehouse management. ERP systems are "comprehensive and packaged software that seeks to integrate the entire business process, and it's to present a holistic business view of one information and IT [information technology] architecture" [2].

Companies that implement and adopt ERPs include forest products, communications, professional services, and telecommunications companies [13]. Essentially, the more ERP software packages evolved, the more companies began using them. One such company in Indonesia is PT. Hutama Karya (Persero) officially began the transformation of its business processes by implementing ERP technology in 2022. Similarly, hundreds of billions of rupiah have been invested in Information Technology in all SOEs in Indonesia. With the flexibility to manage their funds, the configurations of Information Technology investments by SOEs have been diverse.

Importantly, ERP is very expensive. Therefore, its successful implementation is a crucial factor for companies [15]. Measuring efficiency and productivity is relatively easy for most production goods manufacturing companies [16]. However, measuring the successful implementation of an information system remains challenging. ERP system failure can occur because to complexity during usage, integration problems, lack of funds, project scheduling discrepancies, and user resistance to change. In general, ERP implementation requires approximately 0.82% of a company's income, but can reach 13.65% of the income of small companies [17]. Further, there are many cases in Indonesia where ERP implementation takes much longer than the general practice of 6 to 12 months [17]. While many companies have successfully implemented ERP systems, research [13] shows that more than half of ERP buyers were not entirely satisfied after finalising the ERP implementation process.

Furthermore, as a complex software, ERP requires special user abilities. The various modules that exist in ERP software and complexity of using it often hinder its successful use [15]. Drawing on knowledge management theory, the success of ERP requires the competency of personnel and governance in information sharing to support the market response so that companies can realise competitive advantage [18]. Early studies on cases of information technology adoption, such as ERP, revealed that information technology leads to macroeconomic growth [10]. This study empirically examines the links between information sharing, competent personnel, and the success of ERP implementation in Indonesian SOEs. We predict that personal competencies and information sharing positively affect the success of ERP system implementation. To test these relationships, we use structural equation modelling (SEM). Our findings can be insightful for enterprises, especially SOEs, to accelerate the success of their ERP implementations.

2. Theoretical Framework

2.1 Information Sharing and the Success of ERP System Implementation

Communication theory argues that communication is a straightforward way to describe an act of communication by answering 1) who, 2) what is said, 3) which channel, 4) to whom, and 5) the effect [2]. Effectiveness refers to the success of doing something well. It is a basic element in

achieving goals or objectives determined by an organisation, activity, or program. If goals are achieved or objectives are met, they are considered effective [2]. Information sharing is the achievement of, for example, a planning goal by understanding the answers to questions that arise so that the objective of information sharing is achieved. Information that can be identified, recorded, and communicated within specified timeframes allows all parties concerned to carry out their duties and responsibilities, and thus, provide the answers [2]. Managers consider the following types of communication skills to be essential: 1) consumer communication, 2) internal communication, 3) corporate communication, 4) personal communication, 5) crisis or issue management, 6) communication with investors, and 7) international communication.

The design of the information systems [19] appropriate to a company's needs can then be achieved. Using information systems with modern technology increases institutional trust [2], [20]. Good information exchange between ERP system users and management can lead to a good system design, and help support ERP system implementation. The information process can reveal the exact characteristics of competent personnel's fears concerning internal and external environments [2], [21]. However, measuring the effectiveness of communication in specific contexts requires attention to essential aspects. The success of communication depends on effective communication between experts and leaders in the organisation. As such, information sharing can mean close collaboration among employees to achieve their goals [22].

Managers must build relationships with employees to establish good and open communication [2], [23]. Success depends on information between departments, free information flow within the project team, and the ability to communicate the ERP system's benefits [22], [24]. Indeed, appropriate horizontal and vertical communication between various management levels is important for organisations [23]. Thus, information sharing can significantly influence the successful implementation of ERP systems [2], [25].

H₁: Information sharing positively affects the success of ERP system implementation.

2.2 The Influence of Competent Personnel and Success of ERP System Implementation

Competent personnel can be actively involved in organisations. Support refers to the information, advice, or tangible assistance provided by those familiar with individuals in their social environment. For instance, management can provide emotional assistance and positively affect recipients' behaviour [26]. Competent personnel can provide genuine assistance in the process of managing, planning, organising, and controlling an organisation. For instance, the management is responsible for company programs and fiscal matters [13]. In organisations, competent personnel in management can be generally divided into three basic levels: top, middle, and first-line managers. The top management consists of the leader, vice chairman, and CEO. They are responsible for the overall corporate strategy, operating policies, and ultimately, achieving the organisation's goals [3]. Middle management consists of managers, operational managers, and division heads, who together are responsible for implementing the plans and decisions of top managers, and overseeing implementation at two levels. First-line management consists of supervisors, coordinators, and office managers responsible for overseeing and coordinating employees, and handling various routines.

Personal and user attitudes can positively influence the use of a system [27]. Budget users—in this case, management—are very influential in ERP implementation [13], [22], [28]. Managers, as competent personnel, are responsible for providing the active support required by the company. They manage changes in business processes due to the impact of new technology and help users who resist change by showing their commitment to success.

Competent personnel are required to successfully implement ERP [29]. ERP users should be able to understand management policies. Competent personnel have a powerful influence on ERP adoption of users [29]. When users have a positive attitude towards ERP implementation, it can invariably be a success. Competent personnel can also affect system quality [22], [30].

H₂: Competent personnel positively affect the success of ERP system implementation.

2.3 The Influence of Information Sharing and Competent Personnel Simultaneously on the Success of ERP System Implementation

The effectiveness of open and honest information in project teams influences the success of ERP implementation systems [13]. This can ensure higher organisational quality and competence, but requires commitment from the user [13]. Management must open communication to lower levels to be open and effective [22], [23]. For instance, during ERP system implementation, managers must direct, monitor, and thoroughly evaluate the progress of the implementation. Meanwhile, management thinking should be sufficiently flexible to accept the significant changes that arise when ERP systems are being developed [22], [31]. Thus, competent personnel should effectively communicate and share information, which can influence the successful implementation of ERP systems.

H₃: Information sharing and competent personnel have a simultaneous positive effect on the success of ERP system implementation.

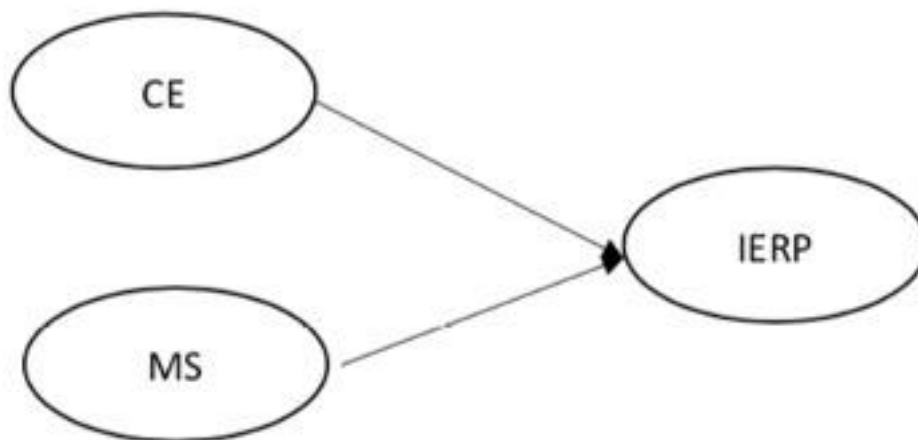


Figure 1 illustrates the conceptual model of this research.

3. Methodology

The study extracted primary data using a questionnaire survey administered to employees of Indonesian SOEs. The sampling technique used purposive sampling, with the respondent criteria being SOE employees who used the ERP system, worked for more than one year, and were willing to be research participants.

3.1 Variable Operationalisation

The variables were operationalised based on previous research and used as the basis for compiling the questionnaire.

Table 1. Variable operationalisation

Variables	Indicator	Scale	Description
The information sharing	<ol style="list-style-type: none"> 1. Information. 2. Good communication. 3. Scope of activities. 4. Results and objectives 5. One-way communication tools 6. Two-way communication tools 	5 points, ordinal	Questionnaire
Ref : (Annamalai & Ramayah, 2013; Laswell, 2007)			
Personnel Competent	<ol style="list-style-type: none"> 1. Initiative 2. Supports implementation 3. Able to find solutions to problems 4. Make clear policies and regulations 5. Supports users 6. Hire personnel 	5 points, ordinal	Questionnaire
Ref : (Annamalai & Ramayah, 2013; Xie et al., 2014)			
Implementation of ERP System	<ol style="list-style-type: none"> 1. Accuracy 2. Integrated 3. In accordance with its function 4. Comprehensive 5. Easily accessible 6. Availability of completed 	5 points, ordinal	Questionnaire
Ref : (Annamalai & Ramayah, 2013; Ferran, 2008)			

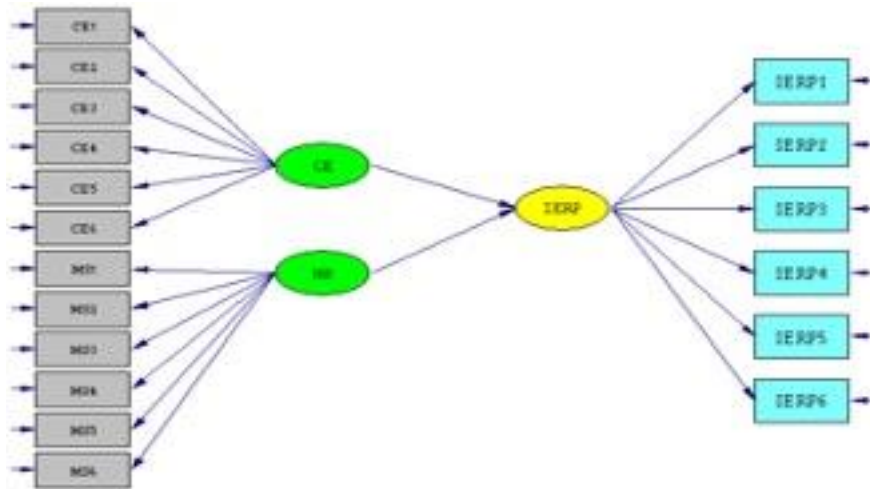


Figure 2 illustrates that there are six indicators for the variable CE representing information sharing. These are CE1 for the importance of information, CE2 for need of good communication, CE3 for scope of activities, CE4 for result and objective, CE5 for one way communication tools, and CE6 for the importance of two way communication tools. MS, representing the variable competent personnel, consists of MS1 for the need of initiative, MS2 for support implementation, MS3 for the ability to find solutions of problems, MS4 for policies and regulations, MS5 for the support user, and MS6 for the focus on hire personnel. Finally, IERP, representing ERP system implementation, consists of IERP1 for represent accuracy, IERP2 for focus on integrated, IERP3 for alignment with its function, IERP4 for comprehensiveness, IERP5 for easily accessible, and IERP6 for importance of availability of completed.

The data were analysed using the CB SEM method. The indicators used are listed in Table 1.

3.2 Data Analysis

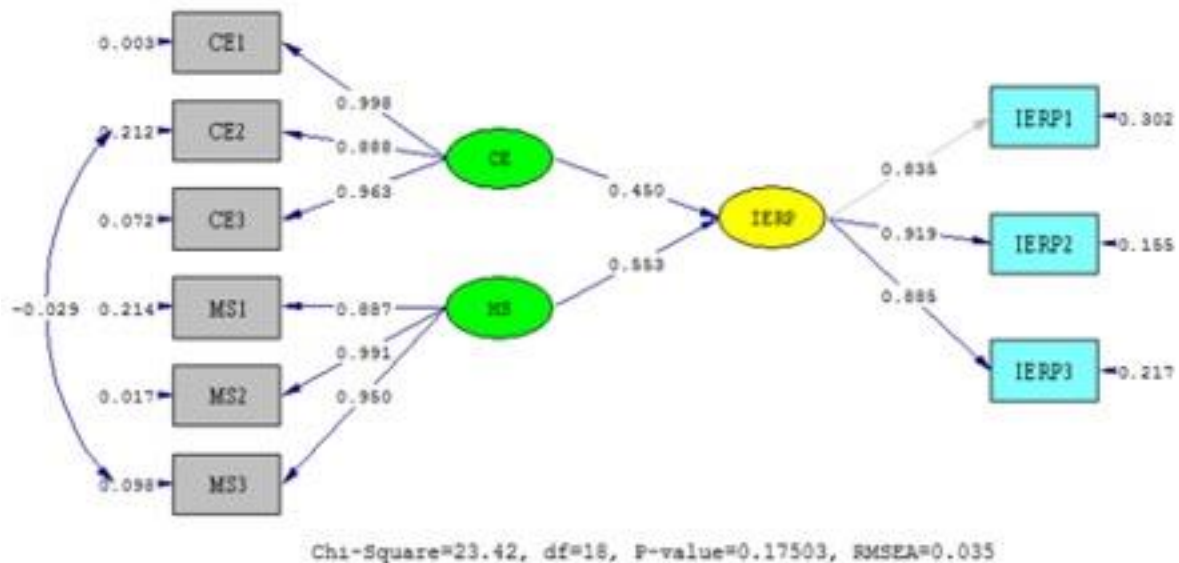
A covariance-based SEM (CB SEM) approach was used for data analysis. The results confirm the theory of the influence of exogenous variables on endogenous variables, as well as previous studies. SEM was used to focus on the latent constructs. SEM measures the structure of the covariance matrix by estimating the model parameters [32]. Here, we measured the information sharing, competent personnel, and ERP system implementation success variables. They can also

be compared using the covariance matrix derived from empirical data [32]. The SEM software LISREL was used here.

4. Results

Questionnaires were distributed in SOEs under the Ministry of Owned State Companies of the Republic of Indonesia. The total number of Indonesian SOEs was 91 by the end of 2022. In total, 500 questionnaires were sent to respondents and 403 were returned (response rate of 80.6%). Of the returned ones, 15 were excluded as they did not fulfil the sample criteria or were incomplete. Finally, we had 388 questionnaires from 51 Indonesian SOEs.

First, we examined the reliability and validity of the measurement instrument for each variable using the standardised loading factor output value for each indicator. Testing was performed using LISREL 8.8 full version software. The instrument is reliable if the standardised loading factor is greater or equal to 0.7 (Hair et al., 2022). Consequently, CE1–CE3 were retained for CE, MS1–MS3 for MS, and IERP1–IERP3 for IERP. Figure 3 presents the results of the reliability test..



The correlation between each indicator and the total score per construct was significant at the 1% and 5% levels. For CE, CE1 had the highest correlation value of 0.998 among CE1–CE3. For MS, MS2 had the highest correlation value of 0.991 among MS1–MS3. Finally, for IERP, IERP2 had

the highest correlation value of 0.919 among IERP1–IERP3. Thus, all measurement instruments met the valid criteria for measuring the constructs.

4.1 Reliability Test

The reliability test tested the consistency of the indicator in the questionnaire using construct reliability and variance extracted [32]. If the construct reliability exceeds 0.70 and variance extracted exceeds 0.5, then the construct reliability is adequate [32]. Table 2 lists the results for each latent variable.

Table 2: Construct-Reliability and Variance-Extracted

Variable	Construct Reliability $\geq 0,70$	Variance Extracted ≥ 0.50	Conclusion
The information sharing	0,81	0,52	Very Good
Competent personnel	0,89	0,66	Very Good
Success of Implementation ERP system	0,92	0,71	Very Good

All three variables pass the reliability test. IERP has the highest construct reliability (0.71) and variance extracted (0.92).

4.2 Analysis Results

Table 3 lists the results of the descriptive analysis.

Table 3: Descriptive analysis of research variables

Variable	Real Score	Max Score	Average Score	% Real	% GAP	Criteria
The information sharing	1966	2640	3,72	74,47%	25,53%	Good
Competent personnel	2258	2640	4,28	85,53%	14,47%	Very Good
Success of Implementation ERP system	2198	2640	4,16	83,26%	16,74%	Good

MS has the highest actual score of 85.53% and highest average Likert score of 4.28. Meanwhile, CE has lowest actual score of 74.47% and lowest average score Likert of 3.72.

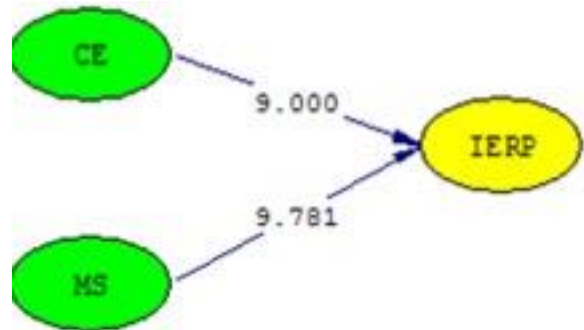
Table 4: Model Fit

Goodness Criteria	Level Goodness criteria	Result of Model Estimation	Conclusion
Chi-square	p-value \geq 0.05	0.175	Good Fit
RMSEA	RMSEA \leq 0.08	0.035	Good Fit
NFI	NFI \geq 0.90	0.992	Good Fit
NNFI	NNFI \geq 0.90	0.996	Good Fit
CFI	CFI \geq 0.90	0.998	Good Fit
IFI	IFI \geq 0.90	0.998	Good Fit
RFI	RFI \geq 0.90	0.985	Good Fit
SRMR	SRMR \leq 0.05	0.022	Good Fit
GFI	GFI \geq 0.90	0.98	Good Fit
AGFI	AGFI \geq 0.90	0.949	Good Fit

The goodness-of-fit test results in Table 4 show a significant probability of 0.175 and an RMSEA of 0.035. The Normed Fit Index (NFI) is 0.992, Comparative Fit Index (CFI) is 0.98, IFI is 0.998, and RFI is 0.985. These indicators indicate that the model has good fit because the values are greater than 0.90. Cross-validation index (CVI) values were used to compare the models. The test results show a model CVI value of 0.998, and thus, is close to saturation. Hence, the model's overall fit is good.

The GFI value is 0.980, exceeding the 0.90 threshold, which indicates good fit. Similarly, AGFI value of 0.985 indicates that good model fit as exceeds the 0.80 threshold. Overall, the model has

a good level of fit. Further, the P value of $0.175 > 0.05$ means that the model indicates a significant positive effect [32].



Information sharing has a significant positive effect on the success of ERP system implementation ($t = 9.000$ and > 1.96). Thus, hypothesis H_1 is supported. Further, competent personnel have a significant positive effect on the success of ERP system implementation ($t = 9.781$ and > 1.96). Thus, hypothesis H_2 is supported.

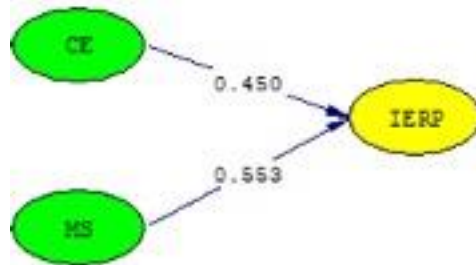


Figure 4 shows the coefficient values of the latent variables From Table 3, the goodness of fit test results show a significant probability value of $0.175 > 0.05$. Therefore, hypothesis H_3 is supported. Thus, information sharing and competent personnel simultaneously have a significant positive effect on the success of ERP implementation.

5. Discussion

5.1 The Influence of Information Sharing on the Success of ERP System Implementation

The results show that the effectiveness of communication significantly positively affects the success of ERP system implementation. Information sharing between departments is beneficial for

successful ERP implementation. In particular, information sharing between top management and staff must be conducted openly. In some cases, information may only go one way [2], [12], and staff simply follow orders from top to bottom. Poor information-sharing is an indicator that good and transparent information is needed. Research shows that information can be shared routinely during regular coordination and evaluation meetings [2].

Constraints during the implementation process must be resolved, solutions for which can be obtained both internally and externally. They are a means of integrating all company components to facilitate management. Effective company management involves successful communication, effective management of human resources, and competitiveness [12]. ERP is implemented based on the company's needs. Information sharing influences how ERP is implemented, and is required between divisions for the company to operate in an integrated fashion.

5.2 The Influence of Competent Personnel on the Success of ERP System Implementation

Next, the results show that competent personnel have a significantly positive effect on the success of ERP system implementation. In the questionnaire, personnel initiative received a high number of responses from the participants. Indeed, prior research shows that personnel initiatives may receive the support of staff and enable project implementation to run smoothly [12]. Indeed, the implementation of an ERP system represents a significant change in a company's business operations. Competent personnel are one of the determining factors in a company's success, and are very influential in the direction of company policy. ERP implementation in most companies is a top-down process. Thus, the competent personnel provide ideas while facilitating the ERP implementation process according to the company's desired goals.

Adoption of new information systems such as ERP enables companies to use more consistent and reliable information. Because competitiveness concerns knowledge and communication with customers, human resources are now the main source of competitive advantage. Therefore, competent human resources are a very important focus of a company's development [12] and success in implementing ERP. ERP systems can also help automate all these processes to ease communication between stakeholders (Abu Madi et al., 2022b).

Further, the personnel must correctly understand the ERP system, usage, and desired output for the needs of the entity [12]. Institutions must provide appropriate resources—sometimes rapid cross-departmental personal mutations—which affect user competence. This change demands strong commitment from the person at all levels [12]. Further, personnel commitment can take the form of establishing regulations related to ERP systems.

5.3 The Influence of Information Sharing and Competent Personnel Simultaneously on the Success of ERP System Implementation

Finally, information sharing and competent personnel simultaneously have a significantly positive influence on the successful implementation of ERP systems. ERP Implementation will be successful if the information is available in real time, and follows the function and availability of complete data. Top managers require proper and fast system output for management and decision-making. Sharing good information and having a competent personnel will promote good ERP implementation. Users must be able to balance the designed system by paying attention to the needs of the organisation. Appropriate support should take the form of training to improve competence [12], as observed in previous studies [15], [33]. Training is important to ensure that users can operate the ERP system correctly and in a manner that reflects the expected results at the time of planning. Effective information and good competent personnel can make a significant contribution to the process.

6. Conclusions

This study reveals that information sharing and competent personnel, both independently and simultaneously, significantly and positively influence the successful implementation of ERP systems.

This research has several limitations. First, the number of respondents is limited because not many Indonesian SOEs have implemented ERP systems primarily because of the high cost of these systems. Second, limitations remain in measuring variables using questionnaires. Even though a pretest was conducted to determine the respondents' understanding of the questionnaire, some participants may have wrong perceptions or understanding of the questionnaire items.

Practically, considering the importance of the role of individual competence in ERP implementation, managers should pay special attention to the ability of each individual in the company to support ERP implementation and ultimately support the company's success. Business practitioners must also pay attention to information management to optimally support the success of ERP implementation.

Future research can focus on private sector companies, as the indicators of successful ERP implementation for them may differ from those for SOEs. In addition, future researchers should examine the impact of successful ERP implementation on overall business performance.

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Tables

Table 1. Variable Operationalisation

Table 2. Construct Reliability and Variance Extracted

Table 3. Descriptive Analysis of Research Variables

Table 4. Model Fit

Figure Captions

1. Figure 1. Theoretical Model [2], [22], [29], [30]. CE: Information sharing; MS: Competent personnel; IERP: Implementation of ERP systems.
2. Figure 2. SEM Research
3. Figure 3. Reliability Test Results
4. Figure 4. Structural Model t-value
5. Figure 5. Standard Structural Model Solution