Training and development of Internet of Things creative industry entrepreneurship models for UPI students

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Abstract. Today the development of electronic technology has reached the generation of the Internet of Things. IoT is a collection of objects (things), in the form of a physical device (hardware) that is able to exchange information between sources of information. The development of creative industries through IoT is expected to be a solution to keep entrepreneurship among students who will contribute to economic development. This Entrepreneurship PKM Activity was attended by 35 students from various study programs in the environment of DPTE FPTK UPI, and they followed this activity carefully starting from the stages of preparation, implementation, apprenticeship to the partner industry until the evaluation stage. Various innovative creations that combine technology with IoT utilization have been generated from the results of training activities, including, Smart Home, Automatic Glass Mixer With Blynk, Smart Building and Motor Controller. It is finding the future challenges and the existence of these business opportunities and as an effort to develop entrepreneurship in the field of information technology, especially those based on creative industries through the use of the Internet of Things for UPI students, this PKM activity is one means to realize economic growth both locally, regionally and internationally.

1. Introduction
The development of the business world and industry with the globalization of the economy has increased sharply. The various products produced are required to be able to meet the needs and desires of consumers. Economic globalization and the information era encourage industries to use human resources of university graduates who are competent and have entrepreneurial spirit. However, it is not every college graduate to have the entrepreneurial spirit as desired by the job. The fact shows that only a small proportion of college graduates have entrepreneurial spirit. On the other hand, the economic crisis caused the number of jobs not to grow, and even decreased due to bankruptcy. In this condition, graduates are required not only to be able to act as job seekers but also to be able to act as creators of work. Both require an entrepreneurial spirit. Therefore, so that universities are able to meet these demands, many types of innovations are needed learning innovation in building the generation of technopreneurship in the current information age [1].

Creative economy including the fourth group economy, Alvin Toffler called the first group of the economy based on the agricultural sector, the second wave economy in the industrial sector, and the third wave economy in the information sector. In Indonesia, creative economy has a role in national economic development even though it has not been touched by government interference. According to data from the Creative Economy Study Team, the creative industry in the Information Technology subsector in 2014 had an added value of subsector (ADHB) of Rp. 8.610 Billion or an average of 0.11%
contributed by the Subsector to Total GDP (ADHB) during 2010-2015. However for the Labour Participation Rate to Employment of the Creative Economy sector is 0.58% during 2010-2013. Furthermore, this sector has a 67.888 workforce subsector with an average national employment growth rate of 0.06% in 2013 [2].

The Indonesian government especially the Indonesian Ministry of Commerce is closer to the classification used by Howkins [3]. This time it has successfully mapped 14 creative industry sectors including: (1) advertising, (2) architecture, (3) art and antiques markets, (4) crafts, (5) design, (6) fashion, (7) videos , film, and photography, (8) interactive games, (9) music, (10) performing arts, (11) publishing and printing, (12) computer and software services, (13) television and radio, and (14) research and development.

Business creativity and innovation have been something to be considered and these can be obtained from experience after interacting with consumers about the product and the quality of the product itself. Every product or service produced will be a higher quality if it always learned from the symptoms of the needs and desires of increasingly critical and educated consumers [4]. Therefore, innovation needs to develop by an environment that encourages capacity increasing and regional capacity to create a creative economy. In this case, innovation means something new for the recipient, that is the community concerned. Economic progress is related to the level of development of technical change which means the stage of mastery of technology. Technical change is mostly tacit or not codified and built on experience. It is also cumulative. The timing of technology mastery depends on the industry sector (sector specific) and the accumulation process attends a particular trajectory that is unique [5].

In last 10 years, the development of information technology, especially in terms of software, has been very fast. This is indicated by the emergence of various devices that already support computing with all its features. One of them is mobile computing devices through smartphones, smartphone users in Indonesia are predicted to reach up to 82 million in 2014 [6]. The development of this sophisticated technology must also be supported by the latest operating systems. One of them is the Android operating system. In 2012, Android users in Indonesia increased by 22%. Devices based on the Android operating system (OS), are now starting to emerge and are increasingly diverse on the market, this is because Android is an open platform, so it can be run on various mobile devices & Internet devices (MID). Furthermore, Android has several advantages including the many vendors that adopt the Android operating system on their devices, operating systems that are open source, there are application market. Another advantage is the ease, interactivity and user experience that is presented by Android through its application, one of which is the type of game. As we know, the majority of children love games. Based on data from Appbrain, the total of games on Google Play is 59.283, Game Casual 51.458, Arcade Games 4.283, Game Action 17.853, Game Educational 14.180, Game Adventure 10.018 [7]. Today the development of electronic technology has reached the generation of the Internet of Things. Internet of Things (IoT) is a collection of things, in the form of physical devices (hardware / embedded systems) that are able to exchange information between information sources, service operators or other devices that are connected to the system so as to provide greater benefits. Embedded systems in the Internet of Things infrastructure are embedded hardware with electronics, software, sensors and connectivity. Embedded system devices compute data processing from sensor inputs and operate in the internet infrastructure. According to research results from Juniper Research there are three times the growth of IoT devices between 2016 to 2021. According to the results of this study, the estimated number of IoT equipment connected to the internet is that devices, sensors and actuators have reached more than 46 billion until 2021 [8].

Building an Internet of Things system requires components, that was device connection and data sensing [9]. Not only components to build IoT systems the ability to communicate between systems is also needed in IoT. It aims to save and do data analytics from Data Sensing acquisition obtained, a database server is used. The last component is the use of communication that is carried out continuously between device connections with data sensing that is able to receive and perform analysis data and is used to help humans in certain cases.
Considering that the future threats and the existence of these business opportunities and as an effort to develop entrepreneurship in the field of information technology, especially those based on creative industries through the use of the Internet of Things software for UPI students, This entrepreneurship PKM activity can be a solution to the growth of young entrepreneurs from among students who is a major role in increasing economic growth at the local, regional and international scale.

2. Methods
Sustainable development is a way to create sustainability (sustainability) into a form of advantage. In this regard, Barney and Clark propose the VRIO model (Value, awareness, imperfect imitability, and organization) [10]. According to him, Sustainable Competitive Advantage can be obtained by carrying out a continuous discovery process that will continue to innovation. This process will run well if it first builds core organizational competencies, namely resources and capabilities. Business development that relies on the potential of nature, culture, and daily life of the community is a very close part in developing a sustainable business. UPI as a tertiary institution has organized various entrepreneurship programs as an effort to increase the independence of its students so that after graduating they are not job seekers but can open jobs. The coaching method compiled here tries to synergize several existing coaching methods at the University.

Society Dedication Activities in the creative industries with the use of the internet of things were carried out at the FPTK UPI Campus, exactly at Industrial Electronics Laboratory of DPTE FPTK UPI, which is located in the 5th floor FPTK UPI Building. This activity is held for 8 months, starting from the preparation stage, Stages of Training and Stages of Evaluation and Monitoring

In the other hand, Entrepreneurship Student Creativity Program also carried out guidance continuously with various needs studies on what training is needed by students to become entrepreneurs in the field of industry based on software technology. Then a simulation is carried out in the form of a business ideas competition. This competition aims to increase student creativity in exploring creative and innovative ideas that provide solutions to problems that take advantage of the advantages of information technology. Furthermore, training and coaching process are carried out. For producing entrepreneurs, a phased approach can stimulate entrepreneurial mentality among students, namely as follows:

- **Stages of First Mentoring.** It aims so that students understand in depth business processes, from the ability to identify and present business opportunities to superior value added, how those added values are transformed in the form of products or services, and can be consumed by the target customers. Analytical skills and creativity are honed in this intervention process. This stage is what we call an understanding of entrepreneurial process.

- **Stages of Second Mentoring,** It is intended that students learn how an entrepreneur runs his business starting with creating a business plan to convince third parties to fund their business, have a commitment to what you want to achieve in the future to always look for ways to achieve that goal make a partnership with a third party or sell part or all of the ownership of the business. Through this simulation, students are expected to feel the bitterness and sweetness of being an entrepreneur.

- **Stages of Third Mentoring,** It is to feel being an entrepreneur. Begin to determine added value through market research, translate added value into product concepts and business concepts, then they are asked to maximize entrepreneurial capital such as group competency, access to funding, and social capital, including the immediate family, relatives, friends, and parents, lecturers and others so that the risk of failure when launching a business can be minimized.

- **Stages of Fourth Mentoring,** It is the process of strengthening business and future business development plans. For long-term goals, the sustainability of the development program is proposed to form an innovation house as one way to develop technology entrepreneur’s products and services in the creative industry in the field of internet of things.
3. Results and discussion
Entrepreneurship activities and training in the IT field that utilize the Internet of Things (IoT) for students can run smoothly and in accordance with planned targets and indicators. This can be seen from the sincerity and discipline of the participant who did their utmost to develop the training material provided. Generally, the training and results or products of the training activities on the Internet of Things fabrication were held by trainees for 5 meetings and guided by PKMK Lecturers and Training Instructors who were experienced in their respective fields.

The results of the development and internet of things fabrication in various fields that have been done by trainees include several works that have been produced and implemented including:

- Domotic/ Smart Home
- Automatic Glass Mixer With Blynk
- Smart Building
- Controller Motor

Figure 1. PKM program activities methods.

Figure 2. Smart home with IoT display.
Figure 3. Automatic Glass Mixer Blynk with IoT and smart building with IoT display.

Figure 4. Motor controller with IoT display.

4. Conclusion
Based on the implementation of entrepreneurship-based Community Service Activities related to the use of the internet of things (IoT) results, there are several conclusions that can be obtained, among others:

- The development of entrepreneurship in the creative industry software field with the use of IoT software for learning can run smoothly and successfully, this can be seen from the enthusiasm of the participants in participating in the workshop and achievements produced by participants who have high innovation and creativity.

- Based on student profiles from observations and mentoring during activities results, around 80% of UPI entrepreneurial students, especially DPTE FPTK UPI students with various types of businesses, have utilized and used information and communication technology advantages, especially in developing the internet of things as a way to develop their innovations in various fields of life.

- The creative industry entrepreneurship guidance model in the field of IoT software that has been compiled is based on the needs of entrepreneurs among students, field observations, results of comparative studies and internships in partner industries that have developed and applied a variety of developing software technologies.

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