Owner's Support, IT Sophistication and IT Adoption in Indonesian Manufacturing SMEs

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Abstract. The importance of technology, especially information technology (IT), to business is widely accepted. But, different from large enterprises, small and medium-sized enterprises (SMEs)– with their limited resources –adopt IT slowly.The literature on technology adoption suggests that organizational readiness is one of many factors that determine the adoption of technology. This paper relates IT adoption in Indonesian B-to-B manufacturing SMEs with their IT readiness, which is represented by the owner's support and the IT sophistication they have. In this paper, the variety of IT adoption by SMEs is explored using a business process approach. Owner's support is represented byIT knowledge of the owners and resource allocation by the owners. IT sophistication includes the management level that is supported by IT, IT skills and IT innovativeness of the SMEs' staffs. Three propositions were formulated and explored using data that were collected from 320 SMEs. Using cluster analysis, these SMEs were grouped into five types of IT adoption based on three business sides(supplier, internal and customer): early adoption, internal focus adoption, customer focus adoption, internal-customer focus adoption and balanced adoption. The results suggest that a wider IT adoption requires a greater support from the owner and a higher IT sophistication.

Keywords: *business process; IT adoption; IT sophistication; owner's support; small and medium-sized enterprises.*

1 Introduction

Small and medium-sized enterprises (SMEs) provide various contributions to Indonesia's economic development. According to the most recent available data there were 52.76 million SMEs in Indonesia in 2009. Based on this figure, SMEs are the dominant economic actors, i.e. 99.99% of all actors in the national economy [1]. SMEs support the strength and growth of the national economy (pro-growth) [2]. The dominant existence of SMEs as national economic actors makes them vital subjects in Indonesia's economic development, especially in expanding the opportunities for new entrepreneurs and reducing unemployment (pro job) [2].

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SMEs have many weaknesses that cause difficulties for them to grow and thrive. Lack of access to productive resources, especially technology and information, leads to their inability to improve the quality of their products. These conditions create a low competitiveness of SMEs [2]. Realizing the role of SMEs in reducing poverty by improving income levels and creating jobs, the Indonesian government has developed various policies to improve the competitiveness of SMEs and encourage their growth [2],[3]. One of the government's efforts is offering training programs for SMEs, including trainings in information and communication technology, including the Internet (IT). With the increasing number of Internet users [4], IT trainings facilitate SMEs to access a wider market.

IT is a resource that helps companies in improving their competitiveness [5]-[8]. Blattberg and Deighton state that the Internet has two important features: *addressability* (ability to address an individual) and *memory storage* (ability to gather and remember the response of that individual). These two features shift the paradigm of product marketing from broadcast marketing to interactive marketing [9]. In addition, the Internet is a public network that allows interaction with a company's suppliers and customers and enables private communication networks within an organization to manage its workflow, coordinate its activities and improve its efficiency [10].

The Internet facilitates SMEs to grow and compete with big companies, because it is a low entry-price technology [10],[11]. Advantages of Internet use for SMEs include three aspects [12]. First, efficiency gains in communication via email. Second, effectiveness gains in research and information on competitors. Third, the Internet helps create the image of a modern company and improves SMEs' promotion and their products. In general, the advantages of Internet for companies are a broader potential market, reduced costs of transactions, increased speed of transactions, increased economies of scale, minimized human involvement in the business processes, and unlimited customer access to product information [13].

To improve SMEs' competitiveness, the government offered IT trainings for SMEs from 2008-2010. To understand the further use of IT by Indonesian SMEs, previous studies [14],[15] were conducted. These studies found that most SMEs do not continue to use Internet for various reasons. These reasons show that SMEs have a low readiness for IT adoption. The Indonesian government sees that the training facilities and the funds that were allocated were not effective. Therefore, there is a need to understand how IT adoption occurs in Indonesian SMEs. This understanding will be used in a future study on a business and IT alignment framework. This framework will help SMEs in

preparing the requirements for implementing IT in order to achieve effectiveness of IT training and IT investments.

This paper presents an empirical study on IT adoption by Indonesian SMEs that engage in B-to-B manufacturing. This paper discusses the results of an exploratory study on IT adoption by SMEs using a business process approach. Based on IT-supported business processes, a typology of IT adoption was obtained and each type of adoption was linked to the readiness of SMEs in the form of owner support and IT sophistication in the SMEs.

2 Research Methods

2.1 Business Process Approach

Many studies have focused on IT's contribution to firm performance [16] and there is a consensus that IT has significant influence on business success [17]. There are two approaches to describe IT's contribution to business: the economic-production based approach and the business process approach [18]. The economic-production based approach sees the performance of business as an input-output relationship. The literature on this approach is summarized in [19].

Kauffman and Weill [20] have suggested that in IT research, the analysis of IT's contribution to business is conducted at the technology's locus of impact within the organization. The business process approach proposes business processes as the IT locus of impact [21],[22]. Because IT business value is created on a business process level [21], many IT references emphasize that IT business values should be observed when using the business process approach [23].

From the perspective of IT, the evolution of an organization is viewed from the extent of business processes that are supported by IT and the complexity of the technology that is used in running the business processes [24],[25]. The complexity of an innovation is accepted as a factor that inhibits the rate of innovation [26], while the implementation of IT in SME business processes is a form of assimilation of IT knowledge and skills by SMEs [27]. Therefore, utilizing the business process approach in this study shows the typology of IT adoption by SMEs. Each type of IT adoption is connected with the SME's internal condition and can thus be interpreted as the SME's readiness to undertake IT adoption.

This study used 41 business processes that can be supported by IT. This study borrows a typology of 36 business processes that have been identified by Elia, *et al.* [27]. Five other business processes were obtained through our previous

study [28]. With the business process approach this study identifies the differences between SMEs based on their IT-supported business processes.

		Business Processes
Functional Activities	Pde	1. Transfer documents and technical drawings to customers (2.33) 2. Transfer documents and technical drawings to suppliers (2.33) 3. Integrate software supporting product design (e.g.: CAD/CAM) (5.58) 4. Do collaborative on-line engineering with suppliers (6.00) 5. Do collaborative on-line engineering with customers (6.00)
	Proc	6. Seek out new suppliers (1.25) 7. Seek out products/services (1.25) 8.Buy products/services using electronic catalogs (2.25) 9. Buy products/services by electronic auction (2.92) 10. Buy products/services by issuing electronic calls for tenders (3.50) 11. Place and manage orders with suppliers (3.00) 12. Negotiate contracts (price, volume, etc.) with suppliers (2.92) 13. Make electronic payments to suppliers (2.91) 14. Access suppliers' product/service databases (3.33)
	Prod	15. Automate the floor using a manufacturing execution system (4.50) 16. Integrate the MES into the management information system (5.08) 17. Ensure the management of quality assurance using the MIS (3.33) 18. Allow customers to access the company's inventories (4.50) 19. Access customers' inventories (4.08) 20. Allow suppliers to access the company's inventories. (4.50) 21. Access suppliers' inventories (4.00)
	Mark	22. Advertise the company and/or its products/services (1.50) 23. Seek out new customers (1.25) 24. Convert information on products/services into digital form (2.27) 25. Sell products/services using electronic catalogs (2.75) 26. Sell products/services by electronic auction (3.42) 27. Sell products/services by responding to electronic calls for tenders (3.50) 28. Negotiate contracts (price, volume, etc.) with customers (3.00) 29. Receive and manage customer orders (2.55) 30. Receive electronic payments from customers (3.00) 31. Access customers' product/service databases (3.75) 32. Offer customers after-sales services (2.75)
	Dist	33. Automate distribution using a logistics execution system (LES) (5.25) 34. Allow distribution partners to access the information they need (5.08) 35. Optimize returns management ("reverse logistics") (5.67) 36. Track products (purchased and sold) during transportation (4.42)
	Fin	37. Administrate business transcations (3.00) 38. Administrate debt (3.00) 39. Administrate receivables (3.00) 40. Account profit/loss (3.00) 41.Account the assets (3.00)

Figure 1 Business processes typology based on functional activities with their complexity weight.

Figure 1 presents the typology of business processes based on functional activities. There are six functional activities: Product Design (Pde), Procurement/Purchasing (Proc), Production/Operations (Prod), Sales/Marketing

(Mark), Distribution/Logistics (Dist) and Finance (Fin). Figure 2 presents a business processes typology based on functional activities (columns) and business sides (rows). There are three business sides: suppliers, internal and customers.

	Functional Activities							
	Pde	Proc	Prod	Mark	Dist	Fin		
Supplier Side	2,3,4	6,7,8,9, 10,11, 12,13,1 4	20,21		34	37	Upstrea m Score	Global Score
Internal Side			15,16,17	24	33,36	38,39,40 ,41	Internal Score	
Customer Side	1,3,5		18,19	22,23,25,26, 27,28,29,30, 31,32	35	37	Downstrea m Score	
	Pde Score	Proc Score	Prod Score	Mark Score	Dist Score	Fin Score		

Figure 2 Business processes typology based on business sides and functional activities.

The number in parentheses after each business process in Figure 1 is the complexity weight of each business process. The complexity weights were assessed using the Delphi Method. The complexity weights of business processes 1 to 36 were borrowed from [27]. The business processes 36 to 41 and their complexity weights were obtained from our previous study [28].

With these complexity weights, each SME received complexity scores that were calculated with the following formula:

$$\frac{\sum_{i=1}^{n} c_i \times BP_i}{\sum_{i=1}^{n} c_i} 100 \quad (1)$$

where c_i is the complexity weight of business process i; BP_i = 0 if business process i is not executed with IT support and BP_i = 1 when business process i is executed with IT support. Each SME has ten complexity scores: a global complexity score, a complexity score of each functional activity (there are six activities), and a complexity score of each business side (there are three business sides). Using these complexity scores, the SMEs were grouped based on the focus of IT support in their functional activities and their business sides.

2.2 Data Collection

This study seeks to understand the current IT adoption by SMEs in Indonesia related to their internal condition. Therefore, the unit of analysis of this study is an SME that has adopted IT, especially Internet technology, in its business. The respondent is a person who represents the SME and may be the owner, the manager or an employee who understands the adoption of IT in his/her company. The definition of SMEs varies between countries, but it is usually based on the number of employees, assets value, or a combination of both [3],[29]. This paper uses the definition of SMEs based on their assets value as described in Indonesian law [30].

Data were collected through a survey of 320 SMEs in Java (64% of Indonesian SMEs are in Java [31]). Because there are six provinces in Java and this study focused on wood and metal manufacturing SMEs, the data were gathered through random, proportional, clustered and stratified sampling. Table 1 presents the proportional clustered stratified numbers of samples taken in this study. The data that were gathered by the survey were processed using cluster analysis in order to obtain a typology of IT adoption by the SMEs.

Table 1 The numbers of samples taken in this study (n=320).

	Banten	**Jakarta**	**West Java**	**Central Java**	**Yogya**	**East Java**
Wood	**11**	**4**	**25**	**60**	**28**	**58**
Small Ent.	10	3	22	52	24	51
Medium Ent.	1	1	3	8	4	7
Metal	**6**	**10**	**43**	**32**	**0**	**43**
Small Ent.	5	9	38	28	0	38
Medium Ent.	1	1	5	4	0	5

Source: calculated based on [32].

3 Conceptual Model

3.1 Types of IT Adoption by SMEs

SMEs have a business strategy. However, the business strategy of Indonesian SMEs is generally not clearly and not formally formulated, not developed with a good planning and appears only in the form of commitments [33],[34]. Meanwhile, the adoption of IT in SMEs cannot be separated from their business strategy. Business strategy may act as a transporter that moves SMEs from one phase of IT adoption to a higher phase without having to go through the sequence of IT adoption phases [33],[35]. When SMEs determine a business

strategy and decide to adopt IT to support their chosen business strategy, they have to prepare their internal support.

Each SME has a different business strategy compared to other SMEs and this has as a consequence that there are various types of IT adoption by SMEs. Each type of IT adoption, as expected by the SMEs, will provide a different business performance [27],[36]-[39]. But, because there is little knowledge about the condition of IT adoption in Indonesian manufacturing SMEs there is a need to explore various types of IT adoption. Hence, we state Proposition 1: *There are various types of IT adoption in SME business processes*.

3.2 The Owner's Support

In general, Indonesian SMEs are managed directly by the owner or their family members with informal management [40]. In SMEs, all roles are played by one manager or several managers from the family [41]. To understand the role of the owner in SMEs, he can be compared with an executive at a big company. The commitment of senior executives to IT is a major enabler in IT adoption that is aligned with business strategy [42]. The support of senior executives for IT can be seen from the executives understanding of IT's value; the executives are able to define and communicate the vision and strategy that involve the role of IT, and the executives' will to sponsor IT projects within the company [43],[44].

In an organization, the CEO's commitment to IT has a positive influence on IT adoption [38]. The SME owner's support for IT adoption, in this study, manifests itself in the form of IT knowledge of the owner and IT resource allocation in the SME. Regarding the support of the SME's owner, we state Proposition 2: *The SME's owner provides diverse support for IT adoption in the company*.

3.3 IT Sophistication

IT sophistication is an influential factor in business-IT alignment in SMEs [38]. IT sophistication in this study covers technical aspects and innovativeness. The technical aspects of IT sophistication include: IT skills level of the SME's staff and management level that is supported by IT. The SME's commitment to IT is manifested in improving IT skills of its staff and how wide IT is adopted in the business processes of the SME. Companies with sophisticated IT resources can achieve a competitive advantage by deploying these resources to strengthen their business [5].

The evolution of an organization in adopting IT starts from the lowest level (the organization adopts e-mail technology) to the highest level (the organization implements e-business)[25],[45],[46]. From the perspective of IT, the evolution

of an organization is viewed from the extent to which the business processes are supported by IT and the complexity of the technology that is used in running the business processes [24],[25]. The complexity of a technology is known as an inhibiting factor in the adoption of technology by organizations [26],[47],[48], while the implementation of IT in the SME's business processes is a form of IT knowledge and skill assimilation by the SME [27]. This means that a wider adoption of IT in the SME's business processes requires a higher IT sophistication. Therefore we state Proposition 3: *There is a relationship between IT sophistication and each type of IT adoption by the SME*.

4 The Typology of IT Adoption in Indonesian Manufacturing SMEs

Questionnaires were distributed for this study and each questionnaire was answered by someone who represented the SME. Each SME was asked which business processes were currently supported by IT and other questions that were related to the SME owner's support and IT sophistication. From business processes that are supported by IT, using Formula 1, the complexity scores of each SME were calculated.

Using their global scores to classify the SME will not give a useful insight, because it doesn't show the differences among the SMEs. From the perspective of functional activities, the SMEs can be grouped using the complexity score of each functional activity, so that this study obtains an understanding of the activities focus of IT support. The SMEs can also be grouped based on the complexity score of their business sides, so that this study gains an understanding of the business focus of IT support in the SMEs.

As an illustration for the calculation of the complexity score, SME Y has adopted IT for supporting business process number 1 only (Transfer documents and technical drawings to customers, which has complexity weight 2.33), while other business processes are not supported by IT. This business process is included in the customer side. This SME has an upstream score of 0 and an internal score of 0, because it has no business process with IT support on both other business sides (See Figure 2). Using Formula 1, the complexity weight of business process number 1 (2.33) and the sum of all complexity weights of the business processes on the customer side (55.63) are processed to obtain the downstream score of 4.19.

This study used cluster analysis to group the SMEs. Two cluster analyses were conducted: one based on the complexity score of the functional activities and one based on the complexity score of the business sides. For each grouping, this study used a two-stage cluster analysis that is commonly carried out [49]. The

first cluster analysis uses Ward's method to find the optimal number of clusters through an agglomeration schedule. The second cluster analysis uses the K-means clustering method. Because the cluster analysis based on the functional activities presents a diffused result, this study does not allow the conclusion that the groups are formed well. Therefore, this study only discusses the cluster analysis based on the business sides.

The cluster analysis based on the business sides starts with Ward's method. With this method, the optimum number of clusters is 5. The second cluster analysis uses the K-means clustering method with initial number of clusters of 5 obtained from Ward's method. The five clusters are presented in Table 2.

Table 2 Cluster of IT adoption (n=320).

Clusters	Upstream score[b]	Internal score[b]	Downstream score[b]	Global score[b]
Cluster 1 (n=155)	2.63	5.49	4.94	4.46
Cluster 2 (n=19)	2.20	42.64	5.43	14.74
Cluster 3 (n=58)	6.70	5.53	27.78	13.94
Cluster 4 (n=31)	5.95	43.34	24.64	23.91
Cluster 5 (n=57)	22.04	43.34	44.48	33.85
p[a]	0.000	0.000	0.000	0.000

[a] p = significance level of ANOVA test
[b] maximum score = 100 and minimum score = 0; these scores represent the weighted sum.

To ensure that the grouping process would give a valid result, this study performed a discriminant analysis. Based on the result of the discriminant analysis, the study found that 97.5% of SMEs had been appropriately grouped. This suggests that the formed groups were valid and feasible for further analysis.

Table 2 shows that Cluster 1 consists of SMEs that have already adopted IT in three business sides, but still to a limited degree. This cluster has a low global score of 4.46. This means that the SMEs in this cluster have assimilated 4.46% of IT knowledge and skills. There were 155 small enterprises (81 wood manufacturing and 74 metal manufacturing) that were using this type of IT adoption. With this type of adoption, the SMEs in this cluster are in the early phase of IT adoption.

The other clusters show the focus of IT adoption by the SMEs. In Cluster 2, the efficiency of internal business processes is the major concern. The internal score (43.34) was greater than the upstream score (2.20) and the downstream score (5.43). Although Cluster 3 had a global score (13.94) that is not significantly different from that of Cluster 2 (14.74), the SMEs in Cluster 3 pay more

attention to business processes that support their customer relationships (score of downstream = 27.78).

The SMEs in Cluster 4 have adopted more IT support on the internal side (43.34) and the customer side (24.63) rather than the supplier side (5.95). Cluster 5 shows more advanced IT adoption by the SMEs in three business sides (upstream score = 22.04; downstream score = 44.48; internal score = 43.34) compared to the four other clusters.

Thus, this study has found five types of IT adoption in Indonesian manufacturing SMEs: (1) adoption of IT in three business sides, but with lack of focus on any business side, (2) adoption of IT that supports the efficiency of the internal business process, (3) adoption of IT that supports customer relationships, (4) adoption of IT that supports internal efficiency and customer relationships, and (5) adoption of IT that is balanced over all three business sides. This pattern may indicate an evolution path of IT adoption in Indonesian manufacturing SMEs, but further research is needed to confirm this.

There are some differences among the clusters of IT adoption, which are presented in Table 3. Since this study focuses on manufacturing SMEs that use wood and metal as the raw material, Table 3 presents the differences based on these materials. In Table 3, medium-sized enterprises appear in Cluster 5 for wood companies and in Cluster 4 and 5 for metal companies. This indicates that companysize is an influential factor for IT adoption. The bigger the company, the higher its IT adoption.

Table 3 Differences between clusters.

	Attributes	**Cluster 1** (155 SMEs)	**Cluster 2** (19 SMEs)	**Cluster 3** (58 SMEs)	**Cluster 4** (21 SMEs)	**Cluster 5** (57 SMEs)
Wood	Number of companies	81 SE	10 SE	23 SE	29 SE	19 SE, 24 ME*
	Product Characteristic	Semi-finished product and spare parts	Semi-finished product and spare parts	Semi-finished product	Finished product	Finished product
	Market	Local	Local	National	National – International	National – International
Metal	Number of companies	74 SE	9 SE	35 SE	2 ME	14 ME
	Product Characteristic	Spareparts	Spareparts	Spareparts	Spareparts	Spareparts
	Market	National	National	National	National	National

*SE = small enterprise, ME = medium-sized enterprise.

As for the wood companies, the SMEs in the lower clusters (1, 2 and 3) produce semi-finished products and spare parts. They seem to be suppliers for the higher clusters (4 and 5), which produce finished products. This is shown by the

differences between product characteristics in the wood companies. Table 3 also shows that the wood SMEs with a higher IT adoption, market their products to wider markets.

For the metal companies, the product characteristics do not differ between clusters, because all cluster produce the same kind of products (spare parts). In the products market, all clusters of metal SMEs market their products to the national market.

5 The Owner's Support

The SME owner's knowledge about IT is seen through the intensity of IT use (how many hours per day) and IT courses that have been taken by the owner, which include the subject areas: computer aided design (CAD), office, accounting, graphic design, Internet, and website management. Table 4 shows scores for the IT knowledge of the SME owners. The first row after the heading of Table 4 presents the intensity of IT use by the owner. The next rows present the number of SMEs of which owner has taken courses in the afore mentioned subject areas. As an example, in Cluster 1, there are 130 of 155 SMEs of which the owner has taken a CAD course.

Table 4 IT knowledge of SME owner.

IT Knowledge	**Cluster 1** (155 SMEs)	**Cluster 2** (19 SMEs)	**Cluster 3** (58 SMEs)	**Cluster 4** (31 SMEs)	**Cluster 5** (57 SMEs)
IT Use	1 hour/day (138 SMEs) 2 hours/day (17 SMEs)	2 hours/day	4 hours/day	4 hours/day	2 hours/day
CAD Course	130 SMEs	18 SMEs	58 SMEs	28 SMEs	55 SMEs
Office Course	155 SMEs	19 SMEs	58 SMEs	31 SMEs	57 SMEs
Accounting Course	24 SMEs	19 SMEs	9 SMEs	24 SMEs	6 SMEs
Graphics Design Course	132 SMEs	19 SMEs	58 SMEs	31 SMEs	57 SMEs
Internet Course	155 SMEs	19 SMEs	58 SMEs	31 SMEs	57 SMEs
Website Course	107 SMEs	13 SMEs	23 SMEs	22 SMEs	4 SMEs

Table 5 presents the allocation of IT resources by the SME owners in each cluster of IT adoption. IT resources that are allocated by the owner are seen through: the number of IT staffs, the number of computers provided, the arrangement of computer use, and the connectivity of computers with the Internet.

From Table 4, IT use by the owner increases from Cluster 1 to Cluster 4 and then decreases in Cluster 5. In Cluster 1, although IT has been adopted by the SMEs, the intensity of IT use by the owners is not high because of the SMEs' limited resources. Along with a wider IT adoption by the SMEs, the intensity of IT use by the owner is higher. The decreases in Cluster 5 can be related to the number of IT staffs and the Internet connectivity (see Table 5). Having additional IT staffs reduces the use of computers by the owners, because IT tasks are allocated to the IT staff. While an Internet connection was only available on the owner's computer in the lower clusters, the SME owners in Cluster 5 provide an Internet connection for every computer in the company. This means that the interaction of the owner with the Internet is lowered, because this interaction is distributed among the staffs.

Table 5 IT resource allocation.

IT Reources	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5
Number of IT Staff	0 person (all SMEs)	1 (4 SMEs)	1 (8)	1 (5)	1 (42) 2 (15)
Number of Computer	2	2-5	2-5	2-5	> 5
Computer Use	Mix (143)	(For office & finance)and for design (13)	Mix (53)	(For office & finance)and for design (28)	For finance, for office and for design (49)
Internet connectivity	Internet for the owners	Internet for the owners	Internet for the owners	Internet for the owners	Every computer connected to LAN and Internet

Table 4 shows that most owners have taken courses in CAD, office, graphic design and Internet. This means that CAD, office, graphic design and Internet skills are fundamental skills that must be owned by the owners of manufacturing SMEs. In other words, CAD, office, graphic design and Internet are basic requirements for SME owners to provide support for their business by utilizing IT. Skills in financial accounting become a necessity for the owners who adopt IT for internal efficiency (Cluster 2 and 4). However, skill in financial accounting is not a requirement for the owners in Cluster 5.

Regarding website management skills, although the need for these is not as strong as for the previous skills, the SME owners gained these through courses. Accounting courses become a need for the owners in clusters that implement IT in finance activities, except for Cluster 5. From Accounting Courses in Table 4 and Computer Use in Table 5, the availability of specialized staff in finance

renders accounting skills unnecessary for the owners in Cluster 5. Computer arrangements that separate computer uses (different computers for office, design and finance) show that skill in financial accounting is handed over to a special finance staff.

Table 5 shows that a wider IT adoption requires more support from the SME owners in the form of greater computer allocation and more specialized computer usage. In addition, although the use of Internet is common in manufacturing SMEs that adopt IT, the most advanced IT adoption (Cluster 5) requires the owner's support in the form of Internet connectivity for all the company's computers.

Provision of IT staff and computers by SMEs owners in Cluster 5 leads to Cluster 5 becoming a different cluster from the other clusters in IT implementation. The differences with the other clusters are in the arrangement of computer usage and Internet connectivity. In addition, the presence of IT staff decreases the owner's need for accounting and website management skills. In general, a wider IT adoption demands higher support from the owner, especially in IT resource allocation.

6 IT Sophistication

This study looked at IT sophistication in the form of technical aspects of IT and staff innovativeness in IT use. The technical aspects of IT include: how the SME manages IT, how the SME getsits software, and how the SME creates its own website. Innovativeness aspects include: how often the SME releases new products, how frequently the SME updates IT, and how the SME utilizes IT in product development, marketing, procurement, production and finance. Table 6 presents IT sophistication of the SMEs.

Most Indonesian manufacturing SMEs hand over their IT management to external parties, except those in Cluster 5, which have support from their own IT staff. In Cluster 1-4, IT adoption by the SMEs is conducted on the use level and has not reached the level of independent IT management. In software development, all SMEs get their software by buying from vendors and do not develop software for their own needs. Based on this IT management, the majority of the SMEs are still on the user level, i.e. the owners and staffs use IT, while IT administration is handed over to external parties, and no SMEs develop their own software. This can also be seen from the aspect of website development, where the purpose of the website is the existence of the SMEs on the Internet. Most SMEs utilize free blogging services and in the most advanced adoption (Cluster 5) the SMEs use a paid website for their company.

Table 6 IT sophistication in SMEs.

Aspects	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5
IT management	External administrator	External administrator (15 SMEs)	External administrator (50 SMEs)	External administrator (26 SMEs)	Internal administrator (43 SMEs) with external support from IT expert
Software Development	Buy	Buy	Buy	Buy	Buy
Website Development	Free blog	Free blog	Free blog	Free blog	Paid website
New product release per year	> 5 times	>5 times	> 5 times	> 5 times	>5 times
IT Update	Never	Every new release (11)	Every new release (3)	Every new release (3)	Every new release (8)
IT for Pde	New product	New product	New product	New product	New product
IT for Mark	Market information	Market information	Market information	Market information	Market information
IT for Proc	Transaction	Transaction	Transaction	Transaction	Transaction
IT for Prod and Dist	No	No	No	No	No
IT for Fin	No	Administrative activities	No	Financial planning	Financial planning

IT has been used innovatively in product design and in the development of new products. This is shown by all clusters that release new products more than five times a year. However, as for software updating, only a small proportion of SMEs update their software. This shows that the SMEs' need for IT support of their business is already satisfied by older software releases.

IT support for product development has reached the highest level, which means IT is utilized in the creation of new products. In marketing, SMEs use IT to seek market information for their products. In procurement activities, IT is used on a transactional level. IT does not support marketing and procurement activities on a strategic level. As for production, inventory and distribution, this study has not found SMEs that implement IT in supporting these activities. Combined with a previous qualitative study [28] that investigated the support of IT in production management, this study suggests that IT support in production is rarely implemented. As for financial activities, the SMEs utilize IT on an administrative level (Cluster 2), while usage becomes more strategic for financial planning in Clusters 4 and 5.

From the above, higher IT adoption requires the availability of support staff with the ability to administer IT. In innovativeness, IT adoption related to product development has reached a strategic level. But these IT adoption levels

have not been reached in marketing and procurement, where IT adoption is still limited to the market information seeking and transactional level. In financial accounting, the IT adoption in Clusters 4 and 5 has reached a strategic level, where IT is used in financial planning. However, in Cluster 2 IT support is at an operational level, where it is used in financial administration. In general, a higher IT sophistication, from operational to strategic level, enables a wider IT adoption by the SME.

7 Conclusion

This study has shown that there are five types of IT adoption in Indonesian manufacturing SMEs. The SMEs have adopted IT on three sides of the business: (1) limited IT adoption in three business sides, (2) adoption of IT that promotes internal efficiency, (3) adoption of IT with more attention to customer relationships, (4) IT adoption that streamlines internal business processes and customer relationships, and (5) adoption of more advanced IT that balances its focus over the three business sides. This study also showed that the owner's support is necessary for IT adoption in SMEs. Higher support enables wider IT adoption. SMEs with a higher IT sophistication, where IT is implemented on a strategic level and not just on an operational level, adopt IT to support more business processes. This means that the SMEs' internal resources, as an expression of their readiness to adopt IT, should be prepared in order to gain IT adoption effectiveness.

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