

DEVELOPMENT OF A BUSINESS ECOSYSTEM MODEL OF DIGITAL PLATFORMS USING VALUE NETWORK AND BEHAVIORAL ANALYSIS: CASES IN INDONESIA

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Article History

Received: January 22nd 2026
Revised : January 22nd 2026
Accepted : January 23rd 2026
Published : January 23rd 2026

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Cite This Article:

Siti Dyah Handayani, Fauziyah, Punang Amaripuja, & Mohammad Nabil Almunawar. (2026). DEVELOPMENT OF A BUSINESS ECOSYSTEM MODEL OF DIGITAL PLATFORMS USING VALUE NETWORK AND BEHAVIORAL ANALYSIS: CASES IN INDONESIA. *International Journal Management and Economic*, 5(1), 01–13.
<https://doi.org/10.56127/ijme.v5i1.1190>

DOI:

<https://doi.org/10.56127/ijme.v5i1.1190>

Abstract: With an estimated 171 million internet users from a population of 267 million people in 2019 reported by the Association of Indonesian Internet Providers (APJII, 2019), e-commerce systems have a huge potential to be used as a platform for entrepreneurs. Muhammadiyah University of Yogyakarta has responded to this opportunity by developing the Bedukmutu platform to provide business opportunities for its stakeholders, especially for academic and administrative staff. Bedukmutu has the main objective to manage the economic potential of Muhammadiyah members. The research aims to utilize both the business ecosystem model and the UTAUT (Unified Theory of Acceptance and Use of Technology) theory to analyze the use of Bedukmutu.

Keywords: Digital platform, business ecosystem, behavioral analysis, Bedukmutu

INTRODUCTION

The business model concept has been dramatically developing in recent years. Companies must be able to adapt and design new business models to retain competitive advantage in highly dynamic network environments. This paper presents innovative business ecosystem models that are being developed in two countries using digital platforms. The framework presented in this paper could be useful for companies to take an ecosystem perspective on their business models.

Limited prior research on the business ecosystem, especially related to user behavior, encourages the need for this research. This research will also analyze from the perspective of users through UTAUT (Unified Theory of Acceptance and Use of Technology). It is undeniable that one indicator of the success of a digital business is user involvement. As we know, if the frequency of using a technology is high, it indicates that the business platform is successful, and vice versa.

Muhammadiyah, a social organization founded in 1912 that has spread throughout Indonesia, has a huge captive market with the potential to be part of a digital-based business platform ecosystem. With the desire to manage the market potential in the Muhammadiyah community, Bedukmutu was developed. Bedukmutu, an abbreviation of "Bela beli proDUK

MUhammadiyah bermuTU" or "buying and selling quality Muhammadiyah products," was developed as an online commerce platform for the UMY community. Bedukmutu's presence was initiated by Dr. Suryo Pratolo, M.Sc., Akt., Lecturer of the Faculty of Economics and Business, UMY, since April 2017.

The main objective of establishing Bedukmutu is to manage Muhammadiyah's independence in the economic field. Bedukmutu is part of UMY's support for social economic empowerment through the concept of demand pull and supply push mechanisms by creating a marketplace application, which is accessible to the UMY community through <https://www.bedukmutu.jualretail.com>.

User behavior analysis can use various references. These references develop along with technological developments and changes in business processes. Fig. 1 is a comprehensive overview of the various theories in explaining user behavior.

Based on Fig. 1, it can be explained that the most updated theory to explain user behavior is UTAUT. UTAUT is a widely used theory to explain technology acceptance (Venkatesh et al., 2003) based on the comparison of the eight prominent theories. Fig. 2 depicts this theory.

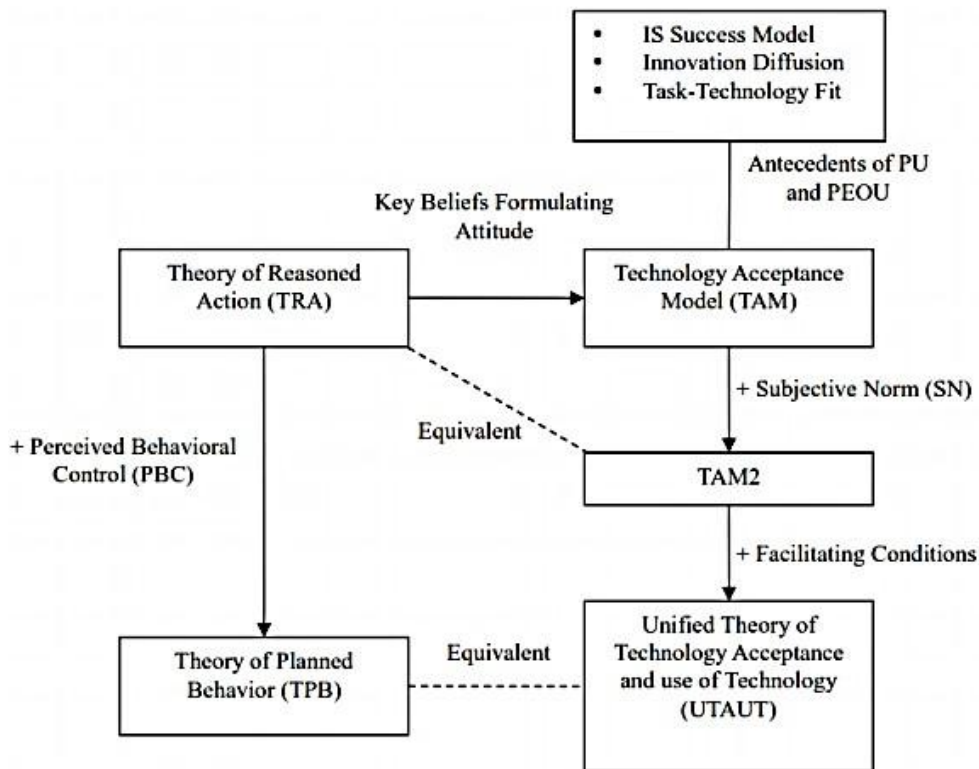


Figure 1. An Overview of Technology Acceptance Theories (Sun, 2013)

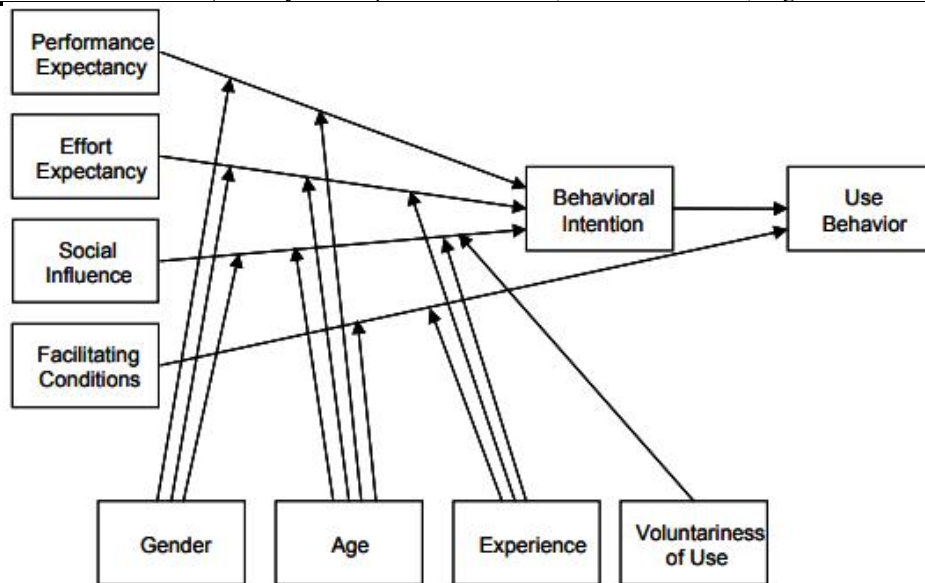


Figure 2. Research Model (Venkatesh, 2003)

In this figure, the influence of the independent variables—performance expectancy, effort expectancy, social influence, and facilitating conditions—on behavioral intention will be moderated by gender, age, and experience. In this study, voluntariness of use will be eliminated because all users are indeed voluntary.

RESEARCH METHODOLOGY

The research in the first year was conducted in Indonesia and the second year was conducted in Brunei Darussalam. In the initial stages of the study, the UTAUT questionnaire was compiled. The questionnaire was modified from a questionnaire proposed by Venkatesh (2003). The questionnaire was distributed to Bedukmutu stakeholders consisting of lecturers, employees, and students. The UTAUT question item was modified from Venkatesh (2003).

Table 1 Research Questionnaire

Construct	Code	Statement
Performance expectancy	U6	I would find the system useful in my job.
	RA1	Using the system enables me to accomplish tasks more quickly.
	RA5	Using the system increases my productivity.
	OE7	If I use the system, I will increase my chances of getting a raise.
Effort expectancy	EOU3	My interaction with the system would be clear and understandable.
	EOU5	It would be easy for me to become skillful at using the system.
	EOU6	I would find the system easy to use.
	EU4	Learning to operate the system is easy for me.
Attitude toward using technology	A1	Using the system is a bad/good idea.
	AF1	The system makes work more interesting.
	AF2	Working with the system is fun.
	Affect1	I like working with the system.
Social influence	SN1	People who influence my behavior think that I should use the system.
	SN2	People who are important to me think that I should use the system.
	SF2	The senior management of this business has been helpful in the use of the system.
	SF4	In general, the organization has supported the use of the system.
Facilitating conditions	PBC2	I have the resources necessary to use the system.
	PBC3	I have the knowledge necessary to use the system.
	PBC5	The system is not compatible with other systems I use.
	FC3	A specific person (or group) is available for assistance with system difficulties.
Self-efficacy	SE1	If there was no one around to tell me what to do as I go.
	SE4	If I could call someone for help if I got stuck.
	SE6	If I had a lot of time to complete the job for which the software was provided.
	SE7	If I had just the built-in help facility for assistance.
Anxiety	ANX1	I feel apprehensive about using the system.
	ANX2	It scares me to think that I could lose a lot of information using the system by hitting the wrong key.
	ANX3	I hesitate to use the system for fear of making mistakes I cannot correct.
	ANX4	The system is somewhat intimidating to me.
Behavioral intention to use the system	BI1	I intend to use the system in the next <n> months.
	BI2	I predict I would use the system in the next <n> months.
	BI3	I plan to use the system in the next <n> months.

Source: Venkatesh, 2003

The following is the data that was successfully collected: In the context of socializing Bedukmutu's existence and supporting Muhammadiyah's economic independence, UMY had a policy of integrating the purchase of Bedukmutu products or services into Bedukmutu activities in AIK (Al-Islam and Kemuhammadiyah) activities, with each lecturer and employee at UMY required to spend at Bedukmutu at least once a month once (Pratolo, 2016).

After one year of operation, optimism can be seen for Bedukmutu, one example being the sales turnover. In June 2017, the sales turnover was still Rp.0, - but with a policy that was more supportive of the existence of Bedukmutu, in July 2017 the turnover had become Rp. 1,336,000 and continues to increase so that in March 2018, after a year, the turnover has grown to 730,349,583. The increase in monthly turnover can be seen in Figure 3.

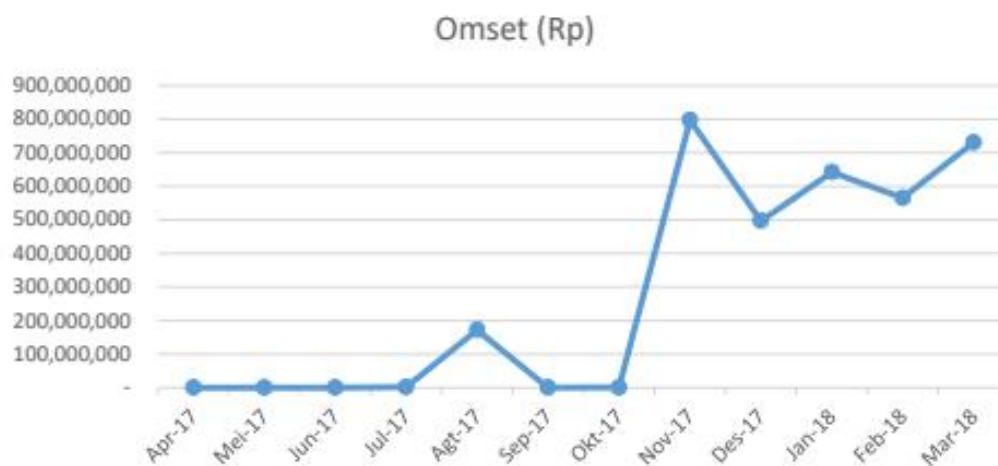


Figure 3. The sales development of Bedukmutu every month

From the graph above, it can be seen that at the beginning of Bedukmutu's launch, turnover was still very low and fluctuating. In April, May, and July 2017, turnover was still Rp. 0, - In August, September, and October 2017, turnover was also still relatively small. Starting in November, sales turnover began to experience a significant increase. (Source: Primary Data, 2018).

In further development, Bedukmutu is expected to not only manage the economic potential of Muhammadiyah residents at UMY, but also Muhammadiyah and AUM residents throughout DIY and even gradually throughout Indonesia. (Pratolo, 2016). As a trading system in general, Bedukmutu certainly hopes for loyal consumers, so that it is expected that Bedukmutu will develop better and reach a wider range. After one year of operation, from the five variables determined, namely: online system, admin service, product quality, product variations, and product prices, this research will examine which variables influence Bedukmutu's customer loyalty.

In the first year of launch, Bedukmutu buyers were still limited to UMY employees and lecturers, who were required to purchase Bedukmutu products as a practice of Al-Islam and Kemuhammadiyah (AIK). The population in this study consisted of 757 lecturers and permanent employees of UMY, spread across eight faculties and bureau employees. Samples were taken from the population using cluster sampling techniques (Sugiyono, 2013: 83). Samples were taken from each faculty and bureau in the same proportion. Because the total population is not up to 2000 people, then using the Harry King Nomogram (Sugiyono, 2013: 89) samples can be taken at approximately 10% of the population. Thus, approximately 10% of lecturers and permanent employees were sampled from each faculty/bureau/respondent. In this study, the sample size was 100 people. The sample distribution from each faculty is as follows:

Table 2. Population and sample distribution from each faculty

No	Faculty/Department	Number of lecturers and staff (persons)	Number of samples (persons)
1	Faculty of Islamic Religion	38	5
2	Faculty of Social and Political Sciences	81	9
3	Faculty of Language Education	31	4
4	Faculty of Economics and Business	84	9
5	Faculty of Law	58	6
6	Faculty of Agriculture	44	5
7	Faculty of Engineering	102	11
8	Faculty of Medicine and Health Sciences	177	27
9	Bureau Employees	142	24
	Total	757	100

UMY is one of the best private tertiary institutions in Indonesia owned by the Muhammadiyah Association. Bedukmutu, which was founded at UMY, became one of the business units of PT. UMB (Participants in Progress), which is owned by UMY and the Muhammadiyah Association-Pimpinan Wilayah Muhammadiyah (PWM DIY). UMY as Muhammadiyah Charitable Enterprises-Amal Usaha Muhammadiyah (AUM) was used for the first time. trial of Bedukmutu online shanties since April 2017, continues to strive to become an independent and Islamic independent university. Excellent in real work that claims to be an independent campus (Entrepreneur University) that has PT. UMB. PT. UMB is 100% owned by the Muhammadiyah Association, with profit sharing of 51% for Muhammadiyah Persyarikatan and 49% for UMY. PT. UMB becomes a holding of business units in UMY:

Table 3. UMY Business Unit

No	Type of Business Unit
1	UMY Sporto
2	UMY Tirta
3	UMY Boga
4	UMY Fleet
5	UMY Pharmacy
6	UMY Otocare
7	UMY BMT
8	UMY Technocreative
9	UMY Firdaus Primary Clinic
10	UMY Cafeteria and Shops
11	UMY Marketplace Bedukmutu
12	UMY Transmutu Motorcycle Taxi
13	UMY Dormitory (with 300 rooms)
14	UMY Construction

While the Islamic meaning in fostering his extended family with the spirit of Al-Islam and KeMuhammadiyah (AIK). (Pratolo, 2018). Bedukmutu, according to Pratolo (2018), which is one of the business units of PT. UMB, is owned by Muhammadiyah (PWM DIY). Because PT.

UMB is owned by two parties (Persyarikatan Muhammadiyah and UMY), Bedukmutu essentially belongs to all Muhammadiyah residents and all existing AUMs. Lecturers and staff as UMY citizens are also expected to actively participate in business transaction activities at Bedukmutu, both online and offline (Pratolo, 2018).

The Bedukmutu site is a web-based online marketplace to manage the market potential of Muhammadiyah residents so that it will not be used continuously by outsiders who do not contribute to the missionary preaching of amar makruf nahi munkar together with Muhammadiyah. The time for Muhammadiyah Defending is interpreted by buying products produced by its own citizens. The aim is to strengthen the brotherhood among Muhammadiyah members as a large family and who are always loyal to defend the da'wah amar ma'ruf nahi munkar driven by Muhammadiyah congregations wherever they are. Bedukmutu, as a movement to buy and sell Muhammadiyah products, is the time to run and be moved more intensively, not because they are cheap or expensive, not because the products are good or not good, but it is moved more than because the products are owned by your own brothers and sisters and a Muhammadiyah religious organization. Who else will defend Muhammadiyah if not ourselves as Muhammadiyah members? Who else will defend the preaching amar makruf nahi munkar movement carried out by Muhammadiyah if not its own citizens? Why should we buy products from fellow Muhammadiyah residents if not because the main goal is to strengthen brotherhood among fellow Muhammadiyah residents (Pratolo, 2016).

Essentially, Bedukmutu was present to defend the dignity of the implementation of the preaching of amar makruf nahi munkar carried out by Muhammadiyah as an Islamic community organization. The main spirit of Bedukmutu is to revive brotherhood among its citizens, namely that I exist for you, you exist for me, we are all in the Muhammadiyah environment and manage Muhammadiyah's independence in the field of economics for mutual synergy and mutual collaboration and mutual help in the good and obedience. The main purpose of this Bedukmutu is in accordance with the spirit of the teachings of Islam as stated in the Al-Qur'an Surah Al-Maidah verse 2 which is essentially, which is to help one another in promoting goodness and obedience towards an independent and progressive life.

Bedukmutu is an online trading system, which in its first year, sellers and buyers are still limited to UMY lecturers and employees (Pratolo, 2016). There are 19 (nineteen) types of products and services being traded.

Table 4. Product Category

No	Product Category	Number of Products
1	Culinary	995 products
2	Groceries (Nine basic necessities: rice, cooking oil, vegetables & fruit, sugar, salt, meat, milk, eggs, LPG)	773 products
3	Fashion	547 products
4	Books and office stationery	224 products
5	Household goods	188 products
6	Services	84 products
7	Credit (Phone Credit) / Data / Electricity Token	58 products
8	Health	49 products
9	Fresh fruits	41 products
10	Handicraft	40 products
11	Electronics	29 products
12	Real Estate	23 products
13	Hobbies	28 products
14	Building materials	20 products

No	Product Category	Number of Products
15	Beauty and Care	16 products
16	Automotive	12 products
17	Furniture	9 products
18	Used goods	3 products
19	Training and certification	3 products

Source: Primary data, 2020

In total, there are currently 3,142 goods and service products expected to grow. Judging from the types of goods and services sold, Bedukmutu is somewhat different from other online stores. Because the marketing range is still limited, there are several types of products that are sold and sell well, such as ready-to-eat foods, such as fresh fruits and vegetables, rice boxes, snack boxes, healthy food and drinks, even pecel rice, steamed rice, meatballs, office stationery, and basic food.

From the user's perspective, Bedukmutu is a digital platform that is very helpful for the economy, especially Muhammadiyah members. Bedukmutu offers an Islamic and profitable digital trading platform. Besides, the convenience and user-friendly system application makes users, in this case sellers and buyers, feel comfortable and safe transacting through Bedukmutu. Amidst the proliferation of supermarkets and online buying and selling platforms provided by giant businesses, Bedukmutu opens up promising opportunities for local, small, and medium businesses to exist and be able to compete. In addition, with the emergence of the Covid-19 pandemic, the development of online businesses is growing rapidly. People are refraining from leaving their homes and starting to take advantage of online buying and selling.

The emergence of Bedukmutu provides a solution to people's concerns, especially Muhammadiyah members, who want to do business online but are afraid of being scammed. Bedukmutu increases public trust because it carries the big name of Muhammadiyah and also strengthens the economy among Muhammadiyah members.

Value Network

A value network can be defined as connections and relationships between entities in the ecosystem that deliver goods or services to customers (Peppard & Rylander, 2006). From these relationships, values are formed. Network Value Analysis describes these interactions in detail, which in turn can be used to devise a competitive strategy. In practice, a marketplace can start small, but the effect can be big and quite fast because of the network effect (Evans & Gawer, 2016). Allee (2008) considers value networks to be interactive agents that carry specific roles and values geared towards the achievement of a specific task or outcome by converting intangible and tangible assets into negotiable offerings. The key concept of Allee's value network is value conversion, where agents engage in intangible and tangible exchanges to achieve economic or social good (Wijo et al., 2026; Nabillah et al., 2025). A value network is divided into two categories: internal value networks and external-facing value networks (Dana et al., 2024). Internal value networks are interactions between or among agents (individuals or work groups) that make up an organization (Musa et al., 2024; Arinilhaq & Fatmawati, 2025).

Modeling Business Ecosystems

A business ecosystem is modeled as a connected directed graph $G(N, V)$ where N is a finite non-empty set of symbols representing actors in the ecosystem and V is a set of edges labeled by a set of values. An edge represents a relationship between two actors, where a non-empty set of values is transferred from one actor to another following the direction of the edge. Value can be in three forms: hard value in the form of goods, services, revenue, and funds (g, s, r, or f); soft value in the form of information or knowledge (ik); and intangible value in the form of benefits (b) (Allee, 2000, 2008).

The business ecosystem analysis will use the MNSDP (multi-sided network digital platform) model in accordance with the research of Almunawar et al (2019). In this study, the digital platform will be represented by a rectangle, while the rounded rectangle will represent business actors. The arrows will represent the relationship between the two actors (value exchange relationship), labeled by a set of values transferred from one actor to the other following the direction of the arrow. The following is the symbol used:



Figure 4. The symbols relationship

The business ecosystem in the bedukmutu digital platform can be described as follows:

Figure 5. The Business Ecosystem of Bedukmutu Digital Platform

A connected directed graph $G(N, V)$ models an ecosystem can be expressed using a simple

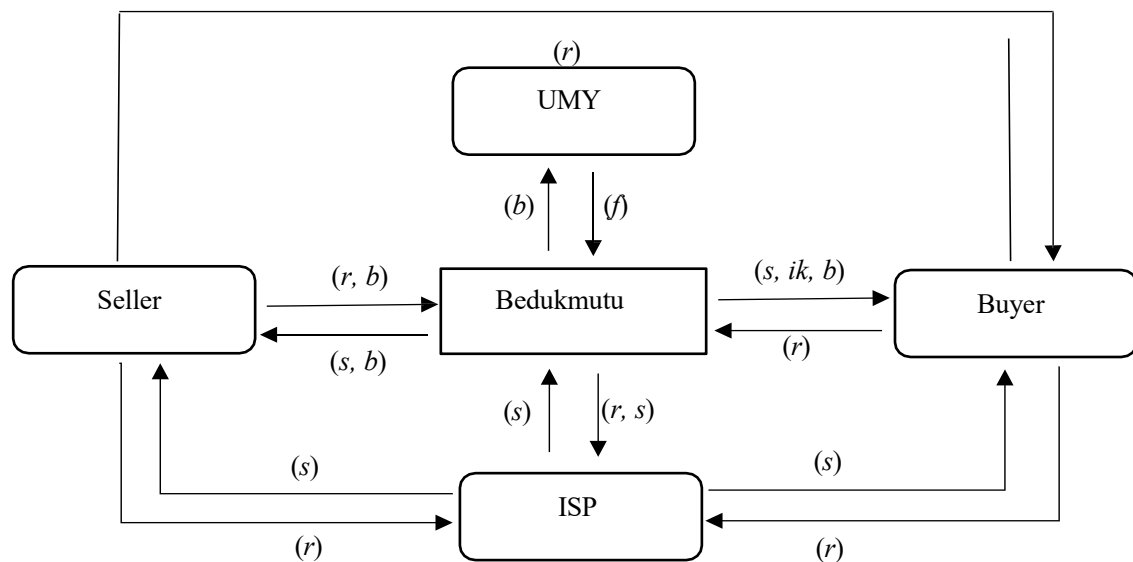


table. Table 5 is a business ecosystem table presenting the business ecosystem of a typical Bedukmutu shown in Figure 5. It is interesting to note that the rows represent values delivered and the columns represent values captured.

Table 5. The business ecosystem of Bedukmutu

Actors	Bedukmutu	UMY	Seller	Buyer	ISP
Bedukmutu	-	(b)	(s, b)	(s, g, ik, b)	(r, s)
UMY	(f)	-	-	-	-
Seller	(r, b)	-	-	(g, s, ik)	(r)
Buyer	(r)	-	(r)	-	(r)
ISP	(s)	-	(s)	(s)	-

Source: Primary data, 2020

Table 5 and Fig. 5 explain that value is delivered from many actors in the ecosystem. This ecosystem is built to provide a mutually beneficial relationship from each actor or stakeholder. There are at least five main actors in Bedukmutu's business ecosystems. They are the Bedukmutu

platform (P), sellers (S) either businesses or individuals, buyers (B), and internet service providers (ISPs). Besides, there are actually several supporting actors such as delivery providers and e-payment providers. Bedukmutu receives the value of revenue (r) and information knowledge. Sellers receive value of information knowledge (ik), benefits (b), and service from the platform. The Bedukmutu's platform (P) receives more revenue (r) compared to other actors in the system. The table or matrix helps simplify the representation of complex MNSDP business ecosystems into a more manageable format for analyzing the exchange values among actors. Sellers receive the value of information knowledge (ik), benefits (b), and services from the platform.

CONCLUSIONS AND RECOMMENDATIONS

In the digital marketplace, the transfer of value between the actors who play in it makes the platform's existence even stronger. The existence of digital platforms such as Bedukmutu provides benefits to actors who play a role in it. In general, values are exchanged between two interacting actors. Digital marketplaces manage value exchange between actors, especially transactions between supply-side and demand-side actors, while co-creating values with supply-side actors to be offered to demand-side actors and vice versa. A digital marketplace ecosystem is modeled as a network of value exchange among actors involved in the ecosystem. The proposed graph-based framework can easily construct any business ecosystem, which can be used further to observe the ecosystem.

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