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Optimizing the Potential of Domestic Small Firm: The Case of ICT in Indonesia with a Focus on Management and Skills, and Collaboration in Entrepreneurial Ecosystems

Liza Mahavianti Syamsuri
PT Telekomunikasi Indonesia
E-mail: liza@telkom.co.id

Abstract

The rapid growth of the ICT market in Indonesia is driven by a young and prosperous population. However, domestic SMEs are struggling to meet the increasing demand. This paper analyzes the internal and external factors affecting innovation in ICT firms. The findings suggest that ICT skills, market-related skills, management experience, and cognitive capability are positively related to innovation. Additionally, improving ICT education and emphasizing modern management is identified as a key challenge. The paper also recommends enhancing value co-creation in local communities, particularly between small firms and local customers, and between foreign firms and local small firms.

Keywords *Innovativeness, SMEs, management skills, ICT skills, entrepreneurial ecosystem, collaboration, Indonesia*

INTRODUCTION

In recent years, there has been a growing demand for innovative ICT services in developing countries like Indonesia. However, Indonesian SMEs are struggling to meet this demand. This paper aims to investigate the reasons for their limited ability and identify factors affecting their innovation performance. Innovation is essential for business growth, and marketing plays a crucial role in delivering innovative products/services. Indonesia's economy falls behind neighboring countries in terms of innovativeness due to low investment in R&D and weak innovation linkages. This is reflected in Indonesia's modest position in the global innovation index. (WIPO, 2023)

An important challenge in Indonesia's innovation landscape is the influence of social-cultural values on firm innovation culture. These values can both hinder and enhance innovation within companies (Hofstede and Hofstede, 2005). For example, A high power distance can hinder innovation as leaders choose preferred ideas. Indonesian entrepreneurial culture values collectivism, creativity, and loyalty to friends and family, supporting innovation. When considering solutions from developed countries, it is crucial to consider cultural differences between Indonesia and the country of origin (Cai, 2014; Mukhtarov and Daniell, 2017). SMEs in Indonesia make up a significant portion of enterprises, accounting for 99 percent in 2016 (BPS, 2016a).

In terms of innovation, challenges faced by SMEs were identified in 2012 (Hamdani and Wirawan, 2012), which were reiterated by the World Economic Forum (2022) regarding SMEs in general. These challenges include a "follower mentality" resulting in limited access to new ideas and low absorptive capacity, which is no longer effective in today's context. The potential for ICT development in Indonesia is immense due to its large market size (260 million population), rising middle-income class, and relatively low level of technological

advancement (ITA US, 2022). ICT applications such as software as a service (SaaS), cloud computing, data analytics, and mobility technologies hold promise for growth. However, managing innovation in this sector is crucial as ICT innovations quickly become outdated and new disruptive innovations emerge rapidly. Domestic creativity, demonstrated by some service firms utilizing the latest ICT technology for e-commerce, Internet of Things (IoT), and artificial intelligence-based solutions, may contribute to domestic innovation through spillover effects in value chains and regional networks (Kristiono, 2016; Kusumawati & Suryanegara, 2016). Local community-led initiatives and collaboration with local customers can also enhance innovation. The contrast between the limited capabilities of domestic SMEs and the sector's potential for innovation and growth motivates the need to address management challenges and propose solutions to enhance innovativeness.
In light of this context, our study aims to investigate the innovativeness of ICT firms in Indonesia by addressing two main questions: (1) How do firms' capability factors and external knowledge spillovers influence their innovativeness? (2) What potential solutions can be proposed considering the large potential and transferability of solutions? The paper examines various factors that may impact firm innovativeness, focusing on internal knowledge development and external knowledge acquisition, while considering domestic cultural values (Tehseen & Anderson, 2020). The research design includes the development of hypotheses based on theory and past empirical studies (section 2), operationalization of key concepts, measurement, and model usage (section 3). Survey data from approximately 200 ICT firms are utilized to investigate the hypotheses (section 4), exploring both linear and non-linear relationships. In the second part (section 5), the quantitative analysis is complemented with expert interviews and additional literature study to explore ways to harness the potential of the ICT market. This comprehensive approach, combining quantitative and qualitative methods, contributes to the limited research on domestic innovativeness in Indonesia conducted by local researchers (e.g., Dhewanto et al., 2015; Lita et al., 2018).

The paper highlights four key contributions: 1) the importance of understanding management conditions and learning capability in ICT in developing countries for long-term innovation, 2) the benefits of knowledge spillovers in clusters, 3) the positive relationship between FDI and innovativeness, and 4) the promotion of 'soft engineering' of innovation models in entrepreneurial activity, particularly for small firms, focusing on community value co-creation and venture studios.

Theoretical Foundation

Two main theories serve as the theoretical foundation of this paper. The first theory is the dynamic capabilities of the firm, which focuses on internal and external sources of competitive advantage (Alonso et al., 2019; Teece, 2006; Cassiman & Veugelers, 2006). This theory emphasizes the ability of firms to adapt and take advantage of changing business environments by identifying, integrating, reconfiguring, and renewing their resources and abilities (Cohen & Levinthal, 2000; Lin & Wu, 2014; Teece & Leih, 2016; Zahra et al.,

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2006). It also highlights the importance of acquiring different domains of knowledge to enhance innovativeness (Autio et al., 2013; Hamdani & Wirawan, 2012; Mohr et al., 2014).

The second theory is the theory of spatial knowledge spillovers and entrepreneurial ecosystems, which focuses on entrepreneurial opportunities in regions (Acs et al., 2013; Audretsch & Keilbach, 2007; McCann, 2013; Stam, 2015; Stam & Van de Ven, 2019; Stam, 2022). This theory suggests that strong spatial concentration of economic activity and market demand in clusters and large cities can lead to innovation advantages through cross-fertilization between ICT firms, customers, suppliers, and local research centers (Duranton & Puga, 2004; Duranton, 2012; Hamdani & Wirawan, 2012). However, the application of this theory in developing countries is less understood, as there may be differences in human capital, knowledge flows, and availability (González-Pernía et al., 2015).

Furthermore, the concept of entrepreneurial ecosystems (EES) highlights the importance of trustful networks and relationships for small high-tech firms, particularly in close proximity (Stam & Van de Ven, 2019; Stam, 2022). Well-developed ecosystems contribute to the productivity of innovative entrepreneurship through favorable institutional and organizational conditions, including networks for opportunity recognition, proactiveness, and commercialization (Acs et al., 2017; Ferreira et al., 2017; Lux et al., 2020). However, in the context of Indonesia, the activities within the entrepreneurial ecosystem are limited and lack synergies among different programs and regions (Hermanto & Suryanto, 2017; Sihombing, 2019). This suggests that SMEs in large cities may invest in R&D and adopt creative ideas but lack the positive influence of a developed ecosystem, leading to a gap between West and East Indonesia.

Hypothesis

The logic of hypotheses formulation is as follows. We indicate the assumed sign of the relationship by drawing on a linear model. However, we also explore non-linear relationships (i.e., u-shape relationships) as suggested by Aslesen and Harirchi (2015) in those relatively strong learning efforts that are needed to pass a threshold to increase innovativeness. Note, however, that non-linear relationships can only be investigated in our study for continuous (ratio-scale) variables, i.e., firm size, manager ICT skill levels, manager experience, manager cognitive capability and FDI. The three key components of the model we will use, i.e. firm capability, entrepreneurial ecosystems and firm innovativeness, are displayed in Figure 1, in which also the related indicators to measure the first two components are shown, referring to 12 hypotheses.

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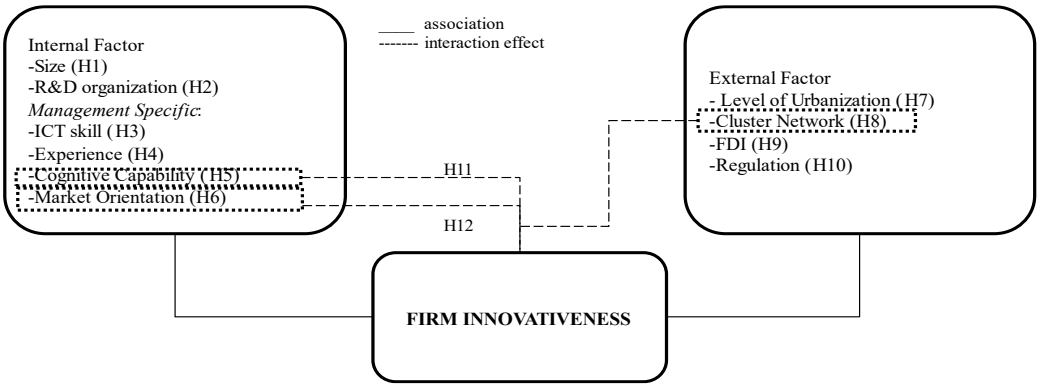

Figure 1. Theoretical concept

Concerning firm size, several scholars suggest large firms have better access to novel knowledge, financial resources to innovate, and a stronger ability to absorb new knowledge resulting in higher propensity to innovate. Non-linear patterns seem also possible, like an increased innovativeness after having passed a certain size. Accordingly: *H1: Firm size is positively associated with innovativeness (linear, u-shape).*

Regarding the organization of R&D, professionalization in management of R&D and diversity in learning processes applied in a collaboration, are essential for stimulating innovation. Professionalization increases by establishing an R&D department (unit) that applies management/planning in dealing with uncertainty and uses 'formalized' positions and responsibility of researchers/developers. Diversity of knowledge may increase through collaboration with other firms. Lucena and Roper (2016) observe that firm collaboration enhances learning experience effects, but many small firms are not able to develop such collaboration and tend to remain low innovative. We use type of R&D organization as an indicator of the professional level of R&D, with a professionally self-owned R&D department and collaborative R&D considered as higher levels. Since this variable is a non-continuous variable in interval scale, we only hypothesize a linear relationship: *H2: A higher level of R&D organization is positively associated with innovativeness.*

Next, we discuss management characteristics as part of firm capabilities in our framework. First, regarding management skills, there is a general consensus that relatively strong skills among managers act as prime condition for innovation. Different skills among managers may lead to firm differences in perceiving opportunities of innovation and in efficiency in innovation processes, like experimentation. Specifically, highly skilled managers tend to be more ambitious and creative compared to less-skilled managers and are better able to plan on the longer term and to manage uncertainty in innovation processes. While this applies in general, it may also apply to the ICT industry, given several general and more applied ICT skills, like communication science, dealing with big data and with artificial intelligence. In addition, also in this respect, there is a possibility of a u-shape relation:
H3: Manager's ICT skill level is positively associated with innovativeness (linear, u-

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shape).

Arguments concerning the role of managers' experience tend to be ambiguous in literature. For instance, Mascitelli (2000) observes a positive role of learning-by-doing and knowledge accumulated through lifetime experience. In contrast, Romijn and Albaladejo (2002) find limited evidence on managers' long working experience in pushing small firms to be more innovative than ohers. Accumulated years of experience may lead to a 'lock-in' situation based on increased self-confidence (over-estimation) and emergence of lack of openness among managers. Different from other situations discussed in this paper, such processes may cause decline of efficiency, indicated by emerging decreasing returns. Based on the ambiguous results of the existing studies, we formulate a non-directional hypothesis: *H4: Years of manager's experience is associated with innovativeness*.

Regarding managerial cognitive capability, Ruiz-Jiménez & Del Mar Fuentes-Fuentes (2016) confirm that such broad capability and concomitant mental activities affect both product and process innovation in a positive manner. In a similar context, Helfat and Peteraf (2015) put emphasis on broad cognitive activities that affect the sensing of opportunities and how to respond to them. Following this line, we expect that the larger the managerial cognitive capability is, the higher innovativeness will be. In addition, prior (subjective) beliefs or cultural influences may distort perceptions, particularly when information and learning are ambiguous. Such a situation may cause needs for relatively strong efforts in learning and absorbing, meaning that only after a certain level (threshold), cognitive capability will turn to positively influence innovativeness. Accordingly: *H5: Manager's cognitive capability is positively associated with innovativeness (linear, u-shape).*

Furthermore, adequate skills in the market and marketing, underpinning the market orientation, have been shown to enhance firm performance in a variety of organizational and industrial contexts. If market(ing) skills are combined with skills to connect with other firms and customers, innovation may be more successful, and performance enhanced. Accordingly, we assume that the stronger a firm's marketing skills are, including identification of meaningful market segments, value propositions, customer involvement and marketing/promotion techniques, the higher the chance of being more innovative. The measurement only allows detecting a linear relationship. *H6: Stronger market-related skills are positively associated with innovativeness.*

In respect to specific external circumstances of knowledge spillovers, we focus on broad levels of urbanization (city size) and more specifically on actual network interaction of firms in clusters and in relationships with multinational firms (through FDI). Regarding urbanization, several scholars argue that proximity in large urban locations provides abundant opportunities for tacit knowledge circulation and informal business meetings. Research in Indonesia confirms such general understanding, despite an emerging danger of

overcrowding in large cities, eventually increasing cost levels and pressure on innovation networks. Also, it needs to be realized that in this broad scan we cannot differentiate between types of externalities, referring to diversification and specialization, and types of interaction effects between agglomerative externalities. Accordingly:
H7: Level of urbanization is positively associated with firm innovativeness.

Regional collaborative innovation is increasingly attracting attention in understanding innovation today. Regarding cluster networks, while Porter (2000) emphasizes benefits from competition with similar firms and close relations with specialized suppliers and customers, access to resources that are otherwise beyond the scope of a single firm is another important point. More specifically, trust-based relationships in a cluster may enhance networks of collective learning, thereby facilitating knowledge spillovers with customers, suppliers etc. In sum, networks within clusters provide (information on) collaboration opportunities, extended resources, infrastructure and institutional support for entrepreneurial activities. In contrast, problematic situations have also been addressed in literature, and these emerge when the relationships between partners have become too tight and rigid. Some doubts on positive impacts of tight intra-cluster networks, such as overreliance of firms on cluster information, have also more recently been raised in Indonesia. However, while this may take place in older and traditional clusters, in line with Aslesen & Harirchi (2015), we expect that in the relatively young ICT clusters in Indonesia, knowledge circulation is not yet affected by negative (lock-in) influences and that relatively strong networks enhance ICT innovation.
H8: Strong intra-cluster networks are positively associated with innovativeness.

Foreign Direct Investment (FDI) may bring knowledge spillovers in the country and region of investment, for example, when local firms imitate imported technologies and management practice, or foreign firms start to develop supplier relationships in the local economy. However, there is no consensus in literature. For example, some argue that FDI does not enhance domestic innovation, while others argue that FDI is an important source of knowledge transfer to firms in Indonesia. The emergence of positive impacts may, however, take some time in situations of relatively low absorptive capacity, causing the need for strong efforts in upgrading management practices in innovation. Accordingly, aside from a positive linear association there may also be a u-shape pattern, making us hypothesize:
H9: FDI share in firms is positively associated with innovativeness (linear, u-shape).

Next, we forward business regulation as a set of important external conditions affecting innovation practices. There is, however, no consistent picture of influence on innovativeness in literature. For example, some mention general influence of regulation on firm innovativeness, like some common problems including cumbersome bureaucratic procedures in obtaining licenses to operate, and regulatory changes that generate market distortions. Further, high taxation of important ICT equipment from abroad may make domestic firms reluctant to innovate. At least three issues are key, namely the ease of doing business, promoting “business friendly” legislation and policies, and taxation policy,

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particularly for SMEs. Differences in local/regional business regulation within Indonesia have also been mentioned. As a response, some firms adapt themselves by accessing the specific information needed on new regulation, while other firms are affected by the constraints. We may assume that a firm's ability to access the right information on regional regulation also enhances its spirit and motivation to be more innovative:

H10: Better (perceived) quality of regulation is positively associated with innovativeness.

Finally, we explore two interaction effects between management and external environment. The more recent approach of entrepreneurial ecosystem (EES) justifies such exploration. While incorporating older ideas on the nursery cities and previously indicated agglomeration economies and cluster advantages, the EES approach puts emphasis on quality of institutional and organizational conditions, in particular, on a rich variety of supporting networks. In practice, it may also refer to places and/or programs for nurturing of ICT start-ups, including attraction of investment capital and availability of places (sites) for experimentation eventually with customers. Accordingly, we assume that the influence of the overall firm capability indicator (managerial cognitive capability) and specifically, market-related skills interact positively with strength of intra-cluster networks:

H11: Interaction between manager's cognitive capability and intra-cluster network strength is positively related with innovativeness.

H12: Interaction between market-related skills and intra-cluster network strength is positively related with innovativeness.

METHOD

Data Collection, Measurement and Method

In a survey conducted in Indonesia from January 2017 to November 2018, we distributed a questionnaire to approximately 2,000 ICT-based firms. These firms were randomly selected from various areas including Jakarta, Surabaya, Semarang, Yogyakarta, and Bandung. The survey aimed to include both small and large firms to examine differences in innovativeness. We targeted middle- or upper-level managers of large firms and top managers of SMEs who had a good understanding of the firm's innovation. We achieved a response rate of 13.6 percent. To ensure regional representativeness, we used data from the Indonesian Central Bureau of Statistics and adjusted accordingly. Micro-firms were excluded from the sample as they are often unregistered. To assess the quality of the dataset and address potential biases, we conducted various tests. We performed a Harman Common method test to evaluate the impact of using a single measurement instrument. We also conducted Leven and T-tests to test for non-response bias. The results of both tests indicated no serious issues. We also checked for internal consistency and removed outliers, resulting in 231 valid cases. Multiple regression models were used, and we ensured that the statistical assumptions for multiple regression analysis were met by removing variables with multicollinearity issues.

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Firm Innovativeness as Dependent Variable

In this study, we used a compound indicator to measure innovativeness, which consisted of two variables: the number of innovations and the level of newness of the innovation. To measure the number of innovations, we provided examples of different types of innovations in the survey to ensure a consistent understanding among respondents.

We also included the level of newness, ranging from new for the firm to new for the world, to account for potential overestimation bias. We multiplied each innovation by its level of newness to create the compound indicator. In terms of the number of innovations, 20 percent of the sample reported no or only one innovation, 55 percent reported a modest number (2-5), and 25 percent reported more than five innovations. Regarding the newness of innovation, 39 percent of the sample reported innovations at the lowest level (only for the firm), 34 percent reported a low to medium level of newness, and 27 percent reported higher levels of newness (often at the country level).

Similarly, in terms of firm expenditure on research and development (R&D), 33 percent of the sample reported no or limited engagement in R&D (0-10 percent of sales), 38 percent reported engagement at the 10-25 percent expenditure level, and 29 percent reported engagement at higher expenditure levels. Overall, around 35 percent of the sample faced challenges in enhancing their innovativeness, particularly the 40 percent involved in innovation only for their own firm and the 55 percent involved in a small number of innovations. (Johannessen et al., 2001). Table 1 presents all variables in the model estimation, regarding measurement scale and descriptive results. The independent variables in this scan fall apart into broad firm characteristics, specific management potentials, opportunities from entrepreneurial ecosystems (urbanization level) and specific networking and dealing in clusters.

Variables	*Measurement scale (for binary variables including measurement results)*	*Avg*	*SD*	*Min-Max*
Dependent				
Firm R&D intensity	Continuous, as firm expenditure in % of sales	19.58	21.79	0-90
Newness of Innovations	Continuous, derived from weighing procedure using spatial reach of newness	8.62	13.34	0-52
Independent				
Firm Internal (broad)				
Firm size (2017)	Continuous, as number of full-time employees	130.15	708.3	1-4500
Firm R&D organization	Binary: High level R&D: 39%; Otherwise: 61%	-	-	-
Specific: Management Potentials				
Manager's ICT-skills	Continuous, based on regional ICT skill level and managers' education level (b)	0.97	0.48	0.28-2.34
Manager's Experience	Continuous, as years of employment in business	8.41	6.47	1-31
Managerial CC	Continuous, as overall level of capabilities (compound variable) (b)	6.13	1.30	2.33-8.66
Marketing skills	Binary: Medium-Strong Marketing Skills 42%; Otherwise: 58%	-	-	-
External (EES)				
Urbanization	Binary: High Urbanization level: 50%; Otherwise: 50%	-	-	-
Cluster Network Strength	Binary: strong intra-cluster network, compared with extra-cluster network (43%); Otherwise (57%) (b)	-	-	-
FDI-share in ownership	Continuous, as share of investment in firm ownership	9.77	22.92	0-100
Regulation	Binary: dealing positively with regulation (48%); Otherwise (52%)	-	-	-

(a) Continuous variables: prior to transformation; (b) See Appendix 8.

Table 1. Variables and measurement

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RESULT AND DISCUSSION

Model Summary

We assessed innovativeness using a compound indicator consisting of the number of innovations and the level of newness. The number of innovations was measured over the past two years, with examples of innovation types provided in the survey. To account for potential self-evaluation bias, we also included the level of newness, ranging from new for the firm to new for the world. Each innovation was multiplied by its corresponding level of newness.

Regarding the number of innovations, 20% of the sample had no or one innovation, 55% had a modest number (2-5), and 25% had more than five innovations. In terms of newness, 39% of the sample had innovations at the firm level, 34% had innovations at a low to medium level, and 27% had innovations at higher levels, often at the country level. Similarly, in terms of R&D expenditure, 33% of the sample had no or limited R&D involvement (0-10% of sales), 38% had R&D expenditure at the 10-25% level, and 29% had higher expenditure levels. Overall, around 35% of the sample faced challenges in enhancing their innovativeness, particularly the 40% involved in innovation only for their own firm and the 55% with a small number of innovations. (Johannessen et al., 2001). Overall, the estimation results of the full models are at a 'reasonable' strength (R^2 between 0.35 and 0.39) but remain behind estimation results when taking R&D investment as a dependent variable (R^2 between 0.51 and 0.55) (not in the table, see Syamsuri, 2023). Such discrepancies between intended innovation (R&D investment) and actual innovation may be explained by managers' modest knowledge on transforming R&D results and innovative ideas into innovations that are brought to market, and dealing with concomitant complexities (e.g., Edquist, 2010; Kleinknecht et al. 2001; OECD, 2018ab). Further, our results confirm weak u-shape relationships, indicating a *systematic* influence of increasing returns. Accordingly, relatively strong efforts in increasing firm capabilities and external knowledge tend to be required ('passing a threshold') before a substantial increase in higher innovativeness can be realized.

Firm Size, R&D and Management

In our analysis, we found that firm size, ownership of market-related skills, R&D organization, manager's ICT skills, manager's experience, managerial cognitive capability, and market-related skills were all related to innovativeness in ICT firms. Firm size had the strongest explanatory value, followed by ownership of market-related skills. R&D organization, manager's ICT skills, and market-related skills also had positive and significant relationships with innovativeness. Manager's experience and cognitive capability showed positive patterns, but their significance varied in the different models. Overall, the results suggest that there may be some ambiguity in the relationship between management factors and innovation in ICT firms, possibly due to the fast-changing requirements and complexity in ICT innovation management.

Entrepreneurial Ecosystem

Entrepreneurial ecosystem indicators on knowledge spillovers show positive relationships with cluster internal network strength and foreign direct investment (FDI), confirming Hypotheses 8 and 9. However, the influence of knowledge spillovers in metropolitan areas on innovation outcomes is weak, contradicting Hypothesis 7. This may be due to larger firms in developing countries being located in cities, which can afford R&D investments and creative ideas. Intra-cluster networks also have a positive influence on innovation management practice, contrary to the belief of poor and redundant knowledge circulation. This finding is, in a way, in contrast to ideas about relatively poor and redundant knowledge circulation in intra-cluster networks (Bathelt et al., 2004; Gunawan et al., 2016). The lack of a negative influence on actual innovativeness may be due to the specific measurement of internal network strength and the relative youthfulness of ICT networks. The relationship between FDI share and innovativeness follows a positive and non-linear trend. Higher levels of innovativeness are associated with a positive approach to regulation, confirming Hypothesis 9. Solid intra-cluster networks strengthen the relationship between cognitive capability, market-related skills, and the newness of innovation, supporting Hypotheses 10 and 11. Overall, the influence of knowledge spillovers in entrepreneurial ecosystems is relatively weak, except for FDI share and regulation.

Table 2. Estimation Results on innovativeness

	Model 1 (Broad Internal)		Model 2 (Specific Management)		Model 3 (External)		Model 4 (Full)			
	Linear	Non-Linear & Linear	Linear	Non-Linear & Linear	Linear	Non-Linear & Linear	Linear	Linear+interaction		Non-Linear & Linear
Firm Internal (broad)	β(s.e.)	β(s.e.)	β(s.e.)	β(s.e.)	β(s.e.)	β(s.e.)	β(s.e.)	β(s.e.)	β(s.e.)	β(s.e.)
Firm Size	.28(.02) †						.29(.02) †	.30(.01) †	.30(.01) †	
Firm Size squared		.28(.01) †								.29.01) ***
Firm R&D organization	.07(.03)						.13(.04) **	.11(.02) **	.11(.05) *	
Specific: Management potentials										
Manager ICT-skills			.08(02) *				.06(.01) *	.09(.01) *	.05(.01) *	
Manager ICT-skills squared				.11(.01) *						.06(.01) *
Manager Experience			.04(.01)				.02(.04)	.08(.04)	.03(.03)	
Manager Exp. Squared				.15(.01) **						.02(.00)
Manager Cognitive Capabilities			.06(.01) *				-.06(.05)	-.07(.07)	-.09(.06)	
Manager CC squared				.06(.01) *						.03(.00)
Marketing Skills			.22(.01) ***				.12(.01) **	.09(.01) *	.19(.01) *	
External (EES)										
Level of Urbanization					.09(.08)		.02(.01)	.02(.02)	.01(.00)	
Cluster Network Strength					.09(.01) **		.02(.01)	.03(.01)	.05(.01)	
FDI Share					.06(.01)		.04. (.01)	.05(.01)	.05. (.02)	
FDI Share squared						.11(.01) *				.06(.01) *
Regulation					.06(.01) *		.05(.01) *	.10(.03) *		
Interaction Effects										
Cognitive capability*Cluster network strength								.23(.05) **		
Marketing skills* Cluster network strength									.10(.01) *	
N	260	260	260	260	260	260	260	260	260	260
F	9.17†	11.46†	5.18**	5.56**	4.97**	3.24*	4.99***	6.95**	5.70**	6.63†
R^2	.25	.29	.25	.19	.15	.12	.37	.39	.33	.35
ΔR^2		.04	.00	.06	.10	.13	.12	.14	.08	.10

* p<0.1; ** p<0.05; ***p<0.01; † p<0.005

Towards Harnessing Market Potensial

Firm Capabilities

Expert interviews confirm that small firm size is a significant constraint on innovation activity. Other issues related to firm capabilities include management conditions, marketing

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conditions, low skill levels, and poor business values. Small firms in countries like Indonesia are less flexible and creative compared to those in developed economies. They struggle to increase R&D budgets and professionalize R&D organizations, making it difficult to develop competitive products/services. Small firms tend to focus on niche markets with specialized products, but face obstacles in meeting market demand due to missing features in service design. The small firm segment is also heterogeneous, requiring different improvement strategies. Management conditions contribute to low innovativeness, with missing strong leaders and adequate business culture. Managers have low awareness of innovation and poor marketing techniques, hindering coordination between design and marketing. Market-related skills are crucial for ICT firms, but the level of education in Indonesia is not competitive globally (e.g., Hamdani & Wirawan, 2012). Low skill levels are also related to inhibiting values in entrepreneurial culture, such as a strong power distance and a culture of low ambitions and risk-taking. However, positive values like collectivism, creativity, and loyalty to friends and family are also present in Indonesian entrepreneurial culture. There is a shortage of qualified managers in ICT management in Indonesia due to deficits in the education system. This leads to a preference for global firms over domestic ones (Aryanto et al., 2015; Hartono, 2015).

Entrepreneurial Ecosystem

The interviews emphasized the relevance of ecosystem factors. The digital divide between Indonesia's Western and Eastern parts was addressed, with the Eastern part having fewer internet users and weaker ICT infrastructure. This divide also exists between Java and outer Java. Most large ICT firms choose to establish themselves in Jakarta or other big cities in Java, where the market demand is strong and knowledge spillovers are more likely. However, our results were mixed, as they did not confirm the influence of the urban environment but showed some influence of intra-cluster relationships. Respondents suggested that cluster formation outside Java could be improved by collaborating with local research institutes and engineering schools, but only if the quality levels are upgraded. There is a misconception that physical infrastructure alone can enhance innovativeness.

The quality of the last mile connection to remote areas and the skills of the population and business users are also important. Regarding FDI, respondents confirmed its importance for knowledge spillovers and catching up. However, they believed that FDI could play a bigger role if it transferred specific technology and management skills in more tangible ways, such as providing training and enhancing the learning capabilities of local entrepreneurs. Knowledge spillovers were seen as more effective when FDIs are integrated into networks of domestic firms.

‘Soft re-engineering’: community value co-creation, venture studios

We propose a "soft re-engineering" of innovation models and policies to address the disadvantages faced by small firms and the limitations of risk-averse strategies (Aritenang, 2015). This approach should align with domestic values while introducing new approaches. We suggest community value co-creation as a solution (Yunus, 2017, Widjojo et al., 2019;

EAILD, 2022; Blank, 2023; De Maré & Magnetec, 202), leveraging local community values such as loyalty and collaboration to foster trust and collaboration among local SMEs and communities. This model has already been successful in creative industries and organic food production in Indonesia. However, there is a need for more entrepreneurial and marketing-minded approaches to maximize the potential of community value co-creation. Venture Studios can play a crucial role in this regard, providing support and resources to start-ups without relying solely on individual entrepreneurs. These studios can also offer training to potential entrepreneurs to enhance their practical abilities. Collaboration is also a challenge in government programs like the "100 Smart City Movement," where genuine community-led developments require partners to be co-decision makers (Bastian, Effendi et al., 2022 Jaspers & Steen, 2019; Prahalad & Ramaswamy, 2004; Steen, 2011 Dhewanto et al., 2011). Involving potential customers/users in the design process can help reduce market risks and enable scaling-up. Community-based and user-centered innovation can also accelerate cluster networking in the ICT industry. However, community-based innovation faces challenges such as enhancing inclusion, promoting bottom-up initiatives, preserving creativity, maintaining appropriate relationships, and monitoring developments.

Our study examines the innovativeness of domestic ICT firms in a developing economy using a mixed-method approach. We discussed the four contributions of the paper, the issue of generalization, the limits of the study, and future research directions. The study highlights the need for small firms to improve their management capabilities, particularly in ICT and market-related skills (Long et al., 2017; World Bank, 2015). It also emphasizes the importance of interfirm collaboration and co-creation with customers in driving innovation. The study reveals the trends of the positive influence of clusters and the relatively weak influence of the urban environment. Additionally, it suggests that firm-level foreign direct investment (FDI) can enhance innovativeness, but opportunities are not fully utilized due to challenges in intellectual property protection. The study also explores the potential of "soft engineering" in policymaking, including community value co-creation and better utilization of FDI demand effects. However, the study acknowledges limitations in understanding limited innovativeness and calls for further research to deepen the understanding of specific knowledge types and learning processes. It also suggests the use of advanced modeling techniques and longitudinal approaches. The study emphasizes the need for practical local experimentation and investigation to address the challenges and opportunities in the domestic ICT market in developing countries like Indonesia.

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