

Assessment of Business Process Maturity Model in Culinary SMEs as a Pre-Stage of Enterprise Resource Planning Implementation

Nur Abdillah Bagus Prakoso¹, Danang Setiawan², Azzahra Tiffany Rachmad³, and Berliana Frisca Azzahra⁴

^{1,2,3,4} Industrial Engineering, Faculty of Industrial Technology, Universitas Islam Indonesia, Jl. Kaliurang km 14.5, Yogyakarta, 55584, Indonesia

Abstract. The SMEs sector is predicted to have a surplus of ERP implementation projects in 2024, with 60% of the total implementation projects. However, the ERP implementation growth cannot be separated from the threat of project failure (35%) and project delays (55%). This study measured the maturity of business processes as a pre-implementation stage to reduce the risk of ERP implementation failure. The object studied was three culinary SMEs in Yogyakarta. This paper used McCormack's theory of business process management maturity model, combined with the ICT maturity model developed by Pham. The assessment showed that the three SMEs were at the lowest level of business process maturity, the ad hoc level. Meanwhile, the ICT maturity varies from inactive to substantial. However, SME A had the eligibility to implement an ERP system but first needed to perform the business process re-engineering. The recommendations were designed for SME A to enhance its business process flow by proposing a business process based on the best practice process used by ERP system providers.

Keyword: BPM Maturity, ERP, ICT Maturity, SMEs

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1. Introduction

Since its emergence in 1990, Enterprise Resource Planning (ERP) systems have continued to evolve as complex integrated enterprise systems [1]. By 2024, 60% of information system implementation projects will be carried out in small and medium enterprises (SMEs) [2]. As an integrated information system that supports financial and resource management, the ERP system will be the most significant software investment throughout 2019. It is predicted to grow by 7,1% from 2018 to 2022 [3].

Companies face many ERP implementation failures along with the widespread ERP implementation phenomenon. Ulrich dan Newcomb [4] stated that only 10% of ERP

*Corresponding author at: [Universitas Islam Indonesia, Jl. Kaliurang km 14.5, Daerah Istimewa Yogyakarta, 55584, Indonesia]

E-mail address: [danang.setiawan@uii.ac.id]

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implementation projects were successful, while 35% experienced cancellations and 55% were delayed. This figure indicates the high risk of implementing an ERP system for both the implementor and the prospective users. Wong et al. [5] stated that fourteen factors cause ERP systems implementation failure, such as complex business process re-engineering, ineffective project management, poor infrastructure, and resistance to change. On the other hand, Hasan et al. [6] classified factors causing ERP implementation failure into internal, external, and overlapping factors. Internal factors are caused by top management and human resources, while external factors include system vendors and consultants. In contrast, overlapping factors are caused by communication between the prospective user and the implementation project team.

This research focused on reducing implementation risk by measuring the readiness of prospective SMEs to use ERP systems. This research was conducted in the pre-stage of ERP implementation on SMEs. This study used three culinary-based SMEs in Yogyakarta as case studies. At the existing condition, the recording of business process transactions in the three SMEs is still performed manually. This condition causes various problems, such as delays in orders, mismatches in production and orders, and miscommunication among departments in the studied SMEs. Through the implementation of ERP systems, it is expected that the observed SMEs will get benefits from ERP systems, such as reducing inventory costs, improving service performance to customers, and improving communication between processes, as stated in [7]. This research is expected to help reduce the risk of ERP system implementation. The paper can also be used as a reference for the pre-implementation stages of ERP systems implementation, especially in SMEs.

2. Method

The research used three culinary SMEs in Yogyakarta as case studies. Of the three SMEs, SME A plans to implement an ERP system in the near future. The other two SMEs were selected based on similarities in business sector, track record, and desire to implement an ERP system in the future. Two questionnaires were given to the owner and management of the three SMEs: BPM maturity and ICT maturity questionnaire. The BPM maturity questionnaire is based on the research of Skrinjar and Trkman [8]. The questionnaire measures nine variables: *strategic view (sv)*, *process definition and documentation (ddp)*, *process management and measurement (mmp)*, *organizational process structure (pos)*, *people management (uk)*, *process organizational culture (pok)*, *market orientation (tu)*, *supplier perspective (vd)*, and *IT support (pip)*. This questionnaire has been used by various researchers, such as [9], [10], [11], [12], and [13]. The ICT maturity questionnaire is based on Pham's [14] research. This questionnaire measures three variables: ICT Infrastructure, ICT Application, ICT Human Resources, and ICT Policy. This questionnaire has been used in research [13].

Figure 1 is the research flowchart. The research begins by collecting relevant literature and field studies on the three SMEs. Primary data was obtained from BPM maturity and ICT maturity questionnaires, while secondary data needed were existing business processes and IT implementation. From the questionnaire results, the BPM and ICT maturity score was calculated,

and then the score was grouped based on the maturity level. Evaluation for each variable was also carried out using a spider chart. Analysis and formulation of recommendations were performed by comparing existing business processes and the maturity level of BPM and ICT.

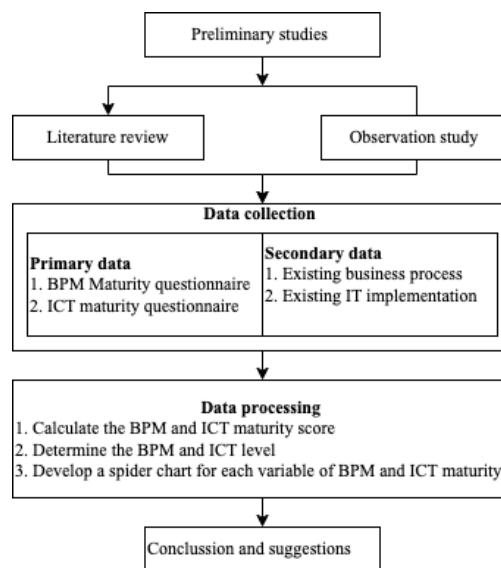


Figure 1 Research flow chart

3. Result and Discussions

3.1. The Existing Business Process of SME A

SME A is a culinary business that provides cake and catering services. SME A uses the make-to-order strategy, where the production process starts with a customer order. Based on the industrial scale, SME A is classified as a small business unit with 1-50 employees and below 300 million rupiahs yearly income. The customer order triggers the entire process if viewed based on business process flow. These activities will then trigger procurement, production, and financial processes sequentially. Most of the processes in SME A are still manual. However, along with technological developments, SME A has begun to use a mobile app to communicate with its vendors, customers, and banks. The existing business process is illustrated in Figure 2. Two documents are produced from the existing business process: financial documents and production schedules.

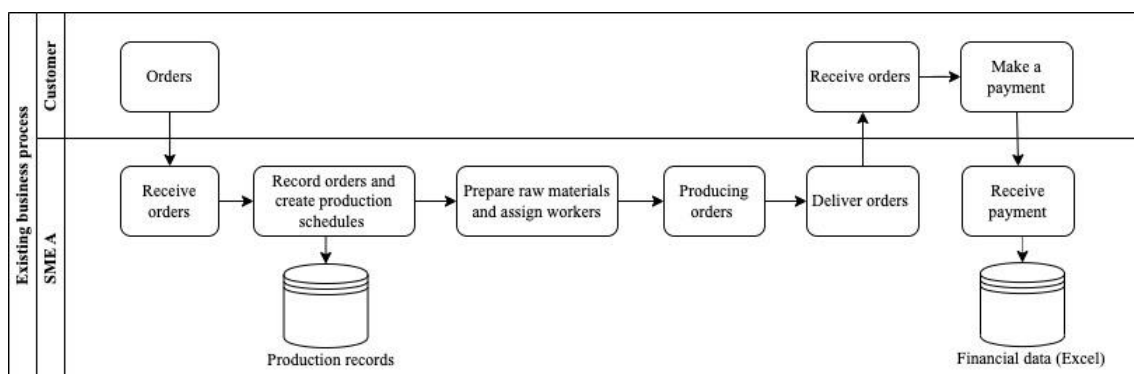


Figure 2 The business process of SME A

3.2. The Existing Business Process of SME B

SME B is a culinary SME that produces frozen tuna. SME B uses a made-to-stock strategy with a daily production target. SME B sells its products with a business-to-business (B2B) scheme to hospitals, schools, and supermarkets. The market of SME B spreads extensively throughout Java Island. The business process of SME B consists of three groups: procurement, production, and sales. Most of SME B's operations are focused on procurement and production, while the marketing and distribution processes are left to the distributors. The business process flow of SME B is depicted in Figure 3.

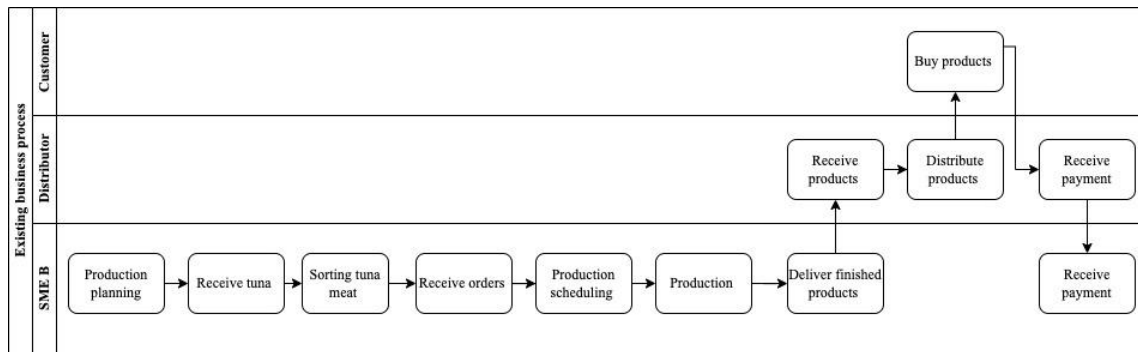


Figure 3 The business process of SME B

3.3. The Existing Business Process of SME C

SME C provides a variety of cakes and serves catering needs. This SME uses a make-to-stock strategy with a daily production target of 200 pieces. The target market is the end consumers of cake and catering services. The business process in SME 3 is grouped into three divisions: procurement, production, and sales. Figure 4 depicts the business process for SME 3.

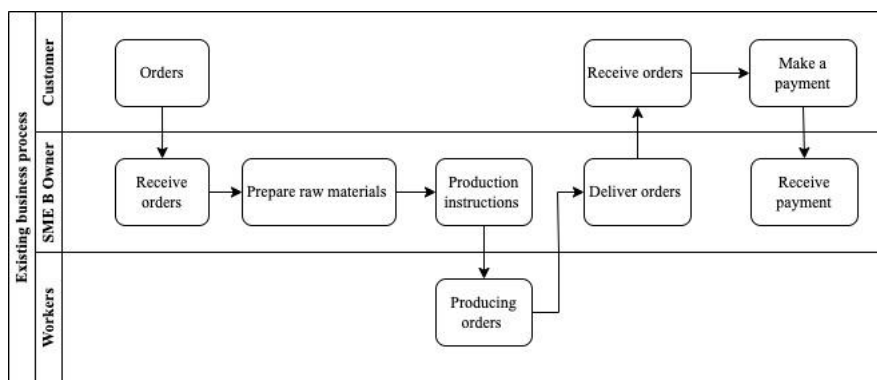


Figure 4 The business process of SME C

The three SMEs above have similarities and differences. SME A and SME C use a make-to-order strategy, where the process is stimulated by customer orders. On the other hand, SME B uses a make-to-stock strategy, where the process is triggered by the fulfillment of finished product stock. In each SME, the maturity level was then evaluated, and a comparison was made of the maturity of the three SMEs on each variable. This was performed to see the possibility of implementing an ERP system in the culinary SMEs in Yogyakarta, especially in the three SMEs samples. Sibarani

[11] studied culinary SMEs in East Java and resulted that only one SME was at the defined level, while the others were at the ad hoc level.

3.4. BPM and ICT Maturity Level

The BPM maturity is measured using a questionnaire developed by Skrinjar and Trkman [8]. The questionnaire uses a Likert scale of 1-7, where one means strongly disagree, and seven means strongly agree. Researchers accompany SME owners as respondents in filling out the questionnaire. Table 1 shows the results of the BPM Maturity questionnaire. As shown in Table 1, the strategic view (sv) variable was measured by four questions (sv1, sv2, sv3, and sv4) based on the research of Skrinjar and Trkman [8]. In this variable, the three SMEs have different maturity values.

Table 1 BPM Maturity Questionnaires

Variable	Questions	SME A	SME B	SME C	Variable	Questions	SME A	SME B	SME C	
<i>sv</i>	sv1	6	7	5	<i>pok</i>	pok1	2	3	1	
	sv2	4	4	4		pok2	4	4	3	
	sv3	3	3	2		pok3	2	2	1	
	sv4	5	5	3		pok4	3	6	4	
<i>ddp</i>	ddp1	4	6	4	<i>tu</i>	tu1	6	3	4	
	ddp2	5	3	3		tu2	5	4	5	
	ddp3	2	3	2		tu3	4	6	4	
	ddp4	3	4	3		tu4	3	6	3	
	ddp5	2	3	2		tu5	4	7	7	
	ddp6	2	2	2		tu6	6	1	5	
<i>mmp</i>	mmp1	3	5	3	<i>vd</i>	tu7	4	1	3	
	mmp2	3	5	2		vd1	6	7	1	
	mmp3	3	6	5		vd2	3	2	1	
	mmp4	3	4	4		vd3	3	2	1	
	mmp5	6	6	2		<i>pip</i>	pip1	1	1	1
	mmp6	4	4	1			pip2	1	1	1
<i>pos</i>	pos1	3	3	1	pip3		1	1	1	
	pos2	3	1	2	pip4		2	2	2	
	pos3	6	3	2	pip5	1	1	1		
	pos4	2	2	4	pip6	2	1	1		
<i>uk</i>	uk1	3	2	2	Pip7	1	1	1		
	uk2	4	3	2						
	uk3	4	4	1						
	uk4	4	6	5						

The Information Communication Technology (ICT) Maturity is measured using a questionnaire developed by Pham [14]. The questionnaire consists of four variables: ICT infrastructure, ICT application, ICT Human Resources, and ICT policy.

3.5. Discussion

The assessment of the 3 SMEs showed an average score of 3.35 for SME A, 3.42 for SME B, and 2.75 for SME C. The three SMEs are still at the ad hoc level, where SME C has the lowest maturity score. The ad hoc level is a business process that needs to be structured, and most functions are

still traditional. These results align with the interviews conducted with each SME’s owner, which stated that most processes are still traditional.

As seen in Figure 5a, SME A requires an improvement in all variables, especially the IT support variable (pip), while the market orientation (tu) is the highest value. On the other hand, the ICT maturity value of SME A is 0.477, which means that SME A at the substantial phase or level 3. The highest index is obtained for the infrastructure variable (0.603), whereas the lowest is for the policy variable (0.248). SME B has an average business process maturity score of 3.46, with the IT supports variable (pip) being the lowest maturity. Figure 5b illustrates the result of the business maturity model on SME B. On the other hand, the assessment of ICT maturity showed that SME B was in the level 1 or inactive phase with a 0.1975 score. On the other hand, SME 3, as illustrated in Figure 5c, needs improvements in all variables because each variable shows a low maturity level, especially from the supplier perspective (vd) and IT support (pip).

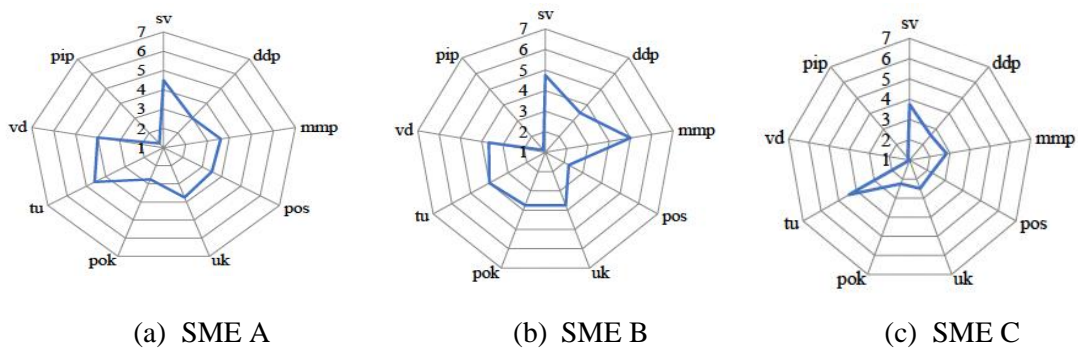


Figure 5 The business process of SME 3

The three SMEs need a specific division to manage a series of activities for each business process. SME B has a dedicated marketing team, a structured production schedule, and a clear procurement process. To see more detail on the maturity of business processes in the three SMEs, Figure 6 compares the average scores for each variable. Based on Figure 5, the three SMEs are very weak in the IT support variable (pip). This lowest score means no IT involvement in the SME business process. Another area for improvement is the supplier perspective variable (vd), especially for SME C. SME C needs to collaborate with the vendors to support the procurement process. In addition, SMEs A and B have key suppliers, despite the limitation in the cooperation. On the other hand, the ICT maturity assessment showed various maturity scores. The ICT maturity level of SME A is 0.477 (substantial), SME B is 0.1975 (inactive), and SME B is 0.326 (basic). Figure 7 shows a comparison of ICT maturity for each variable. SME A, B, and C are depicted in blue, orange, and grey, respectively.

Sibarani [11] studied 15 culinary SMEs in East Java and resulted that only one SME was at the defined level, while the others were at the ad hoc level. Gandhi [9] researched three garment SMEs and found that two were at the defined level while the other was at the ad hoc level. The previous finding, combined with the result of this research, found that most culinary SMEs were still at an ad hoc level.

ERP implementation will affect the maturity level of an organization's business processes. Grube [15] stated that companies need an integrated business process to have the 3 (linked) maturity levels. Thus, using ERP can increase the maturity of an organization's business processes. In addition, Grube [15] also said that BPM Maturity measurement is essential in measuring the urgency of ERP system implementation. It means that implementing an ERP system must also consider the maturity of the business process. Another factor that influences the success of ERP implementation is the availability of IT infrastructure supported by policies and qualified IT resources. In some literature, such as Jaeger and Mishra [16], ICT Maturity, which includes an understanding of technology and business process flows, is the key to successful ERP implementation.

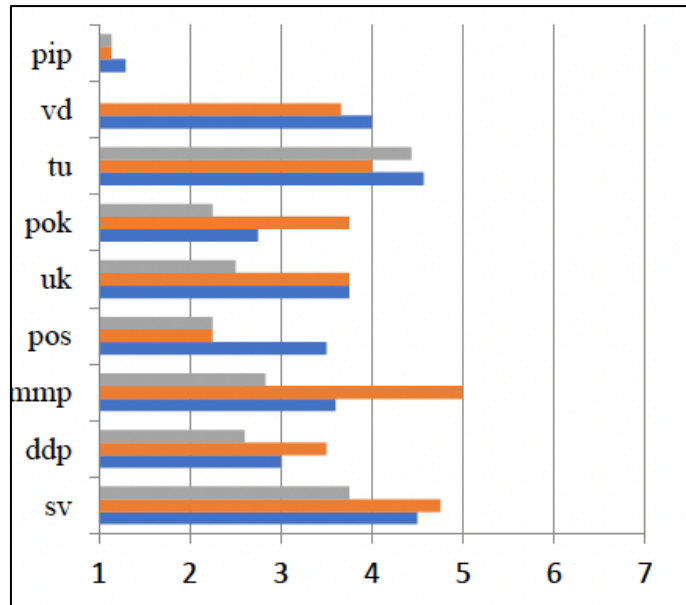


Figure 6 BPM Maturity level

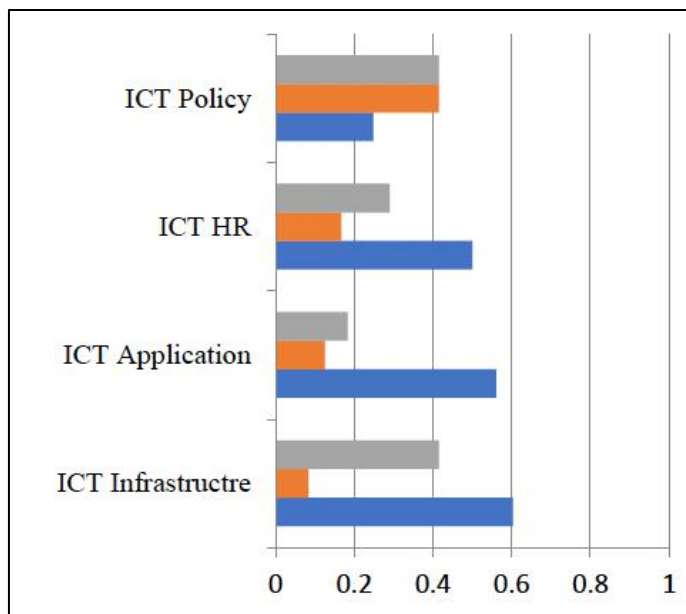


Figure 7 ICT Maturity level

Business process re-engineering needs to be performed before ERP implementation. The three SMEs still need to separate the business process based on dedicated functions in the existing condition. There are no precise tasks for each employee in the business process, and this existing condition causes various problems. First, receiving and recording orders can be performed by anyone without any communication. This condition results in duplicate data, unrecorded data, or messy recording. Second, the payment flow is not defined or waived to the buyer. Several problems have arisen due to unclear payment channels. Third, there needs to be integration between the cake and catering production schedules. Based on the current condition, business process improvements are developed to improve the process. The recommendation is shown in Figure 8.

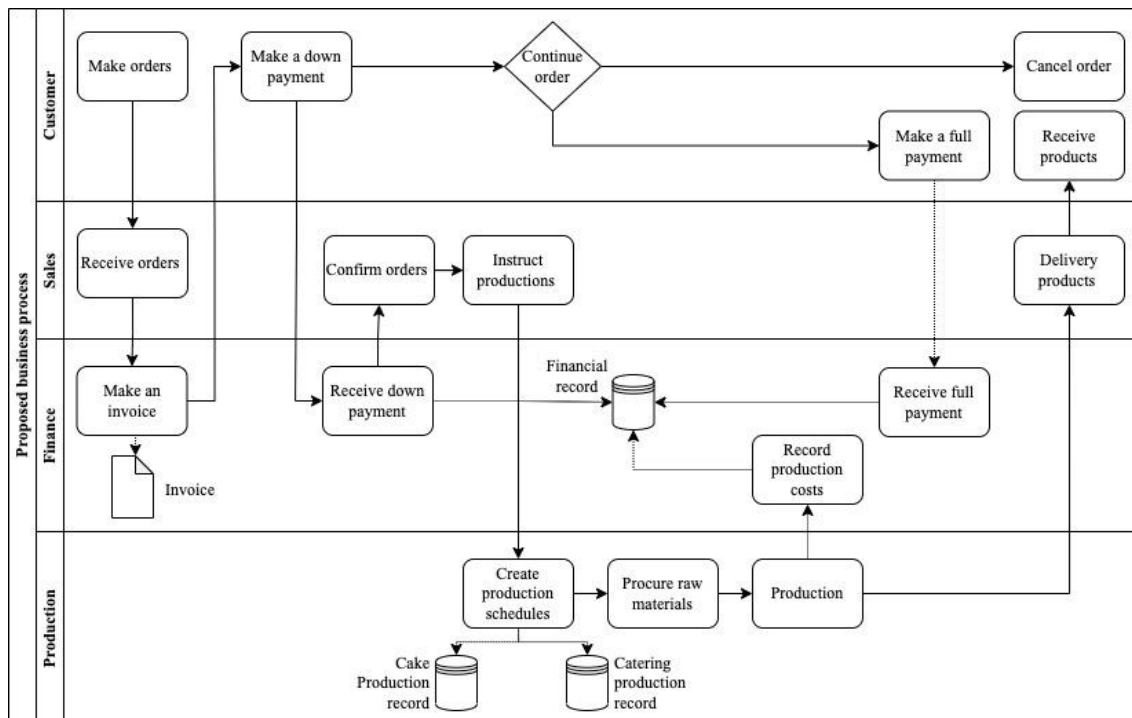


Figure 8 BPM Maturity level

The business process recommendations above are compiled based on the best practice business processes used by ERP system providers, such as Odoo or SAP. As mentioned in the study [17], business process reengineering is the most significant factor determining the success of ERP implementation in MSMEs. In the proposed business process, each activity is defined based on function in the proposed business process flow. The sales team should generate sales orders for the production department. The production department then arranges the production schedule for cake and catering. The transaction recording for cakes and catering products is performed separately. The process also defines the payment flow, and the financial records can be carried out more regularly to avoid the risk of cancellation. As studied in previous research [18] [19], it was also found that non-technical barriers were more significant than technical barriers. On this basis, in addition to re-engineering business processes, it is also necessary to support the provision of guidance and training for SME management.

4. Conclusion and Recommendation

The assessment of business process maturity indicates that the three SMEs are at *the ad hoc level*, the lowest level of business process maturity. On the other hand, the ICT maturity varies from *inactive* to *substantial*. SME A had the eligibility to implement an ERP system but first needed to perform the business process re-engineering project. The recommendations have been designed for SME A to improve its business process flow as a pre-step before implementing an ERP System. Through re-engineering business processes, SME A's business processes are in accordance with the business processes of the ERP system provider, so it is expected to reduce the risk of implementation failure.

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