

Measuring Digital Capability Maturity: Case of Small-Medium Kampong-Digital Companies in Bandung

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ABSTRACT

The objective of this study is to develop a digital capability model for Small-Medium Enterprises (SMEs) and use it as a tool to investigate the maturity of digital transformation of SMEs in three traditional business communities: Suci, Rahayu, and Binong in Bandung, Indonesia. The study employs quantitative research methodology and is exploratory in nature. A digital capability model, using the value chain analysis framework, is constructed. The model consists of nine dimensions: organisation or company presence, store presence, support, knowledge management and decision making, marketing and sales, customer relationship, internal communication, ecosystem management, and digital revenue. It is then used to collect data using saturated and random sampling method. Data is later analysed using descriptive-correlational statistical technique in an effort to describe how each variable plays its role in the digital transformation for SMEs. The aggregate of measurement shows overall digital capability maturity index for Kampong Digital Suci, Rahayu, and Binong are 2.62, 3, and 2.36 from the maximum scale of 4 respectively. The results of the measurement suggest that the constructed model of measurement may be overwhelming for the type of companies under investigation.

Keywords: Digital capability, kampong digital, maturity, Small Medium Enterprise (SME), virtual value chain

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INTRODUCTION

The focus of this study on Small and Medium Enterprises (SMEs) is triggered by an ever-increasing concerns of the Indonesian Government (IG) on enhancing the nation's competitiveness. Indonesian leaders have emphasised on dynamic digital economy as the country's short, medium

and long-term plans; this is to ensure SMEs achieve complete digitisation. This initiative of transforming companies into digital ones and fostering digital start-ups can help strengthen the Indonesian economy (ksp.go.id, 2016). This endeavour would help boost its annual economic growth by 2% in terms of Gross Domestic Product (GDP) as well as increase employment opportunities (Economic Deloitte Access, 2015).

The concept of digital maturity is very important in the digital transformation of an organisation. Digital maturity measures the organisation's digital transformation using a digital maturity model. However, there is no single agreed model of how to measure maturity, let alone a model specially designed to measure digital maturity of SMEs. Kubrick (2012) for example, proposed digital maturity measurement model by dividing the model into six dimensions of measurement, namely human resource, technology resource, data strategy, content strategy, channel strategy, and social business strategy. Stratford Managers Corporation (2015) in Sports and Entertainment Digital Maturity Assessment used a digital maturity measurement model using strategy, customer experience, data and technology, operation or management, and people and culture components. Egger and Bellman (2015) utilised a maturity framework using aspects of people, processes, and preparedness. The dimensions vary from one model to another and are mostly suited for corporation. This was confirmed by the findings of Joseph Ng and Kang, as far as information

infrastructure is concerned (Joseph Ng & Kang, 2016).

The determination of maturity level is still hotly debated and there has not been any agreement of single standard as benchmark of digital maturity level or stage. The Salford University (2014) proposes 5 level of digital business maturity: Level 0 – Non-Digital, Level 1 – Presence, Level 2 – Engagement, Level 3 – Integral, and Final Level – The Future. On the other hand, Dell (2013) uses a 5-stage model but with different terminology, which are: Stage 1 – Physical, Stage 2 – Online, Stage 3 – Self-service, Stage 4 – Connected and Stage 5 – Digital.

This study explores the dimensions of digital capability appropriate to SMEs by deriving the value chain analysis framework proposed by Porter (1985). Porter's value chain is the physical framework of business activity to create products or services. Transforming physical value chain into virtual is a proxy to the transformation of the digitalised SMEs' operation. This virtual value chain concept consists of nine components, namely *organisation or company presence, store presence, support, knowledge management and decision-making, marketing or sales, customer relationship, internal communication, ecosystem management, and digital revenue*. These nine components were then pilot-tested to measure the digital level of three "Kampong Digital" namely Suci, Rahayu and Binong, located in Bandung City area. Kampong (UKM) Digital (digital

SME village) uses the comprehensive and integrative information technology to support business processes running in a centralized SMEs or SMEs centre in a particular region or location, in order to realise millions of advanced, independent and modern SMEs. The maturity of Kampong Digital or Digital Capability Maturity of Kampong Digital is the aggregate measurement of all SMEs. It will be indicated using digital capability maturity index (DI), which is the linear non-weighted sum of the nine components and indicates the overall score of SME measurement.

LITERATURE REVIEW

The development of the digital capability model for SMEs is based on three important concepts: The Concept of Virtual Value Chain, the Concept of Digital Capability by Albanese and Manning, and the Concept

of Digital Master by Westerman, Bonnet and McAfee (2014). The logic of the development of components is shown in Figure 1 which supports Westerman et al. (2014) definition of Digital Capability. It implies “enabler” that sees technology as a means to change the way an organisation does business: its customer engagements, internal operations, and even business models. Albanese and Manning (2015) selected components derived from layers of mode of interactions as shown in Figure 1. It helps the authors to select the most important components from the perspective of SMEs. The present study adopts Jeffrey, Rayport and Jhon (1996) construction of Virtual Value Chain and its components. In this study, the capability of a company (SME) to construct Virtual Value Chain is the basis for determining its digital capability.

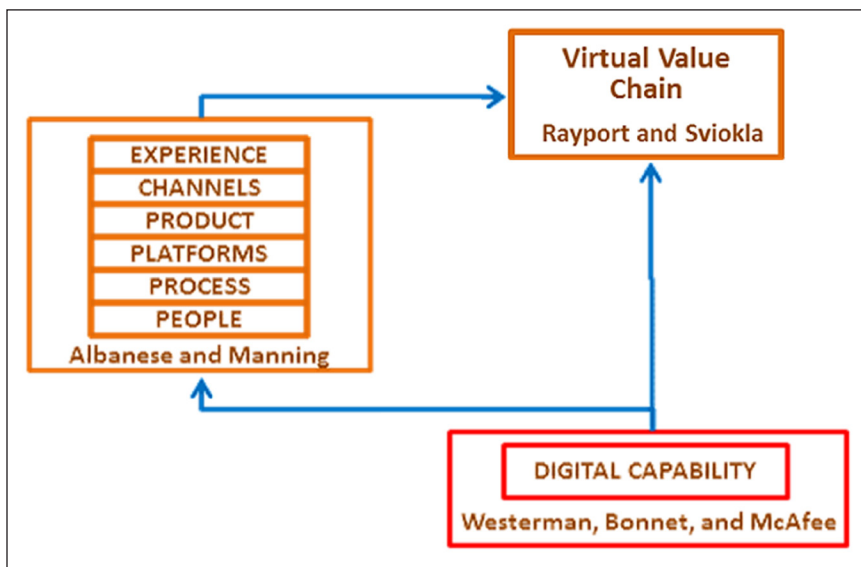


Figure 1. The construction of value chain elements for the measurement of Digital Capability Maturity

The Concept of Virtual Value Chain

The capability of a business operation to create value is represented by its value chain operation. The concept of value chain has been further used as an analytic tool. Value chain analysis is particularly useful in determining whether a company's costs and customer value proposition are competitive. Value chain analysis concerns the analysis of operational activities. Porter (1985) described value chain analysis as a systematic basis for examining all of the company's performance activities and how they relate to each other. Value chain describes the total value that contains value activities and margin. Value activities are physical activities and use different technologies in each company's performance as a component when the company creates a valuable product for consumers.

This concept of value chain has developed in the digital age. Currently, activity in value chains has started to follow technological developments. Chesbrough (2007) stated that the ability of companies to optimise the use of technology is fundamental to the innovation of the value chain platform. Malone, et al. in Auramo, Kauremaa and Tanskanen (2005) affirmed that improvements in information technology efficiency had enabled logistic

flow monitoring, has reduced inventory and has improved customer service. The value provided by IT is the speed of communication (electronic communication) and it provides intermediate automation for transactions and electronic integration. By implementing IT, customer service can focus on providing more value. Amit and Zott (2001) stated that value creation opportunities in a virtual market might result from a new combination of physical information, products and services, innovative transaction configurations, and re-configuration and integration of resources, capabilities, rules, and relationships between suppliers, partners, and customers.

Rayport and Sviokla in their article in Harvard Business Review (1995) found every business competes in two worlds: a physical world of resources that managers can see and touch and a virtual world made of information. The latter—called Virtual Value Chain—has given birth to e-commerce and e-business. Rayport and Sviokla (1995) called the place where the physical value chain lies as “marketplace” and space where the virtual value chain lies as “marketspace” (Jeffrey et al., 1996). The relationship between Physical Value Chain and Virtual Value Chain is shown in Figure 2.

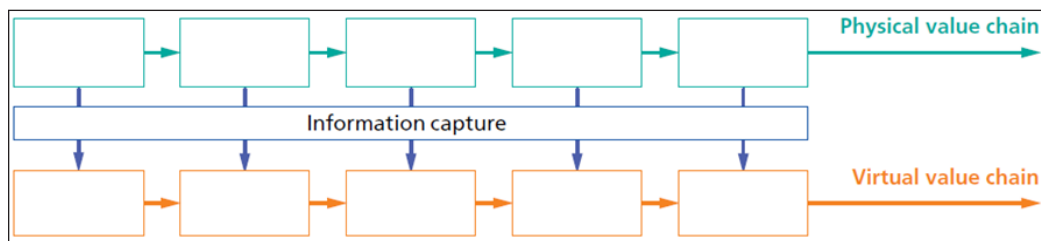


Figure 2. The relationship between physical value chain and virtual value chain (Rayport & Sviokla, 1995)

The Concept of Digital Capability

According to Albanese and Manning (2015), digital technology was multidimensional and constantly expanding, which can make it hard to measure or self-assess. Albanese and Manning deconstructed the digital into its layers in the form of layered hollow ball—from the most inner layer up to the skin—: people, process, platform, product, channels, and experience. The deconstruction into six layers made it easier to begin to understand how to interact with the aspects of digital needed for various projects, processes, or strategies.

Albanese and Manning (2015) described the components as follows:

- *Digital channels*: A different digital channels—whether social media, email, or search—are generally the touch points through which brands are most likely to be connecting with their customers and where their customers may be connecting with each other.
- *Digital ecosystem*: A structured presence or “real estate” in digital, including websites, social media profiles, and applications on smartphones, tablets, wearables, Smart TVs, car displays, and other emerging technology touch points.
- *Digital experience* refers to customer experience. This encompasses the collection of interactions between customers and the company.
- *Digital products/features* are examples of features of customisation and the latter allows users to choose how they interact with a website.
- *Digital platforms*: The platform or platforms that an organisation has created so that others can see/connect/engage with it. The strength of the organisation’s platform/platforms is crucial.

Albanese and Manning (2015)’s layered-digital-concept was used in this study to prioritise the components for digital transformation. The highest priority is “people” which is situated deepest in the ball. And the priority lessens towards the skin, with “digital platform” at the skin as the least priority.

Westerman et al. (2014) defined digital capability was the ability of a business to invest in digital technology investments and transformed it to digitise the company’s activities. The authors (2014) also opined that a business that performed digital transformation would have an impact on income as well as its profit. Using two components of measurement: digital capability (in vertical axis, scale 0 to 7) and leadership capability (in horizontal axis, scale 0 to 7), Westerman et al. (2014)’s digital map revealed four digital quadrants: beginner, fashionistas, conservative, and digital master; they further state Digital Masters excel in two critical dimensions: the “what” of a technology (digital capabilities)

and the “how” of leading change (leadership capabilities). Their statement is in line with the goal of digitising SMEs in Indonesia, namely to strengthen the Indonesian economy through the growth of Medium Business Enterprises, however, with a slight difference. Their study targeted big companies—those with revenues of \$500 million or higher while this study targets SMEs. The authors opine the measurement components in digital transformation would be somewhat very different and should be developed differently due mainly to the different size of the object under

study. The present study will limit only on answering the “what” components of digital transformation.

Virtual Value Chain Construct

As presented in Figure 1, digital capability is a measure of a company capability to construct its Virtual Value Chain. In other words, the search for digital capability model for SMEs is identical with the search for the appropriate Virtual Value Chain model for SMEs.

There are nine critical components in SME’s digital transformation endeavour, as

Table 1
List of nine critical components building Digital Capability Model for SMEs

No.	Virtual Value Chain Component	Physical Value Chain Framework	Reference
1	Organisation or company		
1.a	<i>Company presence</i>	<i>Firms Infrastructure</i>	Companies found online (Auger & Gallagher, 2006)
1.b	<i>Customer or user content</i>	<i>Technology development</i>	Online media to interact with customers (Auger & Gallagher, 2006)
1.c	<i>Content</i>	<i>Technology development</i>	The content platform online (Auger & Gallagher, 2006)
1.d	<i>Content personalisation</i>	<i>Technology development</i>	Submission of product information online (Auger & Gallagher, 2006)
2	<i>Store presence</i>	<i>Outbound logistics</i>	Using self-managed online store (Keegan & Green, 2013)
3	<i>Support</i>	<i>Technology development</i>	The use of information systems (Keegan & Green, 2013; Laudon & Laudon, 2016)
4	<i>Knowledge development and decision-making</i>	<i>Human resources management</i>	Intranet deployment to share information and/or knowledge; implementation of the analytical process for decision-making (Auger & Gallagher, 2006; Sabherwal & Sabherwa, 2005)
5	<i>Marketing and sales</i>	<i>Marketing and sales</i>	Online marketing and sales activities (Gallagher, Auger, & BarNir, 2001; Heizer & Peter, 2015)
6	<i>Customer Relationship</i>	<i>Marketing and sales</i>	Means to communicate with customers online (Peppers & Roggers, 2011)

Table 1 (continue)

No.	Virtual Value Chain Component	Physical Value Chain Framework	Reference
7	<i>Internal Communication</i>	<i>Technology development</i>	Use of technology in interaction between employee and management (Proctor & Doukakis, 2003)
8	Ecosystem management	<i>Procurement and Technology development</i>	Application of digital technology for the exchange process with a partner or partners (Adams & Frost, 2006; Brynjolfsson & Hitt, 2000; Chang, Tsai, & Hsu, 2013; Moller, Torronen, 2003; Salam, Steenkamp, & Khoury, 2008)
9	Digital revenue	<i>Margin</i>	Revenue earned through online activities (Westerman, Bonnet, & McAfee, 2014)

shown in Table 1.

The nine parameters or components of digital capability measurement are as follows:

Organisation or Company

Company presence. The company's implementation of online system to introduce and providing information about organisation or company through websites, social media, blogs or forums, and mobile applications.

Customer or user-connect. Online platform used by the company to interact with customers, such as websites, social media, blogs or trading forums and mobile applications. One of the characteristics of using new media is that the consumers can share their experience in real time using Twitter, chats, and blogs (Hennig-Thurau et al., 2010).

Content. The content of the company via online platform, such as audio, video, text

or sentence, and images. Cronin states that multimedia, such as graphics and sound, can be used to create attractive and popular sites (Auger & Gallagher, 2006).

Content personalisation. The Company provides information about the products (e-catalogue) and provides online information that customers can access through digital devices. According to Heizer and Render (2015), online catalogues would provide comparative cost and other comparisons, making the process efficient for both buyers and sellers. Companies can distribute brochures, catalogues, company information, and online support materials as a small component of printing costs (Auger & Gallagher, 2006).

Store Presence. The channel used by the company to sell its product: through web, blog, marketplace, or social media. Implementation of online sales provides benefit of cut cost and enables digitisation of the process. Auger and Gallagher

(2006) argued that a good website design can reduce the expensive human facility of customer buying processes online by selecting products and filling ordering information.

Support. The use of information systems to support the operation of the company. Information systems can technically be interpreted as a set of interconnected components, collecting (or obtaining), processing, storing, and distributing information to support decision-making and oversight within an organisation. Information system activity in producing information is needed for decision-making,

control operations, analyse problems, and creating new products or services (Laudon & Laudon, 2016). The information system for operational support includes Accounting Information System (SIA), Budgeting Information System, Human Resource Information System, Logistics Information System, and Operational Information System. As described by Mujilan (2012), internal information systems could boost the organisation's functions. Figure 3 shows the division of information system into functional functions of the organisation, which are financial, marketing, production, and human resources.

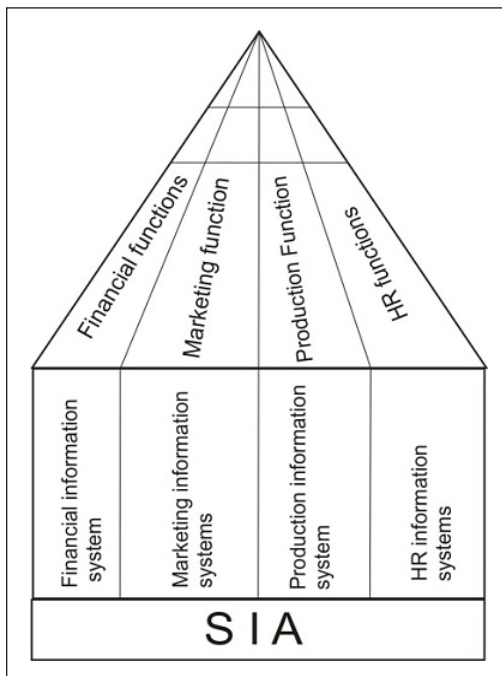


Figure 3. Functional information systems in an organisation (Mujilan, 2012)

Knowledge Development and Decision Making. How knowledge management aims to organise and make available all knowledge created within the company. Knowledge creation means development of new knowledge from data, information or knowledge priority (Sabherwal & Sabherwal, 2005). This study focuses on knowledge within an organisation (SME). First, it can be shared among individuals, groups, departments, or organisations. Second, it can be utilised by and applied among members of the organisation to guide decisions and take action. One technology that can be used to share or exchange knowledge and decision-making is intranet. The advantage of the dissemination of information at low cost can be done internally using intranet, an internal network running the internet protocol and software, but closed to the outside institution (Auger & Gallagher, 2006).

Marketing or Sales. How digital media is used by the company in marketing, such as promotions or advertisements, auctions, and co-creation with customers. Using low-price strategies, online advertising makes it possible to provide product information in the long-term for free (Gallaugher, Auger, & BarNir, 2001). This can also be done online, it can reduce entry barriers (the auction event) and increase the number of potential buyers (Heizer & Render, 2015).

Customer Relationship. How the company establishes relationship using multiple media to help to communicate with customers who do online purchasing: a) a Customer Relationship Management system to communicate with customers online, such as by e-mail; b) a portal or platform to communicate with online customers; c) social media to communicate with customers online; d) a community of experts to communicate with customers online; and e) mobile applications to communicate with online customers. Peppers and Rogers (2011) stated that the strategy behind relationship learning was that the company gave customers the opportunity to know what they wanted, to remember it, to give back to customers, and to maintain customer relationships, and these could be done by communicating with customers.

Internal Communication. Proctor and Doukakis (2003) argued that internal communication is an important part of the practice of building employee development and the core element of employee

development. Internal communication can take advantage of technology. The collaboration with technology provides a mechanism for the transmission of textual, numerical, pictorial and other types of information at very low cost (Gupta & Seshasai, 2007). There must be a means or media used for interaction between employees, employees with management or executive officers within the company.

Ecosystem Management. The Digital Business Ecosystem (DBE) is digitising socialising, collaborating, negotiating, operating and automatically managing business services in open and self-organizing operations (Salam, Steenkamp, & Khoury, 2008). In this study, this component includes signing the contracts with suppliers digitally via a digitised procurement. E-procurement has four functions, namely e-design, e-sourcing, e-negotiation, and e-evaluation. E-design represents the purchase arrangement of needs using electronic procurement system; E-sourcing refers to the process by which a company selects suppliers using an e-procurement system; E-negotiation refers to contract approval using technology; E-evaluation refers to the degree to which extensive information about suppliers is collected for future evaluations and transactions (Chang, Tsai, & Hsu, 2013); b) Quality assurance to customers is done digitally. Companies invest in information technology to improve the quality of its products and consumers to know and appreciate these benefits (Brynjolfsson & Hitt, 2000); c) Interacting

with stakeholders (employees, suppliers, and customers) digitally. Stakeholders can be defined as groups or individuals who have influence on and are impacted by the achievement of company goals. Adams and Frost (2016, p. 283), citing Andriof et al. (2002, p. 283) stated “some companies are taking this stage further and using the internet as part of a stakeholder engagement strategy involving the interaction as expectation of the roles of companies with respect to their stakeholder change”; and d) Companies value exchange with partners or partners of partner digitally. According to Chang, Tsai and Hsu (2013) e-procurement could build relationships with partners, share information, and supply chain integration and improve supply chain performance. If the company’s suppliers cannot build next-generation solutions using technology, such as PC processors, internet interface software, and automation processes, then the company will lose its competitive edge. Furthermore, the use of technology for procurement (e-procurement) can build relationships with partners, share information, and supply chain integration and improve supply chain performance.

Digital Revenue. The level of revenue generated from online activities. According to Westerman et al. (2014), companies with stronger digital capabilities would earn better. Westerman et al. (2014) argue that digital capability could help companies increase revenue by getting new customers or staying in touch with old customers in a new way.

MATERIALS AND METHODS

This study employs quantitative research methodology and it is exploratory in nature as the authors do not have prior knowledge about factors or variables best suited when studying Kampong Digital. Data was obtained from questionnaires that represent selected variables. These variables are measured by interval scales. The function of numbers on the scale is, first, as a symbol to distinguish a state from another; second, to rank the quality of characteristics; and third, to show distance or interval. Likert scale with four choices is used to measure responses of this study. This scale is chosen to show maturity using four stages/levels. Using three points in measuring attitudes provide more reliable results.

The population under this study is the member of the business centre or community defined by areas of Suci, Rahayu, and Binong. The number of population (SMEs) in Suci is 340. By using Slovin formula, with the margin of error of 5%, confidence level of 95% and proportionality of 50%, the authors selected 184 respondents. The selection of respondent in Suci is based on random sampling while for Rahayu and Binong, due to the small population, the authors adopted saturated sampling method recruiting 77 and 159 respondents in Rahayu and Binong respectively.

The questionnaire’s reliability is pilot tested using Cronbach’s alpha with satisfactory proof of reliability ($\alpha > 0.7$). Its validity is checked using Pearson Product Moment which shows satisfactory reliability with all calculated r being greater than

0.361. Data analysis is carried out using SPSS version 21 and Microsoft Excel.

The responses were measured using Likert scale with the scores ranging from 1 to 4. Score 1 indicates the SME does not apply digitisation in its business activities and will not apply it in the future. Score 2 indicates the SME has not implemented digitisation in its business activities, but in the future will implement it or it is currently in the planning stage. Score 3 indicates the SME has implemented digitisation in its business activities but is rarely used. And finally, Score 4 indicates the SME has digitised its business activities and its usage is very frequent.

RESULTS AND DISCUSSION

The results of measurements are presented using spider web visualisation in Figure 4, Figure 5, and Figure 6 for Kampong Digital

Suci, Rahayu and Binong respectively. The maturity scores for Suci for the 9 components are nearly uniform ranging between 2.3 and 2.9 with Marketing and Sales being the largest and Support being the smallest. The maturity pattern for Rahayu is slightly different from Suci. The maturity scores for Rahayu for the 9 components are between 1.8 and 3.0 with Marketing and Sales being the largest and Support being the smallest. The maturity scores for Binong for the 9 components are nearly uniform between 2.1 and 2.5 with Organisation and Store Presence being the largest and Support being the smallest.

The overall score or maturity index of each Kampong Digital is shown in Table 2. Rahayu is relatively more progressive in embracing digital technology for its business compared with Suci and Binong. The score is fairly high for SMEs, 3 (7.5

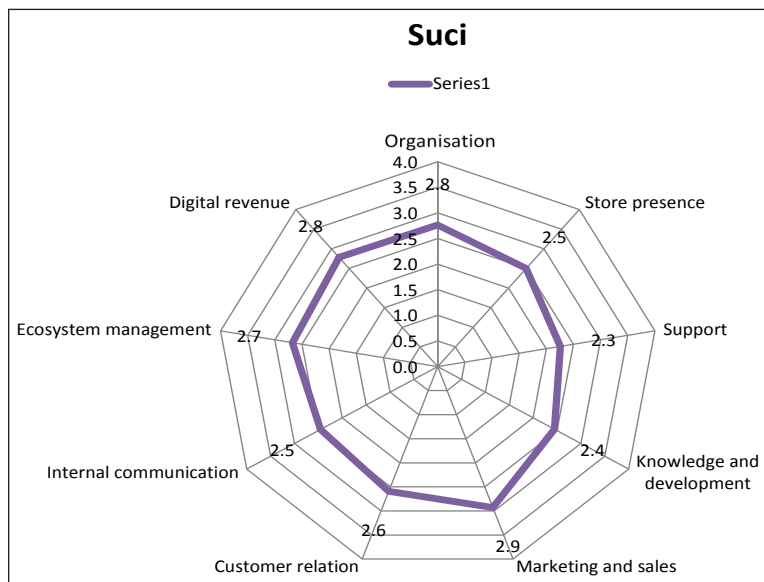


Figure 4. Spider web visualisation of Suci’s digital capability measurement

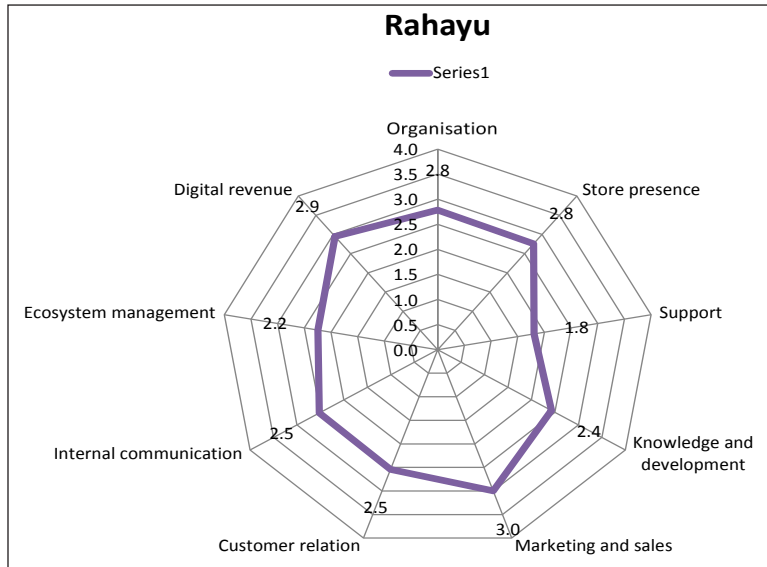


Figure 6. Spider web visualisation of Binong's digital capability measurement

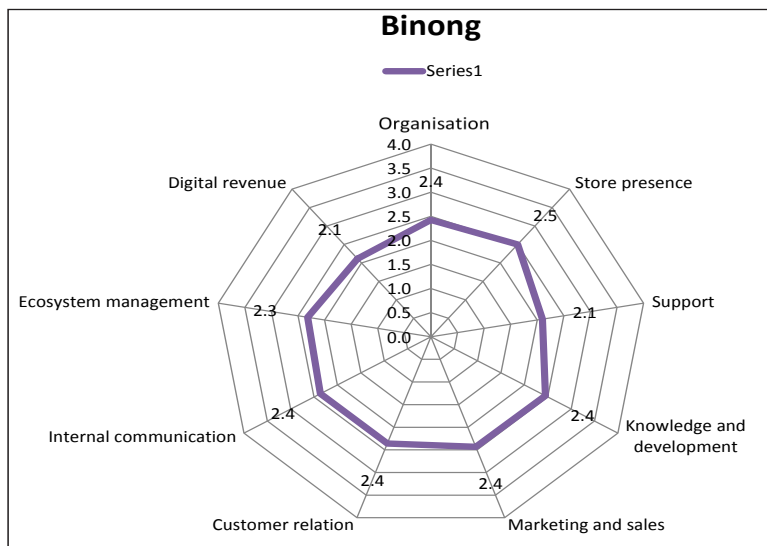


Figure 5. Spider web visualisation of Rahayu's digital capability measurement

in scale of 10). Suci seems to have its own difficulty in its path to digital transformation shown by its relatively lower score 2.6 (6.5 in scale of 10). Binong with the score 2.36 (5.9 in scale of 10)—being the lowest—may need to be more progressive in embracing

digital technology. However, Binong may need to identify what are its obstacles in accepting digitisation of its business. Based on score in the Likert scale, only Rahayu made it to stage 3.

Table 2
Total average score

	Kampong Digital		
	Suci	Rahayu	Binong
Average Total Score (from scale 1 to 4)	2.62	3	2.36

Figure 7 shows the distribution of votes among respondents in Binong. The distribution of votes for Store Presence, Marketing and Sales, Support, Knowledge Management and Digital revenue imitates normal distribution which is encouraging. A deviation from normal distribution is shown by votes for Organisation Presence. This deviation deserves further investigation.

The vote distribution in Suci and Rahayu are relatively similar to Binong.

Table 3 shows the correlation among nine elements of measurement. The table reveals interesting phenomena indicated by cross-correlation value higher than 0.90 (the number written in bold). First, the high correlation between the elements of Organisation, Marketing and

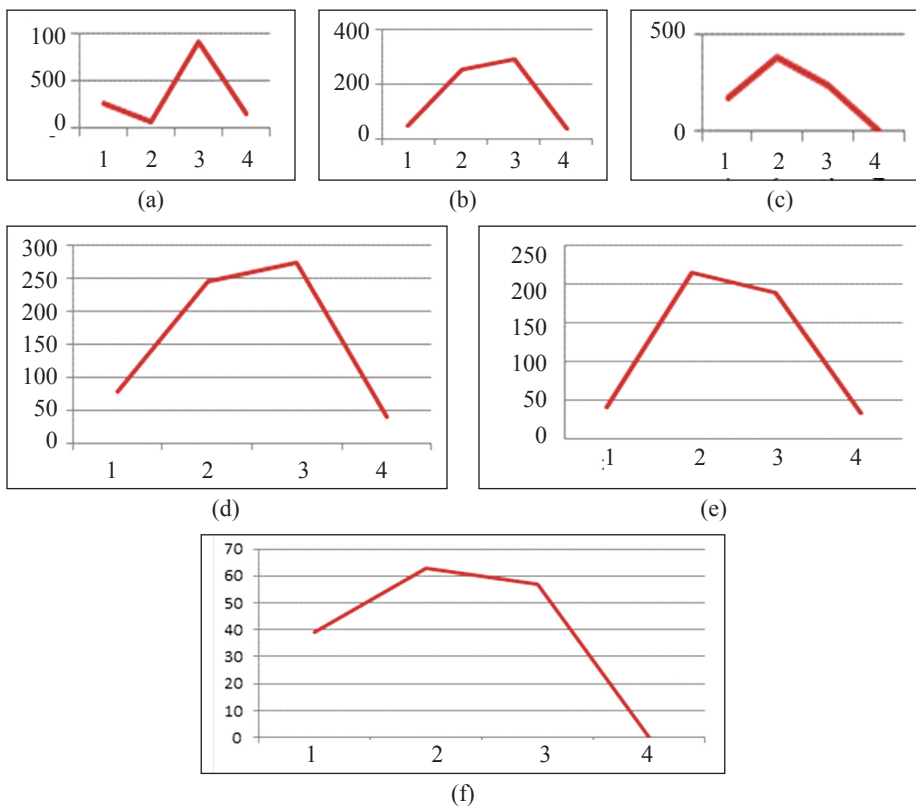


Figure 7. Sample of distribution of votes of several elements in Binong measurement: (a) Organisation; (b) Store presence; (c) Support; (d) Marketing and sales; (e) Knowledge and management; and (f) Digital revenue

Sales, Customer relation, and Internal Communication suggests that average respondents from three Kampong Digitals see that the questions in Organisation Presence as replicated in marketing and sales as well as customer relations. This confusion makes most sense from the business communication perspective because in SMEs where there is no clear organisation structure, all types of external communications are handled centrally.

Second, Table 3 shows the high correlation between Organisation Presence and Internal Communication. This suggests the questions used in the measurement tool may be either redundant or difficult-to-vague

Third, the high correlation between Store Presence with Support and with

Knowledge Management. It is difficult to make sense of this close relationship because Store Presence is outward looking while Support and knowledge are mostly inward in nature. The probable cause may come from the difficulty of average respondents to comprehend the question in the measurement tool.

Fourth, the high correlation of Digital Revenue with Organisation Presence, Marketing Sales, Customer Relations and Internal Communication. This high correlation confirms digital transformation is taking place and the respondents see the benefit of the transformation. While the authors prejudicially suspect that the concept of virtual value chain may be distant to them, the transformation is showing positive impacts on SMEs.

Table 3
Measurement elements cross-correlation

	Organisa- tion	Store presence	Support	Knowl- edge and develop- ment	Marketing and sales	Customer relation	Internal communi- cation	Ecosystem manage- ment	Digital revenue
Organisation	1								
Store presence	0.531419	1							
Suppose	-0.21301	-0.94084	1						
Knowledge and development	-0.64117	-0.99081	0.886365	1					
Marketing and sales	0.99785	0.585868	-0.2766	-0.69009	1				
Customer relation	0.964654	0.289487	0.051986	-0.41628	0.945307	1			
Internal com- munication	0.923887	0.81518	-0.57069	-0.88603	0.946982	0.790391	1		
Ecosystem management	0.307802	-0.64235	0.864048	0.532788	0.244777	0.547674	-0.07971	1	
Digital revenue	0.991105	0.639492	-0.34115	-0.73759	0.997697	0.921004	0.966595	0.178442	1

CONCLUSION

The study shows overall digital capability maturity index for Suci, Rahayu, and Binong are 2.62, 3, and 2.36 respectively from the maximum scale of 4 which indicates a positive impact on SMEs. The results of the measurement suggest that the constructed model of measurement may be overwhelming for the kind of companies under investigation.

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