

## **Digital Innovation in the Digital Innovation Ecosystem: A Digital Collaboration Networks Approach**

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### **ABSTRACT**

This study aimed to analyze the occurrence of digital innovation in the digital innovation ecosystem within the digital collaboration network. It used a mixed method with an exploratory sequential strategy involving 32 respondents and 15 informants comprising digital startup actors in West Java. The data obtained using a questionnaire instrument and interview guidelines were tabulated, reduced, triangulated, verified, and analyzed descriptively. The findings showed that the Co-Inform dimension in digital collaboration networks was rated as “Good”, while the Co-Produce and Co-Build dimensions were rated as “Not Good”. These findings imply a need for improved collaboration between suppliers, investors, and information media. Better collaboration would improve the quality of digital innovation and increase the competitiveness of startups in West Java.

**Keywords:** Digital Innovation, Digital Collaboration Networks, Digital Innovation Ecosystem, Digital Startup, Digital Entrepreneurship

### **1. INTRODUCTION**

The digital revolution caused by Information and Communications Technology (ICT) development changes almost all aspects of human activities, including entrepreneurship. Following this, innovative startup has become revolutionary change agents in implementing and commercializing new technical and technological solutions in information processing (Skala, 2019).

A startup is an organization designed to find the right business model suitable for fast growth (Afdi & Purwanggono, 2018). In line with this, digital startup is company that integrates digitization into the products and processes (Hardiansyah & Tricahyono, 2019). It shows the potential to enable and support the transition of local areas towards economic advancement, knowledge, and competitiveness. It also enables industry transformation through innovation and new technologies (Quinones et al., 2015).

The fastest growth in consumers entering the digital economy is estimated to come from emerging markets (Quinones et al., 2015; Hooton, 2017), including Indonesia. As a

developing country, the digital industry in the country is growing (Dessyana & Riyanti, 2017) and marked by the emergence of digital startup spearheaded by young people (Arjanti & Mosal, 2012; Dessyana & Riyanti, 2017). The studies published on daily social.id predicted that the development of digital startup would increase by 6.5 times in 2024. This is due to the government's support by forming the National Movement 1000 Startups through the Ministry of Communication and Information. The government has collaborated with a company (KIBAR) to build a digital ecosystem. Furthermore, this is a movement to realize the country's potential to become the Digital Energy of Asia by creating 1,000 startups as solutions to various problems using digital technology (Hardiansyah & Tricahyono, 2019; Startup Studio Indonesia, 2022). Therefore, digital startup would increasingly influence the Indonesian economy (Dessyana & Riyanti, 2017).

West Java Province, as one of the provinces in Indonesia, shows a positive trend in digital startup growth. According to data from the Bandung Startup Community, the growth reached 250 startups in 2019. Furthermore, the 2021 East Ventures - Digital Competitiveness Index (EV-DCI) report showed West Java is the most excellent in digital human resource availability, with a score of 57.14. This digital talent has made the province boast the second-highest digital competitiveness after Jakarta. It scored 58.5 based on the Digital Competitiveness Index 2022 (EV-DCI 2022) (Rizaty, 2021). West Java is also a digital province and hopes to serve as a reference for other regions in pushing for the achievement of a Digital Indonesia (Mathilda Gian Ayu, 2022).

The rise of digital startup is also accompanied by failures in some companies. According to the forbes.com, 90% of startup created worldwide fail to survive (Forbes, 2015; Jaya et al., 2017). Similarly, West Java digital startup' failure rate is still high. One incubator in Bandung reported that the startup failure rate reached 14% (Anggara & Anggadwita, 2018; Hardiansyah & Tricahyono, 2019). Many factors contribute to the success of a startup, including innovation and creativity (Zaheer, 2015; Dessyana & Riyanti, 2017). These two factors are needed to develop and create ideas in startup (Nugraha & Wahyuhastuti, 2017). Unfortunately, startup still faces problems related to digital innovation and the national startup ecosystem, such as funding, infrastructure, mentor networks, and markets. Many digital business opportunities have not been maximized due to a lack of understanding by startup actors regarding information technology, business creativity and innovation, as well as management. Moreover, startup is constrained by the lack of digital talent, an important factor supporting innovation (Nugraha & Wahyuhastuti, 2017).

The digital innovation is the integrated orchestration of new products, processes, services, platforms, or business models (Nambisan et al., 2017; Hinings et al., 2018). According to many studies, synergy and collaboration influence the success of startup, specifically digital innovation (Hardiansyah & Tricahyono, 2019). Thus, digital startup should establish collaborative relationships in digital innovation with actors such as venture capitalists and angel investors, academics, innovation agencies, external partners, suppliers, and governments. This would enable startup to fill the knowledge and resource gaps, and address challenges effectively. Networks of collaborative relationships could be found through a holistic approach to the entrepreneurial ecosystem. In this case, organizations, individuals, and institutions are formally and informally interconnected by providing bottom-up steps to support startup success (Passaro et al., 2020). This means that organizations are connected networks of people, practices, tools, and other resources working together to create digital solutions (Ciriello et al., 2018). In digital innovation, social networks are often conducted as Idea Hub. An idea hub is a collective creative nexus where all parties generate, refine, or expand innovative ideas online or offline (Ciriello & Richter, 2015; Ciriello et al., 2018).

Based on the description above, the innovation could occur in a network contained in the digital innovation ecosystem where startup is located. To obtain technical and managerial resources, prospective startup must collaborate with several actors in the entrepreneurial ecosystem. It is necessary to understand and explain digital innovation due to its importance for startup and the complexity of the network contained in the ecosystem. Therefore, this study conducted an analysis using a digital collaboration network approach. The approach is relevant because a digital innovation ecosystem has elements that support the creation and implementation of collaborative networks among actors. The goal is to bridge the gaps between various actors by creating the best entrepreneurial networks. Participating in collaborative networks enables digital startups to access, develop, and continuously transform the necessary knowledge resources. Subsequently, the startups increase their chances of survival and success at various life cycle stages (Passaro et al., 2020).

The studies on digital startup, innovation, and ecosystems are becoming increasingly important in explaining these three concepts' empirical relevance. The rise of digitization has triggered questions regarding the explanation and usefulness of current innovation theory and related business organizations (digital business) (Goldfarb & Tucker, 2012; Yoo et al., 2012; Greenstein et al., 2013; Barrett et al., 2015; Nambisan, 2017). Many studies described the characteristics of startup in recent years. However, there is no general agreement on a digital startup among scientists, business support institutions, and entrepreneurs themselves (Breschi et al., 2018; Skala, 2019).

It is necessary to answer various problems regarding digital startup in West Java and complement the weaknesses of studies on digital startup, digital innovation, and digital innovation ecosystem. Therefore, this study aimed to analyze the occurrence of digital innovation in digital innovation ecosystem using a digital collaboration network approach. The objective was to increase innovation and the quality of digital startup entrepreneurship in Indonesia, specifically in West Java.

## **2. LITERATURE REVIEW**

### **2.1 Digital Innovation**

The digital innovation refers to innovating products, processes, or business models using digital technology platforms as means or goals within and across organizations (Yoo et al., 2012; Ciriello et al., 2018). The term digital innovation refers to a product-centric perspective that involves combining physical and digital products to form new products (Yoo et al., 2010; Lee & Berente, 2012; Kohli & Melville, 2019). Digital innovation activities include initiating, developing, implementing, and exploiting existing systems or data to create new ones (Cooper & Zmud, 1990; Kohli & Melville, 2019). These four activities do not have to be present in all digital innovation efforts, do not need to be orderly, and could be inseparable. Digital innovation could be framed as strategic initiatives organized and implemented within the IT service function. Organizations could sometimes use business strategies, culture, and operations that significantly impact digital innovation. However, innovation transforms organizations by enabling new business models (Fichman et al., 2014; Kohli & Melville, 2019).

### **2.2 Digital Innovation Ecosystem**

Ecosystem is complex adaptive system (Choi et al., 2001) characterized by interactions between the behavior of individuals and the entire system across indeterminate boundaries (Autio & Thomas, 2014; Beltagui et al., 2020). It consists of interdependent and co-evolved

actors with an agency (Choi et al., 2001; Beltagui et al., 2020). It has become one of the concepts used in several recent studies where a digital product or service innovation refers to reconfiguring or recombining existing resources (Tiwana, 2015; S. Um et al., 2015; Hu et al., 2016; Chae, 2019). This has resulted in an innovation ecosystem concept. An innovation ecosystem becomes important for developing and combining elements. It leads to a complex, hierarchical, self-regulating structure resembling a biological ecosystem (Iansti & Levien, 2004). The innovation ecosystem comprises customers, suppliers, and complements working together and competing for survival and dominance (Moore, 1993; Beltagui et al., 2020).

A digital innovation ecosystem contains complex heterogeneous social and technical elements. These elements evolve together and refer to technological arrangements, methodologies, concepts, business application areas, organizations, and complex institutions (Chae, 2019). The ecosystem is a proposed framework using a complex network (Axelrod & Cohen, 2000; Holland, 2014). This system is a theoretical lens to study digital innovation as a heterogeneous network of elements that change over time through variation and selective retention (Chae, 2019). Furthermore, this analytical framework links digital entrepreneurs and innovation ecosystems. A holistic and multilevel view is adopted to analyze the networked digital entrepreneurs within the innovation ecosystem (Beliaeva et al., 2020). The ecosystem comprises industry players, customers, and suppliers. Additionally, it encompasses government, industrial companies, and universities working together and competing for survival and dominance (Chae, 2019; Beltagui et al., 2020; Beliaeva et al., 2020).

### **2.3 Digital Collaboration Network**

A digital collaboration network is a virtual ecosystem that enables businesses to collaborate and build coalitions (Fachrunnisa, 2016). Virtual collaboration is a long-term strategic interaction based on mutual agreement and resource sharing to benefit the collaborating parties (Hoyer, 2008). Albert et al., (2009) stated that digital collaboration networks are formed to inform the public or rebuild social and economic foundations to create efficiency, new opportunities, and quality of life for all people. This cooperation and collaboration is the exchange of knowledge and business resources to create digital services. It is based on the core competencies of each provider to increase industry competitiveness in the market. According to Waits (2000), digital collaboration networks are measured based on the following dimensions (Albert et al., 2009; Fachrunnisa et al., 2013; Fachrunnisa, 2016):

1. Co-Inform: Identifying members and impact, increasing awareness of issues, and improving communication among members;
2. Co-Learn: Education and training programs sponsored by the network;
3. Co-market: Collective activities that promote members' products or services domestically or abroad;
4. Co-Purchase: Strengthening buyer-supplier relationships or jointly purchasing expensive equipment;
5. Co-Produce Alliance to make products together or conduct joint R&D;
6. Co-Build: Building a shared economic foundation, as well as stronger educational, financial, and government institutions that enable communities to compete better.

Based on the literature, the authors developed a research conceptual framework which can be seen in Figure 1.

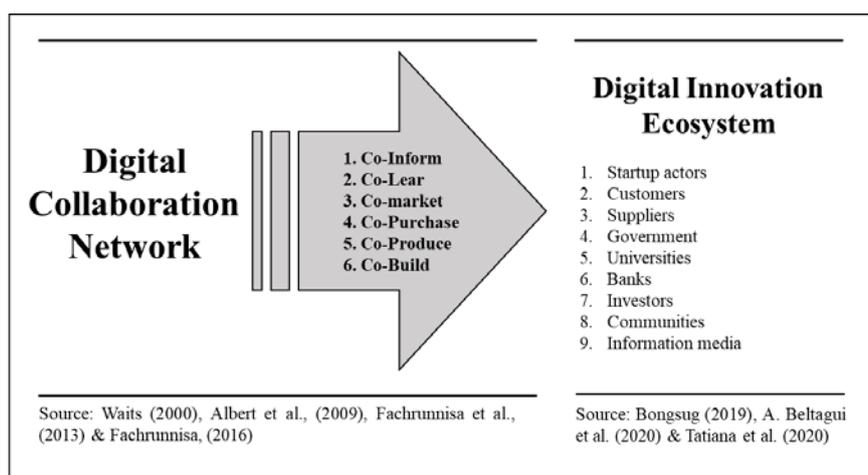


Figure 1. Research Conceptual Framework

### 3. METHOD

This study used a Mixed Methods approach with an exploratory sequential strategy (Creswell, 2014). The population comprised 86 digital startup in West Java, recorded at [www.startupranking.com/top/jawa-barat](http://www.startupranking.com/top/jawa-barat) in June 2022. Respondents were selected by purposive sampling based on characteristics related to the population (Bougie & Sekaran, 2019). The criteria used were digital startup established for at least one year and located in West Java. The sample size was determined by the number of questionnaires with responses from the total distributed to the startup. Only 32 of the 86 questionnaires distributed online were filled out completely. This sample size was sufficient for the minimum number of respondents required in descriptive quantitative studies. In line with this, Gay stated that a minimum of 10% of the population is sufficient for descriptive studies (Agung, 2006). This study also involved 15 digital startups as key informants in group discussion forum activities. Respondents and informants comprised digital startup with various business fields, including Animation, Photography, Videography and Content Creator. Other informants came from the Services sector, including Business Consultants, Digital Marketing, IT & Finance, Software, Application & Website Developers, and Digital Creative Industries. The data obtained using questionnaires and interview guides were tabulated, reduced, triangulated, verified, and analyzed descriptively.

### 4. RESULTS AND DISCUSSION

The following section presents an analysis of the digital innovation ecosystem based on the collaboration network for digital startup in West Java.

#### 1. Co-Inform Dimension

The Co-Inform dimension relates to identifying the digital innovation ecosystem actors and their impact, increasing awareness of issues, and improving communication among members. This dimension was measured by seven statement items with the following results:

Table 1. Co-Inform Dimension Score Recapitulation

No	CO-INFORM Statement Items	Frequency of Respondents' Answers					Score	%
		SA	A	N	DA	SDA		
		5	4	3	2	1		
1	Startups collaborate with other industry players involved in the digital industry in West Java	11	17	0	4	0	131	16.17%
2	Startups collaborate with formal organizations (Government, University, Banking, etc.) involved in the digital industry in West Java	7	19	0	6	0	123	15.19%
3	Startups collaborate with formal organizations that have specific goals in the digital industry in West Java	4	19	0	9	0	114	14.07%
4	Collaboration has a certain impact on startup businesses	11	15	0	5	1	126	15.56%
5	Collaboration often faces problems	6	17	0	7	2	78	9,63%
6	There are applications /software/devices that support communication in collaboration	6	21	0	3	2	122	15.06%
7	Application / software / device usage rate is already good	3	22	0	6	1	116	14.32%
<b>Total Score</b>							<b>810</b>	<b>100%</b>

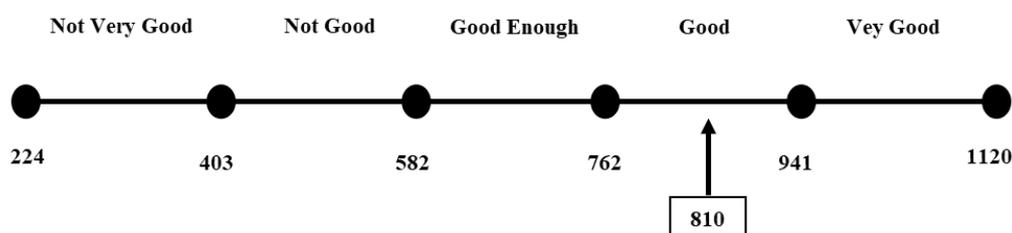


Figure 2. Co-Inform Dimension Categories

The Co-Inform dimension obtained a score of 810 with an interval of 179. The results of the total score are included in the good category. This means identifying collaborative activities of startup in the digital innovation ecosystem has been effective. Furthermore, there has been a good effort to increase awareness of collaboration issues and improve communication among startup. Most respondents established collaboration with other industry players or formal organizations, including the government, universities, and banks.

Other industry players collaborating with digital startup in West Java include other digital startup, marketers, programmers, content creators, influencers, production houses, IT consultants, technology planners, digital ventures, and business associations. The formal organizational institutions collaborating with digital startup include government organizations such as BUMN, Telkom Indonesia, DISKOMINFO West Java Province, and KREASI West Java. Other government agencies are the Ministry of Industry, Tourism and Culture Office of West Java Province, UMKM Office of West Java Province, Tourism Office

of West Java Province, Bandung City Government, Kominfo BRIN, Ministry of Trade, and HIPMI & Kadin. Furthermore, formal organizational institutions could also include university parties such as SBM ITB, Telkom University, Padjadjaran University, Bakrie University, Djuanda University, and the Indonesian Postal Polytechnic. Other formal organizational institutions include banking parties such as BSI, BCA, BRI, DANAMON, BCA, and Bank Muamalat.

Digital startup collaboration activities with government agencies, universities, and banks have specific goals in West Java. These include business incubation activities such as the Indigo Incubator at Telkom Indonesia. Other activities include outsourcing projects, Unpad Student Pre-Startup Innovation Grants, digital literacy, and building content-creator ecosystems. Moreover, the collaboration involves empowering local sheep breeders for digitization and financial application development training.

These collaborative activities have positively impacted digital startup businesses. Collaboration has enhanced technology systems, provided fleets for shipments, capital to customer partners, and opportunities to use applications freely. Through collaboration, startup have obtained assistance with market access for product development, as well as business strategy advice on expanding market and supplier networks. Applications are available to support communication in digital startup collaboration with other players involved in the digital industry in West Java. These include WhatsApp groups, Telegram, LinkedIn, Zoom, Microsoft teams, Google Meet, Google workspace and Trello. This explanation of the Co-Inform dimension is in line with Waits (2000) that almost the entire digital innovation ecosystem could have projects to improve electronic communication between the actors involved.

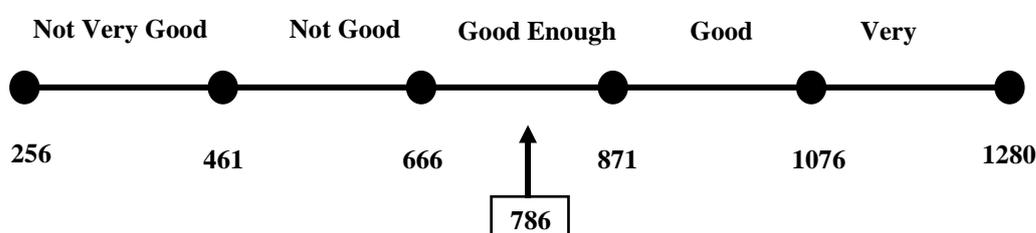
## 2. Co-Learn Dimension

The Co-Learn dimension relates to digital collaboration measurement through network-sponsored education and training programs in the digital innovation ecosystem. This dimension was measured by eight items with the following results:

Table 2. Co-Learn Dimension Score Recapitulation

No	CO-LEARN Statement Items	Frequency of Respondents' Answers					Score	%
		SA	A	N	DA	SDA		
		5	4	3	2	1		
1	In collaboration available educational programs	3	12	0	15	2	95	12.09%
2	In collaboration available applications / software / devices that support educational programs	1	12	0	18	1	90	11.45%
3	The usage rate of applications / software / devices that support educational programs in collaboration is already good	1	17	0	11	3	98	12.47%
4	In collaboration available training programs	3	18	0	10	1	108	13.74%

5	In collaboration available applications / software / devices that support training programs	1	19	0	11	1	104	13.23%
6	The usage rate of applications / software / devices that support the training program in collaboration is already good	1	16	0	14	1	98	12.47%
7	In collaboration to have joint partners in implementing education	1	15	0	15	1	96	12.21%
8	In collaboration to have joint partners in carrying out training	2	14	0	15	1	97	12.34%
<b>Total Score</b>							<b>786</b>	<b>100%</b>



**Figure 3. Co-Learn Dimension Categories**

The Co-Learn dimension obtained a score of 786 with an interval of 205. The results of the total score are included in the pretty good category. This shows that education and training programs in West Java are running well, sponsored by networks in the digital innovation ecosystem. Respondents' data indicated that not all startup have experienced education and training programs sponsored by digital networks and collaboration. The number of startups that experience educational programs is almost equal to those without the programs. However, the startups experiencing training programs are more than those involved collaborative activities.

Educational programs in digital startup collaboration with other industry players include the West Java Kreasi program, the Ekabima Program, Ecourses on digital marketing, and the Merdeka Learning program. Also, the workshops and educational programs in Bandung Digital Valley focus on developing communication skills. The implementation of these programs is supported by various applications, software, and devices such as Zoom, Google Meet, website, and social media.

There are training programs in startup collaboration with other players involved in the digital innovation ecosystem in West Java. These include programs on family financial management, apprenticeship programs or training of educators, and digital marketing training. Applications, software, and devices used to support training programs in the digital startup include LMS tutor, LearnDash, Google Meet, Zoom, WhatsApp, and Telegram. Education in digital startup collaboration with other players is conducted by joint partners, including Telkom Indonesia, Venturi Startup Studio, and Teacher Room.

The results are in line with that organizations within the digital innovation ecosystem usually hold seminars or conferences to learn where and how to obtain resources and services.

The training also covers quality management or strategic planning to build the vision of digital startup owners and business managers (Waits, 2000). In a digital innovation ecosystem for a product, service, or technology category, resources are available to actors within the respective population and across communities and ecosystems. Actors contribute to utilizing knowledge to collectively understand innovation (Nambisan, 2017; Wang, 2021).

### 3. Co-Market Dimension

The Co-Market dimension relates to collective activities conducted by digital startup and other actors in promoting products or services domestically and internationally. This dimension was measured by three statement items with the following results:

Table 3. Co-Market Dimension Score Recapitulation

No	CO-MARKET Statement Items	Frequency of Respondents' Answers					Score	%
		SA	A	N	DA	SDA		
		5	4	3	2	1		
1	In collaboration is available co-marketing program in the industry	2	16	0	13	1	101	33.22%
2	In collaboration available applications / software / devices that support the shared marketing program	3	15	0	12	2	101	33.22%
3	The usage rate of applications / software / devices that support the joint marketing program is good	4	14	0	12	2	102	33.55%
<b>Total Score</b>							<b>304</b>	<b>100%</b>

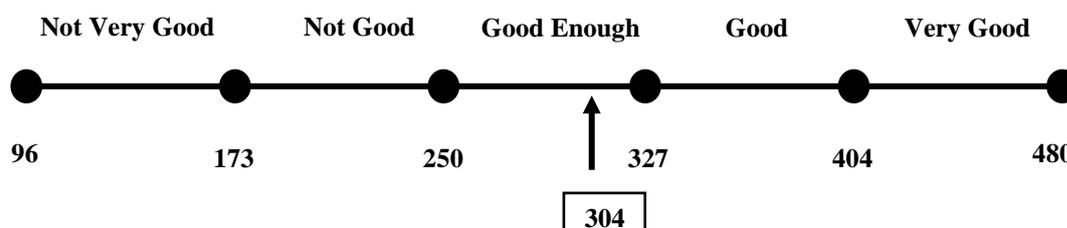


Figure 4. The Co-Market Dimension Categories

The Co-Market dimension obtained a score of 304 with an interval of 77. The results of the total score are included in the fairly good category. This means that startup and other actors involved in the digital innovation ecosystem conducted good collective activities in promoting products or services domestically and internationally.

There are joint marketing programs within the industry in digital startup collaboration with other players in West Java. These include the paddy marketplace program, belikreatiflokal.id, joint promotions and special discounts, and joint event programs. Moreover, there are application product marketing programs, sponsorship finance, and marketing. An example of activities is the collaboration between digital startup and the Bandung and Bandung Digital Valley communities. They hold joint events filled with promotional activities, knowledge sharing, and discussions. The implementation of the joint marketing program is supported by the use of Google Ads, Tiktok Ads, Facebook Ads,

YouTube, Zoom, WhatsApp, Trello, and website.

Several startup digital marketing activities must be conducted to reach the target market and anticipate competition (Beier, 2016). These include using digital media to distribute information related to the business. Moreover, startup digital must develop methods consistent with their knowledge and abilities to provide certain content and formats to the target market (Nugraha & Wahyuhastuti, 2017).

#### 4. Co-Purchase Dimension

The Co-Purchase dimension relates to collaboration in strengthening relationships between suppliers and buyers. It also refers to jointly purchasing equipment considered expensive by digital startup and other actors involved in the digital innovation ecosystem in West Java. This dimension was measured by four statement items with the following results:

Table 4. Co-Purchase Dimension Score Recapitulation

No	CO-PURCHASE Statement Items	Frequency of Respondents' Answers					Score	%
		SA	A	N	DA	SDA		
		5	4	3	2	1		
1	In collaboration there are joint activities to strengthen relationships with suppliers	2	10	0	17	3	87	25.29%
2	In collaboration available applications / software / devices that support joint activities to strengthen relationships with suppliers	1	11	0	18	2	87	25.29%
3	The usage rate of applications/software/devices that support joint activities to strengthen relationships with suppliers is good	1	11	0	18	2	87	25.29%
4	In collaboration to have a joint partner in the supply chain	0	10	0	21	1	83	24.13%
<b>Skor Total</b>							<b>344</b>	<b>100%</b>

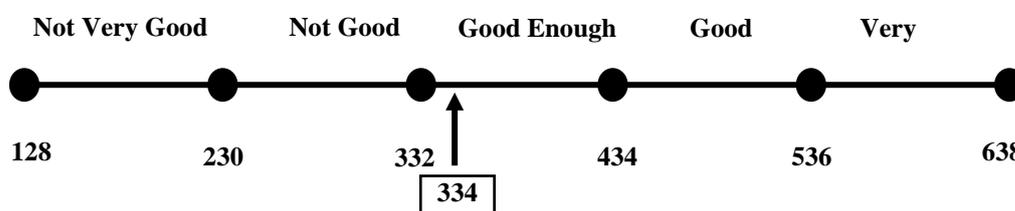


Figure 5. The Co-Purchase Dimension Categories

The co-purchase dimension obtained a score of 334 with an interval of 102. The total score is included in the fairly good category but is more likely unfavorable. This means that collaboration in strengthening the relationship between suppliers and buyers or purchasing

expensive equipment in West Java is quite good but tends towards not good.

The co-purchase dimension is in a fairly good to a bad category, but some startups and other players in the digital industry agreed and strongly agreed. The relationships with suppliers are strengthened by providing stock and price information in applications and outreach and expanding the network of suppliers of certain raw materials. The applications supporting joint activities to strengthen supplier relationships include WhatsApp, websites, Zoom, and Telegram. They are used in digital startup collaborative activities regarding the supply chain involving packaging distributors, the accessmu application, Assembler Edu, the gapoktan website, and certain raw material supplier partners.

Digital startup in West Java uses applications as reminders or providers of information to suppliers regarding raw materials. Suppliers automatically identify and send offers to digital startup. Furthermore, activities occurred in the digital innovation ecosystem aimed to strengthen the relationship between suppliers and buyers or jointly purchase expensive equipment. In this case, the ecosystem is an agent to introduce software suppliers from smaller into wider high-tech supply chains (Waits, 2000). This makes it easier for digital startup to obtain expensive and high technology that supports their business.

## 5. Co-Produce Dimension

The Co-Produce dimension relates to alliances or collaborations to make products together or perform joint R&D. It was measured by six statement items with the following results:

Table 5. Co-Produce Dimension Score Recapitulation

No	CO-PRODUCE Statement Items	Frequency of Respondents' Answers					Score	%
		SA	A	N	DA	SDA		
		5	4	3	2	1		
1	In collaboration there is an Alliance to create products Together	0	2	0	28	2	66	16.67%
2	In collaboration there are activities for Joint R&D	0	3	0	25	4	66	16.67%
3	In collaboration, applications / software / devices are available that support joint activities to create products	0	2	0	27	3	65	16.41%
4	In collaboration available Applications / software / devices that support joint activities for R&D	0	3	0	25	4	66	16.67%
5	The usage rate of applications / software / devices that support joint activities to make the product is good	1	1	0	28	2	67	16.92%

6	The usage rate of applications / software / devices that support joint activities for R&D is already good	0	3	0	25	4	66	16.67%
<b>Total Score</b>							<b>396</b>	<b>100%</b>

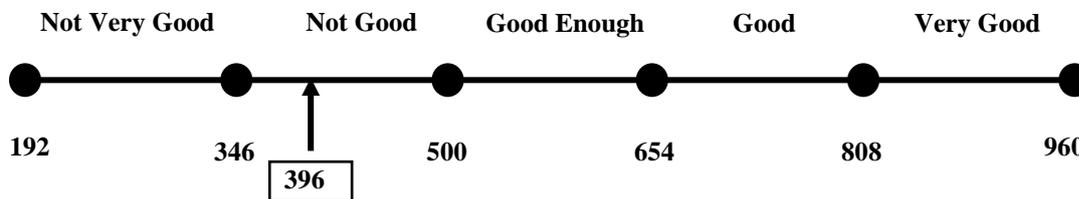


Figure 6. Co-Produce Dimension Categories

The Co-Produce dimension obtained a score of 396 with an interval of 154. The total score is included in the bad category but tends towards very bad. This means that alliances or collaborations are not implemented properly to make joint products or perform R&D. The conditions for collaboration in activities to make joint products and R&D activities are ineffective. However, several digital startup and other actors have alliances or collaborations to create joint products and conduct R&D activities. These include product research based on market preferences and developing food technology innovations. They also create websites and applications for products or services and develop technology for financial applications. These activities are supported by the use of Google Meet, Zoom, Meister task, Trello, and WhatsApp.

Products or services cannot be produced independently of certain tools requiring digital startup to collaborate with principals or other startups. These parties produce products or services with a job correlation. For instance, startup produces software products, while other parties produce hardware to complement each other. Alliances or collaborations to make joint products or conduct R&D involve signing formal agreements to develop future products or services. This activity occurs in a digital innovation ecosystem that helps identify the company's capabilities and capacities in developing products or services (Waits, 2000). Also, financing becomes more efficient through this collaboration.

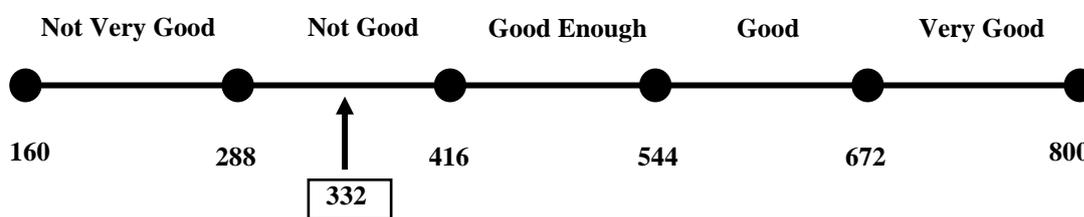
**6. Co-Build Dimensions**

The Co-Build dimension relates to collaboration in building a shared economic foundation. It includes building stronger educational, financial, and government institutions to improve digital startup' competitiveness. This dimension was measured by five statement items with the following results:

Table 6. Co-Build Dimension Score Recapitulation

No	CO-BUILD Statement Items	Frequency of Respondents' Answers					Skor	%
		SA	A	N	DA	SDA		
		5	4	3	2	1		
1	Collaboration has the ability to build an educational Institution	0	2	0	29	1	67	20.18%
2	Collaboration has activities to build financial institutions	0	1	0	28	3	63	18.98%

3	Collaboration has activities to build government institutions	0	0	0	31	1	63	18.98%
4	Collaboration has applications / software / devices that support the activities of building educational / financial / government institutions	0	3	0	28	1	69	20.78%
5	The level of use of applications / software devices that support activities to build educational / financial / government institutions in collaboration is good	1	2	0	28	1	70	21.08%
<b>Total Score</b>							<b>332</b>	<b>100%</b>



**Figure 7. Co-Build Dimension Categories**

The Co-Build dimension scored 332 with an interval of 128. The total score is included in the bad category and tends towards very bad. This implies that collaborative activities are not conducted properly in building a shared economic foundation. The activities include building stronger educational, financial, and government institutions that improve digital startup competitiveness.

Most respondents did not participate in collaborative activities to build educational, financial, and government institutions that benefit startup and other actors involved in the digital innovation ecosystem in West Java. Regarding technology adaptation and utilization, most respondents lack applications, software, or devices that support collaboration activities. This results in suboptimal use of the applications, software, and devices in supporting activities that improve the startup competitiveness.

The collaboration related to the Co-Build dimension involves activities to build educational institutions for the common good, though the conditions are still limited. Some of the activities and parties involved in collaborations include online tutoring, incubation and acceleration, and building learning communities. These activities are assisted by Bandung Digital Valley, Oorange Unpad, and Assembler Edu. Moreover, educational institutions are important because the formal education sector in digital marketing is still limited. Digital marketing activities are an important strategy for startup to market their products and services and increase sales. Additionally, the collective building of educational institutions is necessary because it allows digital startup to compete better (Waits, 2000).

**5. CONCLUSION AND RECOMMENDATIONS**

This study found that the Co-Inform dimension in digital collaboration networks is good, while the Co-Produce and Co-Build dimensions are not good. This implies the need for

increased cooperation from suppliers, investors, and information media. The cooperation could increase the digital startup innovation quality and competitiveness in West Java.

This study contributes to the development of digital innovation ecosystems and collaboration networks. Therefore, future studies could use the A to F theory or dynamic systems to analyze the innovation process in digital innovation ecosystems and collaboration networks.

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