

# Business Incubator Development Model based on Business Incubator Model 4.0 (BIM 4.0) at Higher Education

Mudjiarto <sup>1</sup>, Asep Sopandi <sup>2</sup>, Wiriadi Sutrisno<sup>3</sup>, Aliaras Wahid <sup>4</sup>  
{wiriadisutrisno@gmail.com<sup>3</sup> and [mudjiarto@esaunggul.ac.id](mailto:mudjiarto@esaunggul.ac.id)<sup>1</sup>}

<sup>1,2,3</sup>University of Esa Unggul, Jakarta, Indonesia

<sup>4</sup>University of Indraprasta PGRI (UNINDRA), Jakarta, Indonesia

**Abstract.** This study explores the business incubator model based on Industry 4.0 (BIM 4.0) at Higher Education Institution (HEI) where was developing a business incubator actively. Such as an instrument, it uses a cross-sectional research design to find that there are disparities between how respondents rated the importance of business-incubation process with actual services received. These efforts in line with the vision and mission of the University of Esa Unggul (UEU) Jakarta, aims to improve the quality of the business incubator by developing BIM 4.0, to produce tenant performance as new entrepreneurs who able to face business challenges in the industry 4.0. Then in the future, MBI 4.0 is a promising tenant to have more explore competencies and finding rich opportunities. The methods applied qualitative research with a case study approach to tenants as partners in developing business incubators at UEU by conducting in-depth interviews to gather with potential key informants.

**Keyword:** business incubator, tenant, higher education, industry 4.0, entrepreneurship 4.0, BIM 4.0

## 1 Introduction

Recent global economic conditions are facing a change in the 4th industry or known as Industry 4.0. Based on the analysis of the Mckinsey Global Institute, Industry 4.0 has a very large and broad impact, especially in the employment sector, where robots and machines will eliminate many jobs in the world as in (Irianto,2017). The concept its self sparked by Prof. Klaus Schwab, German world-famous economist, Founder and Executive Chair of the World Economic Forum (WEF) in his book entitled "The Fourth Industrial Revolution", which explains that the industrial revolution 4.0 has changed the life and work of human beings fundamental(Schwab, 2016).

Unlike the previous industrial revolution, the 4th generation industrial revolution has a wider scale, scope, and complexity. Advances in new technologies that integrate the physical, digital and biological worlds have affected all disciplines, economies, industry, and government. In connection

with these fundamental changes in work methods, new entrepreneurship development programs through business incubators must also be carried out with the 4.0 approach as well, so as to generate a cub entrepreneurs who can enter the vortex of industry 4.0.

### **Business Incubation and Incubator**

**Business Incubation** is a tool for promoting innovation and economic development (Bergek & Norrman, 2008), designed to be capable of adding value to incubated companies with the intent of increasing the survival rates of such incubated companies (C. & S. Carvalho, 2012). The value-adding activities are generally regarded as the business incubation process with several models developed to explain the phenomenon. (Bergek & Norrman, 2008) cautions on the limited scope to which most of the incubation models are conceived as focusing primarily on results neglecting the interrelationship of the value-added activities to other incubator activities. (Hausberg & Korreck, 2018) in their article Business incubators and accelerators: a co-citation analysis-based, said that the business incubation concept experienced a considerable evolution and division into several similar institutions and approaches (Hackett & Dilts, 2004). Furthermore, explained that after the first private incubator was established in New York in 1959 (Harper-Anderson & Lewis, 2018) and the first public incubator in Philadelphia in 1964, business incubation diffused slowly during the 1960s and 1970s (Hackett & Dilts, 2004). By now, incubators have become an integral part of the modern entrepreneurial ecosystem, supporting the growth of new ventures based on a broad range of measures.

**Business Incubator.** is a cabin for business incubation to achieved its success. Incubators are major actors in the entrepreneurial ecosystem by linking talent, technology, capital and know-how (Todorovic & Moenter, 2010). However, definitional challenges exist on what constitutes business incubators or business incubation (Hausberg & Korreck, 2018). Sources of this definitional challenge arise from the confusion of virtual incubators with traditional incubators that provide in-house tenancy, the inability to properly define the incubation process or define it but fail to identify with whom the incubation process occurs and the use of the terms such as science parks, technology centers etc. interchangeably (Bergek & Norrman, 2008). The general idea of what research scholars see as business incubators is that they are institutions concerned with speeding up the growth, financial and operational stability of entrepreneurial start-ups by offering them targeted services and support (Lesáková, 2012) with a strong emphasis on knowledge agglomeration, resource sharing, innovativeness and competitiveness by creating an environment which help start-ups deal with the challenges of entrepreneurial pursuit (Phan, Siegel, & Wright, 2005).

University-based incubators (UBIs) are a special type of business incubators that are located in universities (Bathula H, Karia M, Abbot, 2011). The concept holds out the possibility of linking talent, technology, capital, and know-how to leverage entrepreneurial talent, accelerate the development of new technology-based firms, and speed the commercialization of technology. Then Bathula et al said that throughout the world, universities are developing ties with the industry and the government. Some of such initiatives can be seen especially in the developed world where a significant number of universities have set up business incubators. However, as noted by (Njau, Wachira, & Mwenda, 2019) that business incubators are still a fairly new concept in developing countries. Apart from assisting students who seek jobs, these universities also run business incubators to support students starting their ventures. Some leading universities in Kenya have taken initiative to establish university-based incubators. Then, Njau *et al* completed their statement that all of these are aimed at

empowering students to be self-employed upon graduation, thereby reducing pressure on the ever-thinning employment space and the chronic unemployment in Kenya.

### **Tenant.**

In this context, tenant means incubatee, as a tool in the business incubator (Hackett & Dilts, 2004). Tenant measure incubator success, as described by (McAdam & Marlow, 2007), such as: creation of a responsive business consulting network, participation of financial intermediaries in tenant capitalization, the point at which a majority of tenants are start-up firms as opposed to previously existing small businesses, and the synergism that occurs when tenants develop trade relations with one another such as subcontracting and joint purchasing. Then, (Hackett & Dilts, 2004), said that tenant also gave more notation that in line with measures of the above aspects are also indicators of the incubator's level of development, as the sustainability and growth of the incubator, the scope, and effectiveness of incubator management policies, and the ability to provide comprehensive services. The degree of fit between the business incubation services offered by the incubator and the needs of the local market is another measure of incubator success. (McAdam & Marlow, 2007), suggests that if data is regularly collected and made available, an incubator could also measure its success in comparison to other incubators on a variety of operational and outcome measures and against a business incubator industry baseline.

The selection criteria into an incubator will majorly focus on start-up businesses that its developers believes to have high potential in that they: Have a product or service that is based on technological knowledge; Are likely to achieve significant growth in three years, in terms of sales and number of employees; and demonstrate considerable export potential. According to (Becker & Gassmann, 2006), for-profit business incubators look for innovative projects – either start-ups or spin-offs from existing companies – with a developed business plan and a potential for high growth. In addition, their fit with the corporate technology strategy is of the utmost importance for corporate incubators. University-based business incubators on the other hand, are primarily aimed at innovative, technology-oriented small and medium scale enterprises geared towards commercializing research and development

### **Industri 4.0**

According (Schwab, 2016) industry 4.0 is a term for the digital revolution in industrial production emerging from the comprehensive networking and computerization of all areas of production. Equipment, machinery, materials and end products apprehend environmental conditions and processing status via sensors, communicate with one another via embedded software and thus optimize the production process in an unprecedented manner. This enables companies not only to organize their production process more efficiently but also, for example, to manufacture customized products within the framework of and at the same cost as automated manufacturing. Entirely new business models can also emerge in this way, for example, based on the evaluation and utilization of masses of incoming data, for instance, from the provision of optimized maintenance services.

Then, (Schröder, 2016) completed that changes arising from the digital revolution in the production and value creation process are radical and pose a real challenge to enterprises. In order not to be left behind companies need to develop strategies in good time to exploit the new possibilities of digitalization, to improve established processes and develop new business models.

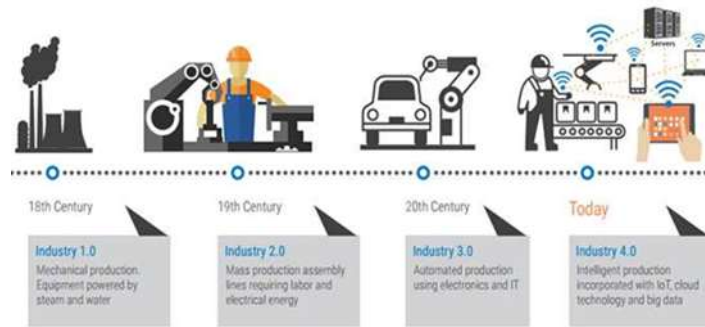


Figure 1, Industry Revolution 4.0 (www.kompassiana.com)

Those who persistently lag run the risk of premature demise. However, a good political, legal and infrastructural framework is also required to enable companies to rise to the challenge of Industry 4.0. While many large companies are already attempting to anticipate the potential and risks of digitalization for their respective business models and have introduced innovation processes, small and medium-sized enterprises appear to be making heavy weather of it. The reasons for this are manifold; they are partly internal, but they also arise – and this should give policymakers pause for thought – from the environment.

The 4th industrial revolution, which had begun in the 2000s, has made automation even further developed mainly in cyber-physical production systems. (Kinzel, 2016), explained industry characteristics 4.0 which is a combination of several developments in the latest technologies, namely: 1) Cyber-physical systems. 2) Information and communication technology. 3) Network communications. 4) Big data and cloud computing. 5) Enhancing the ability of equipment for human-computer interaction and cooperation. 6) Modeling, virtualization, and simulation. (Kagermann, Wahlster, & Helbig, 2013), explained those latest technologies, namely:

**Cyber-Physical System (CPS).** Improve the ability to control and monitor physical processes, with the help of sensors, intelligent robots, drones, 3D printers and so on. In cyber-physical systems, physical components such as 3D printers, drones and robots, and software components such as data analysis and sensor technology are all integrated into a network that interacts among its elements. At the time of initial input and final products that are usually in physical form, information is usually transferred between physical and digital conditions during the manufacturing process.

**Information and Communication Technology (ICT).** Based on empirical study, 80% of innovations in manufacturing are based on ICT. The digitalization and spread of ICT applications make it possible to integrate all systems throughout the supply and value chain so that they can aggregate data at all levels. All information is digitized and the suitability of the system within and between companies is integrated in each stage between the manufacture and use of the product life cycle (Kinzel, 2016). Smart product manufacturing will take on an additional role from its main purpose: as an information container that collects information along the supply chain and its life cycle;

as an agent; the product actively influences the environment, and as an observer; the product monitors itself and its environment (Kagermann et al., 2013) .

**Network Communications (NC).** All of this equipment, both at manufacturing plants, suppliers and distributors are all connected via internet and wireless technology (Kinzel, 2016). A high quality trusted communication network is the most important requirement for industry 4.0 and because of this it is very important to develop internet network infrastructure where needed (Kagermann *et al.*, 2013). A network with high internet capability can connect between these components so that they can decentralize and manage independently of the operation of cyber-physical systems (cyber-physical systems).

**Big Data and Cloud Computing (BD & CP).** With the use of big data and cloud computing, information captured through this network can be used to model, visualize and simulate its products and manufacturing processes. This model is referred to as digital twins (digital twins), or device shadows. Digital twins are computerized companions of physical assets capable of monitoring, diagnosing, and prognosis of assets directly (real time).

**Tools.** To exercise control over the process, human workplaces are supplied with ICT equipment designed to be used for developments in augmented reality and intelligent robots. The cyber physical system in Industry 4.0 has main objective to help people in their daily work. They include physical helper exoskeletons, context-adaptive systems for diagnosing errors, time-based planning and treatment systems, mobile, personalization, tutoring systems that are adaptive to situations, and others. The key features of all these supporting systems are non-intrusiveness, context adaptability, personalization, location-based and mobility. To ensure optimal and efficient use, these systems must be well designed, taking into account the possibility of being able to respond to speech, motion, eye tracking, body language, facial expressions, physical movements and graphic graphics (Kagermann *et al.*, 2013) .

**Network Communications (NC).** All of this equipment, both at manufacturing plants, suppliers and distributors are all connected via internet and wireless technology (Kinzel, 2016). A high quality trusted communication network is the most important requirement for industry 4.0 and because of this it is very important to develop internet network infrastructure where needed (Kagermann *et al.*, 2013). A network with high internet capability can connect between these components so that they can decentralize and manage independently of the operation of cyber-physical systems (cyber-physical systems).

**Big Data and Cloud Computing (BD & CP).** With the use of big data and cloud computing, information captured through this network can be used to model, visualize and simulate its products and manufacturing processes. This model is referred to as digital twins (digital twins), or device shadows. Digital twins are computerized companions of physical assets capable of monitoring, diagnosing, and prognosis of assets directly (real time).

**Improved Tools.** To exercise control over the process, human workplaces are supplied with ICT equipment designed to be used for developments in augmented reality and intelligent robots. The cyber physical system in Industry 4.0 has main objective to help people in their daily work. They include physical helper exoskeletons, context-adaptive systems for diagnosing errors, time-based planning and treatment systems, mobile, personalization, tutoring systems that are adaptive to situations, and others. The key features of all these supporting systems are non-intrusiveness, context adaptability, personalization, location-based and mobility. To ensure optimal and efficient use, these systems must be well designed, taking into account the possibility of being able to respond to speech, motion, eye

tracking, body language, facial expressions, physical movements and graphic graphics (Kagermann *et al.*, 2013).

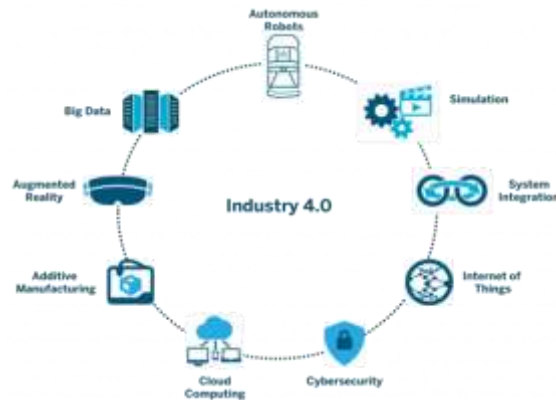


Figure 2, Industry 4.0 environment (Google images, 2019)

The McKinsey survey of March 2017 in (Irianto,2017) found that 300 prominent business leaders in Southeast Asia shows that 9 out of 10 respondents believe in the effectiveness of Industry 4.0. and almost no one doubts it. However, when asked if they are ready for the change, only 48 percent feel ready. This step towards Industry 4.0 will benefit the private sector. Large integrated producers will be able to optimize and simplify the supply chain. On the other hand, a digitally operated manufacturing system will also open up new market opportunities for SME technology providers such as sensors, robotic, 3D printing, or inter-machine communication technology. For developed countries, Industry 4.0 can be a way to regain infrastructure competitiveness.

For developing countries, Industry 4.0 can help simplify the production supply chain, which in this case is urgently needed to deal with rising labor costs. But (Irianto,2017), explained there are challenges that must be faced namely (1) industry readiness; (2) trusted workforce; (3) ease of socio-cultural regulation; and (4) diversification and job creation and industry opportunities 4.0 namely; (a) ecosystem innovation; (b) competitive industrial base; (c) investment in technology; and (d) integration of Small and Medium Enterprises (SMEs) and entrepreneurship.

### **Entrepreneurship 4.0**

In The Challenges of Industry 4.0 for Small and Medium-sized Enterprises, Industry 4.0 is a term for the so called “fourth industrial revolution (4.0)” and in essence means the technological integration of Cyber-Physical Systems (CPS) in the production process CPS enables (internet-based) networking with all participants in the value creation process.

Despite the enormous economic potential of Industry 4.0, SMEs in industry remain relatively cautious about it. For example, around 5 per cent of SMEs are thoroughly networked and a third of them are taking the first steps in that direction or at least have concrete plans to do so. The spread of Industry

4.0 depends on company size. The level of dissemination among large companies is higher and they are more likely to deploy the relevant Industry 4.0 technologies than small and medium-sized enterprises. The leading sectors concerning Industry 4.0 include manufacturers of rubber and plastics and machinery and plant engineering. About individual Industry 4.0 processes and technologies, however, it appears that across the board, regardless of company size and branch, little use is made of the evaluation of large data streams to optimize processes or for downstream services.

Accordingly, small and medium-sized companies often lack a comprehensive strategy. The integration of the data generated in the value creation process requires the networking of various IT systems both within and beyond the company. In this way functional areas such as procurement, production and sales can exchange their data in real time. It is not easy for small and medium-sized enterprises, due to lack of resources, to assess the technological maturity of the relevant solutions and their business uses. Management lacks a methodical approach to implementation. Thus four out of ten SMEs do not have a comprehensive Industry 4.0 strategy compared with two out of ten among large companies

The MBI 4.0 research, is a continuation of the research road map that has been carried out and is in line with UEU vision and mission as well as superior research on the development of the 2012-2018 business incubator model (Mudjiarto, 2018), namely New Entrepreneur Incubator ( INWUB, 2009/2010), Science and Technology for Entrepreneurship for Entrepreneurship (IbK, 2010/2011), Science and Technology for Entrepreneurship (IbK, 2011/2012), Affecting factors to the performance of SMEs, fostered partners of PT. Jasa Marga 2014/2015, The Influences of Development of Business Incubator Models Development on Tenant Performance Base on Self-Firm (2018/2019). The research on the Development of Business Incubator Based on BIM 4.0, aims to answer the challenges of industry 4.0, which has caused a shift in the human workforce towards digitization. This challenge needs to be answered by increasing alumni competence through mentoring (Sutrisno & Cokro, 2018).

## **2 Research Method**

To run this study a qualitative research strategy was adopted based on an approach that delves deeper into the study area by drawing data from people, organizations, and texts; settings, environments, objects, and artifacts; media products, events, happenings; and the researchers as the key instruments for conducting the research (Creswell, 2012). The research process involved both secondary and primary research techniques. The secondary approach focused on collection, sorting, and reviewing published documentation including peer reviewed journals downloaded from major online databases, technical reports sourced from the websites of international development agencies that promote incubation programs, and reviews of case studies from immediately relevant with emerging countries (Chandra & Fealey, 2009). The secondary data were used to identify the major themes that emerged from the area of study and to sort those themes into categories of relevance and priority for discussion and analysis of BI operations in this paper. The primary approach involved visits to the five major incubator facilities in UEU , in-depth face-to-face interviews with incubator managers using the comparative features identified from the research to guide open-ended discussions and develop a comparative matrix of the incubators.

The research method generated results and findings in three areas: insights and understandings of BI designs and operations from international experience of BI in relevant jurisdictions. The analyses

conducted and the authenticity of the results were enhanced by the incorporation of the knowledge and years experiences of first author (Mudjiarto, 2018) in the study, practice, and teaching of entrepreneurship and innovation; and the co-author's and correspondence author have a lot of experience as BI and lecturers as well as an edupreneurship mentor (Sutrisno & Cokro, 2018) This study was an attempt to generate BI development model alignment between incubator center and tenants. Observation showed that an incubator center with a high number of tenants frequently have difficulties in personal mentoring while an incubator center with a small number of tenants shows a low business impact within the surrounded area. Then offered an alignment model between incubator center and its tenants to maximize business capability and sustainability through the available resources.

### 3 Result and Discussion

#### Result

This section analyzes the data provided from 2009 up to 2018 that consists of 10 incubator firms which was tabled as figured of UEU 2009 up to 2014 was mostly as a tenant of UEU and the rest was in deep interview result of informants key. First, we describe the external networks of the start-ups that go beyond the incubator and stem from the tenants' "private" path-dependent trajectory of personal or professional relations. Then, we explain the internal networking within the incubator; finally, we focus on extended network resources facilitated by the incubator management. In the analyses, we emphasize the general experience of the start-ups, and we attempt to reveal their network opportunities both within and beyond the incubator.

**Table of UEU Tenant from 2009 up to 2014 (\*)**

No	Year	Program	Tenants (Students)	Tenants (SME's)	Tenants Total
1	2009	PMW, INWUB & Partners	15	30	45
2	2010	IbK & Partners	5	30	35
3	2011	GKN & Partners	7	30	37
4	2012	PMW & Partners	5	30	35
5	2013	PMW & Partners	12	30	51
6	2014	PKMK & Partners	21	30	51
<b>Total</b>			<b>45</b>	<b>180</b>	<b>365</b>

(\*) Sources: Primary data of UEU Incubator (Mudjiarto *et al* , 2018)

These results of in-depth interviews with key informants on the business incubators development in the period of 2009 to 2018, it was found that the partners experienced capital shortages, weak in terms of business management and business networks. This is link with the constraints of developing Higher Education business incubators mostly experienced, namely: (1) Network constraints; (2) marketing constraints (3) bureaucratic constraints (4) entrepreneurial mental constraints (5) legality

constraints. The technical form of training applied so far has only been carried out in a classical manner such as case studies, discussions, and simulations, such as 1) Initial guidance in the form of entrepreneurship motivation and the role of tertiary institutions in developing student business includes various aspects, including business motivation, capital, management, to marketing products and services; 2) Provisioning relates to how to start, develop and maintain a business in the case of SMEs 3) Provisioning of design, discussed about the role of product and graphic design in supporting business activities so that businesses can develop. Enlightenment was also given by professional business 4) Provision of multimedia material, explaining the opportunities and prospects of multimedia business and the use of multimedia for business development (Budianto, H, et al 2017). To accelerate BI development in the college, Indonesian tertiary institutions with BI based should move on and headed to industry 4.0 as well especially entrepreneurship 4.0 circumstances instead of staying alone in the classic BI development model.

### **Discussion**

(Satya, Venty Eka 2018), gave a dissemination that the Ministry of Industry had set four strategic steps in dealing with Industry 4.0. The steps that will be implemented are: First, to encourage the Indonesian workforce to continue improving their abilities and skills, especially in using internet technology or integrating internet capabilities with production lines in industry. Second, the use of digital technology to spur productivity and competitiveness for Small and Medium Industries (SMI) to be able to penetrate the export market through the E-smart SMI program. Third, the use of digital technology that is more optimal in national industries such as Big Data, Autonomous Robots, Cyber security, Cloud, and Augmented Reality. Fourth, encourage technological innovation through the development of start-up by facilitating business incubation so that more technology-based entrepreneurs in the Indonesia territory. In the forthcoming, Business Incubator (BI) development model should have a link and match with industry 4.0 wave, then would enable all tenants, even students as well as SME[s partners, to demonstrate: (1) Cyber-physical systems, as example, the activity of scanning (scans) physical components that produce digital model representations in accordance with the results of the scan. This digital data can then be converted to physical information again using a 3D printer. (2) Information and Communication Technology, for example, clothing items can monitor how long their obsolescence or tilts have often been washed, to be reported to the factory to produce replacements when needed. (3) Network Communications. All of this equipment, whether in manufacturing plants, suppliers and distributors, is all connected via the internet and wireless technology. (4) Big Data and Cloud Computing, with the use of big data and cloud computing, information captured through this network can be used to model, visualize and simulate its products and manufacturing processes. (5) Enhanced Equipment (Improved Tools), to control the process of the human workplace supplied by ICT equipment made for the development of augmented reality and intelligent robots. This system has the main goal to help humans in their daily work. The central aspect of Industry 4.0 is its interface with other smart infrastructures, such as smart building, smart home, smart logistics, mobility and networking, and connectivity to business and social web.



Figure 4, Fintech start up in Indonesia (google images, 2019)

Furthermore, the output of the above models would enable the beginner (new entrepreneur) familiar with entrepreneur 4.0 skill such as:

- 1) To connect their business with Indonesian Unicorn, such as *Bukalapak*, *Traveloka* *Tokopedia*, *Gojek*, and others.
- 2) Get used to e-commerce to run their business instead of a conventional one
- 3) Apply finance technology system to settle their transaction, such as using *Dana*, *Ovo*, *Gopay*, and others
- 4) Setting up a digital platform for small and medium industries (IKM) through e-Smart IKM to expand their markets.
- 5) Apply digital *fintech* to empower SME's business to go through all the business challenges.



Figure 3, SME's restaurant with digital *fintech* (google images, 2019)

## 4 Conclusion and Recommendation

### Conclusion

As evidenced in this study, it's acknowledged that the appliance of industry 4.0 has developed and growth significantly at all the word and influence business development especially the entrepreneurship atmosphere in Indonesia significantly. University-based business incubators have a positive role to educate and drill seriously to their students as a tenant in the incubator business program. To make the program running well all the materials which is trained should be link and match to follow a rapid business progress that signature with Industry 4.0, by creating an innovative model that can answer all of industry 4.0 challenges. Then, the new model proposed in this study is Business Incubator Model 4.0 (BIM 4,0) that will train and drill tenants concerning the ways how to run the model that will achieve the successful to be a new entrepreneur after graduation.

### Recommendation

Study recommends among others, that the government through the Ministry of Education, to set up more university-based business incubators given the positive potential effect they have on entrepreneurship growth. University-based business incubators should continuously enrich their selection criteria to attract and incubate only the very potential incubatee. The Student Entrepreneurship Development Program is a complete and structured student business development program so that a common understanding is needed between the program implementers and the stakeholders of PT (University). Further studies could be conducted on the role of selection criteria into other kinds of business incubators –those not based in universities-on entrepreneurship growth.

### Acknowledgment

We wish to acknowledge the contribution made by Mr. Dr. Arief Kusuma Among Praja, MBA , Rector of UEU, Indonesia, for his inputs during the development of this manuscript. His contribution is highly relevant given his practical experience with the BIM 4.0 of BI program and process in UEU, is highly appreciated.

### References

- [1] Bathula H, Karia M, Abbot, M. University Based on Incubators. *The Role of University-Based Incubators in Emerging Economies*, No. 22. (2011).
- [2] Becker, B., & Gassmann, O. Corporate incubators: Industrial R&D and what universities can learn from them. *Journal of Technology Transfer*, 31(4), 469–483. [https://doi.org/10.1007/s10961-006-0008-6\(2006\)](https://doi.org/10.1007/s10961-006-0008-6(2006)).
- [3] Bergek, A., & Norrman, C. Linköping University Post Print Incubator best practice : A framework Incubator best practise. *Technovation*, 28(1–2), 20–28. Retrieved from [http://www.elsevier.com/\(2008\)](http://www.elsevier.com/(2008)).
- [4] Budianto, H. Kewirausahaan Dalam Bentuk Di Perguruan Tinggi Bagi Mahasiswa Pemilik Usaha Pemula Unmer Malang (2017)

- [5] C., A., & S. Carvalho, M. F. Incubation of New Ideas: Extending Incubation Models to Less-Favored Regions. *Entrepreneurship - Creativity and Innovative Business Models*, (February 2012). <https://doi.org/10.5772/36705> (2012).
- [6] Chandra, A., & Fealey, T. Business incubation in the united states, china and brazil: A comparison of role of government, incubator funding and financial services. *International Journal of Entrepreneurship* (2009).
- [7] Creswell, J. W. *Research design : qualitative, quantitative, and mixed methods approaches* (4th ed.). United States of America Library: SAGE Publications, Inc. All(2012).
- [8] Hackett, S. M., & Dilts, D. M. A Systematic Review of Business Incubation Research. *The Journal of Technology Transfer*. <https://doi.org/10.1023/b:jott.0000011181.11952.0f>
- [9] Harper-Anderson, E., & Lewis, D. A. What Makes Business Incubation Work? Measuring the Influence of Incubator Quality and Regional Capacity on Incubator Outcomes. *Economic Development Quarterly* (2004). <https://doi.org/10.1177/0891242417741961>(2018).
- [10] Hausberg, J. P., & Korreck, S. Business incubators and accelerators: a co-citation analysis-based, systematic literature review. *Journal of Technology Transfer*, 1–26. [https://doi.org/10.1007/s10961-018-9651-\(2018\)](https://doi.org/10.1007/s10961-018-9651-(2018)).
- [11] Irianto, D. (2017). Industry 4.0 The Challenges of Tomorrow. In N. T. editor S. T. I. (Ed.), *Seminar Nasional Teknik Industri 2017 – Batu-Malang* (pp. 9–11). Retrieved from <https://cyberleninka.ru/article/n/komponenty-ponyatiya-industry-4-0> (дата обращения: 18.06.2019). КиберЛенинка: <https://cyberleninka.ru/article/n/komponenty-ponyatiya-industry-4-0%00> (2017)
- [12] Kagermann, H., Wahlster, W., & Helbig, J. Umsetzungsempfehlungen für das Zukunftsprojekt Industrie 4.0 (in German). In *Forschungsunion Wirtschaft und Wissenschaft* (2013).
- [13] Kinzel, H. Industry 4 . 0 – Where does this leave the Human Factor ? *27th Annual Conference of Human Dignity and Humiliation Studies*(2016).
- [14] Lesáková, L. The role of business incubators in supporting the SME start-up. *Acta Polytechnica Hungarica*, 9(3), 85–95 (2012).
- [15] McAdam, M., & Marlow, S. Building futures or stealing secrets?: Entrepreneurial cooperation and conflict within business incubators. *International Small Business Journal*. <https://doi.org/10.1177/0266242607078563>(2007).
- [16] Mudjiarto, W. *The Influence of the Development of Entrepreneurship Training Model on Tenant Performance through Resilient and Independent Assessments (case study of partnerships)*. 298–327 (2018).
- [17] Njau, J. M., Wachira, D. A. W., & Mwenda, D. L. K. M. Effect of Access To Networks Support Provided By Business Incubators on Technology Based New Venture Creation in Kenya. *International Journal of Entrepreneurship and Project Management* (2019).
- [18] Phan, P. H., Siegel, D. S., & Wright, M. Science parks and incubators: Observations, synthesis and future research. *Journal of Business Venturing*, 20(2), 165–182. <https://doi.org/10.1016/j.jbusvent.2003.12.001>(2005).
- [19] Satya, V. E. Strategi Indonesia Menghadapi Industri 4.0. *Kajian Singkat Terhadap Isu Aktual Dan Strategis Strategi Indonesia Menghadapi Industri 4.0* (2018). .
- [20] Schröder, C. The Challenges of Industry 4.0 for Small and Medium-sized Enterprises a good society – social democracy # 2017 plus. *The Friedrich-Ebert-Stiftung*, 28 (2016).
- [21] Schwab, K. *The Fourth Industrial Revolution*. Switzerland (2016).

- [22] Sutrisno, W., & Cokro, S.. The impact of Edupreneurship and Mentoring Analysis on Competency Stimulation of University Graduation . *Research and Development Journal Of Education*, 5(1), 114–124 (2018).
- [23] Todorovic, Z. W., & Moenter, K, Tenant firm progression within an incubator: Progression toward an optimal point of resource utilization. *Academy of Entrepreneurship Journal* (2010).