



Research Article

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The Synergy between Academic Support, Government Regulation, Business Sector, and Civil Society to Enhancing Innovation Ecosystem Indonesian SMEs

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Abstract

The aims of this research is to empirically testing the role of quadruple helix, consisting of government, academic, business sector, and civil society on developing Small Medium Industry (SMEs) through developing innovation ecosystem. This qualitative study employs a case study design. The samples are small industry in Kudus Regency, Indonesia. The result of this study shows that implementing quadruple helix's role may present innovation to solve some problems in small industry. This role implementation depicts the existence of innovation ecosystem in attempt to develop small industry. This study recommends the necessity to improve synergy and collaboration between of government regulation, academic support, business sector, and civil society through intense communication.

Keywords: *Small Industry, Quadruple Helix's Role, Innovation Ecosystem*

1. Introduction

This research focuses on the descriptive analysis on various parties roles in driving the economy of an area. The said parties include government, university, industry player and civil society, which are frequently referred to as the quadruple helix. The concept of quadruple helix starts from the concept of triple helix which explains that innovation and creativity, in development of a business, may be formed from collaboration and synergy of 3 main economic actors roles: government, university and business player. However, this concept is perceived insufficient to form an innovation ecosystem, especially for small industry (Liljemark, 2004), while the real driver of economic growth is creative city, and creative cities are mostly driven by small industries (Afonso, Monteiro, & Thompson, 2010).

Other actors are needed to connect the roles or to cover the gap between the three actors roles so that the benefits of these roles' implementation reach the smallest industry's line. Civil society is the fourth actor capable of being the triple helix connector. Below are some reasons to extend the innovation system by inserting civil society to be the fourth helix (Lindberg, Lindgren, & Packendorff, 2010): 1) the existing triple helix group is built only to develop big industry with high technology, instead of small industry, 2) small industry does not have the required resources and competence to start innovation collaboration, 3) small industry holds important growth and potential changes in the society, 4) this is very important since marginalized businesses do not only attempt to develop their business, but focus their existence more on survival. It is explained that quadruple helix's activities are instilled in regional actors' local network through civil society's involvement in innovation ecosystem, and are an extensive mixture of some roles in attempt to produce the best outcome (Ahonen & Hämäläinen, 2012).

The purpose of quadruple helix is to develop an area through innovation ecosystem (Ahonen & Hämäläinen, 2012). Moreover, it is explained that the reason behind the creation of innovation ecosystem is the traditional innovation system's incapability of encountering global challenges (Yawson, 2009). This occurs with most SMEs with low competitiveness in encountering global challenges. It is likely that these MSMEs encounter global challenges by themselves, making them encouraged to make innovation and the concept of quadruple helix exists to fill the vacancy of traditional innovation by MSMEs through creation of innovation ecosystem (Reynolds, 2015). Innovation ecosystem is defined as collaboration between business players and some partners with their respective roles for coherence and providing solution to dealing with consumer needs (Adner, 2006).

This study is conducted with embroidery SMEs in Kudus. Kudus is renowned for its embroidery as its local potential of creative economy. Kudus's typical embroidery is known as Bordir Icik. There is even a cluster of embroidery center and convections in Kudus acclaimed as a Tourism Village. In contrary, however, to the enhancement of MSMEs in Kudus, Small embroidery industry, particularly Bordir Icik Industry, has their number and assets declined. According to the craftsmen, many embroidery craftsmen have changed their business to other business sectors, such as convection.

This research aims at empirically testing the role of quadruple helix, consisting of government, academic, business player, and civil society, in developing small industry through developing innovation ecosystem. This qualitative study employs a case study design. The samples are small industry players in Kudus Regency, Indonesia.

2. Literature Review

2.1 *Quadruple Helix Innovation Theory*

Quadruple helix is a development of the Triple Helix Innovation Theory by involving civil society in the network, on the reason that the three actors are insufficient to support long-term innovation (Government, Academic and Business Player). The concept of quadruple helix involves civil society to participate in innovation development by emphasizing society's culture (Liljemark, 2004). This fourth helix is associated with media, creative industry, culture, value, lifestyle, art and idea of creative classes (Carayannis, Barth, & Campbel, 2012).

Innovation itself is a product of social process existing in an organization (Jaw, Chen, & Chen, 2012). This social process is interaction of quadruple helix actors' roles. Open innovation is a new paradigm based on quadruple helix, in which government, industry, academic and society participate in cooperation to realize future and structural changes far from the scope of an organization in case it works alone (Godardd, 2013).

Quadruple Helix Innovation Theory (QHIT) states that the economic structure of a state depends on 4 pillars: Academic, Business Player, Government, and Civil Society, and economic growth is generated from clustering of productive and talented people (Afonso, Monteiro, &

Thompson, 2010). Academic and business player mutually make technology innovation to generate an integrated innovation ecosystem capable of enhancing any kind of creativity. Government provides fund support and implementing policy of such innovation activities. Civil society plays a role to enhance their competence through innovation ecosystem generated. Quadruple helix refers to potential benefit of an innovation ecosystem formed from pluralism and diversity of knowledge of four actors which drive the economy (Carayannis & Campbell, 2009). Moreover, it is explained that one strategy of small business to have competitive advantage is to implement the quadruple helix model, in which the model is a collaboration of synergy of four actors, which are government, business player, university and creative civil society, which serve to drive innovation and creativity to grow (Ratnamurni, 2015).

2.2 *Quadruple Helix Model*

Quadruple Helix is a business innovation development model through the 4 main pillars' roles. These roles include 1) University's role in supporting research, knowledge and advanced technology, 2) Industry Player's role in developing their product, developing network and joining dialog forums to improve their skill, 3) Government's role in giving support of marketing, involving entrepreneurs in developing public sector and offering various dialog forums, 4) Civil Society's role in building community and facilitating the availability of information with regard to business development (Arnkil, Järvensivu, Koski, & Piirainen, 2010).

Quadruple helix is synergy and collaboration of roles between the four economic actors. The role of the four actors is respectively: Academic or University is built to develop community through transfer of science, Government focuses on the development of community's resources by giving added value to the product using academic's knowledge, and industry player supplies the need for raw material from civil society and serves in enhancing its business competence in the market (Tekasakul, 2013). Quadruple helix brings perspective to knowledgeable society or community (Dubina, Carayannis, & Campbell, 2012).

In line with previous question, the quadruple helix model is a conceptual framework of collaboration. Each actor has role and identity, in which university serves as researcher, government serve as policy maker, business player serves as producer, and civil society serve to close the gap and as connector between the three previous helices (Hudani & Dhewanto, 2015)

Academic (university), one actor of quadruple helix, has its own reason to get involved in an industry. Academic's involvement is related to research and science sharing. Academic's motivation for getting involved in research is divided into two: intrinsic and extrinsic motivations. Intrinsic motivation means academic's encouragement in conducting research related to business or commercialization, while extrinsic motivation explains that science must be separated from trade (commercialization) research (Lam, 2010). Extrinsic motivation emphasizes more on reputation reward instead of financial reward. Some problems in a business arise when it is to encounter seeking for new technology, knowledge or skills in business development. This is where university or academic's role to transfer technology, knowledge and skill lies (Gunn & Twynmore, 2015).

2.3 *Innovation Ecosystem*

Innovation ecosystem is defined as collaboration between business players and some partners with their respective roles for coherence and providing solution to dealing with consumers' needs (Adner, 2006). Moreover, Adner (2006) explains that the base expectation behind the idea of building innovation ecosystem is to extend one actor's capability beyond its capability limit and generate innovation through collaboration with other actors. Innovation ecosystem is an environment where innovation grows and develops through interaction of actors involved in such ecosystem development. Innovation ecosystem may be defined as an innovation community consisting of organizations or people with shared purpose and using specific innovation (Wang, 2009). Innovation

itself may be new idea, correction or solution implemented for useful outcome (Bessant & Tidd, 2011).

3. Method

The qualitative approach with a case study design is employed to explain how quadruple helix plays its role in support of small embroidery industry growth in Padurenan Village, Kudus. The case study design may be employed to reveal and analyze a case thoroughly (Chariri, 2009). The single case analyzed is how quadruple helix plays its role in support of small embroidery industry growth. The research design used is as follows:

The respondents are selected based on the concept of quadruple helix, consisting of government, academic, small industry player and community of such industry. The respondents are taken by a purposive sampling, in which informants are they capable of giving information pursuant to the research's purpose. Government is represented by the Industry, Cooperative and Micro, Small and Medium-Scale Business Service Office and the Government of Padurenan Village, Kudus, Academic is represented by university in cooperation with Kudus Regency Administration and researchers related to the research topic, Business player consists of small embroidery industry players in Padurenan Village, and community is represented by Cooperative Padurenan Jaya. The informants' names in this research are not actual names and organizations' acronyms do not reflect actual acronyms.

The data are collected based on triangulation of data generated from three methods: interview, participant observation and document records. Triangulation is a procedure used to enhance the reliability and validity of information presentation (Creswell, 2009).

4. Results and Discussion

4.1 Characteristics of Kudus Embroidery Industry

Kudus Regency consists of 9 subdistricts: Bae, Dawe, Kaliwungu, City, Jati, Mejobo, Jekulo, Gebog, and Undaan. There are about 11,118 small and medium businesses in Kudus. Besides its renowned name as *kretek* city, Kudus is also renowned for its embroidery. Gebog Subdistrict has the second highest number of small and medium industries with convection and embroidery industrial centers, to be exact in Padurenan Village. From the business population of Padurenan Village, there are about 61% units of convection business, 25% units of embroidery business, 11% units of food and drink business, and 3% units of miscellaneous business (furniture, leather craft, printing, and pottery).

This embroidery industry is a home based business. An embroidery craftsman's house does not only serve as dwelling, but also as a workplace. The majority of people open simple showroom which is part of their house. The worker of such industry is surrounding people. Since the workers are surrounding people and the majorities are housewives, embroidery works are frequently brought home to be worked on while taking care of household chores.

Kudus embroidery has been a hereditary business since 1970. Kudus typical embroidery is called Bordir Icik. Bordir Icik is produced with manual sewing machine. Compared to machine based or computerized embroidery, bordir icik has its uniqueness and advantage which make this product more expensive. The advantage of Bordir Icik includes, among others, more careful process, stronger, smooth, hardly damaged, complicated motif and many color combinations. Bordir Icik product needs to be preserved as a typical product of Kudus Regency. Most of embroidery craftsmen in Padurenan Village are 40 years old and above. The local youth lack of interest in embroidery industry.

The investment value of an embroidery business unit ranges from Rp 30.000.000. - Rp 500.000.000. Its marketing includes Kudus, Solo, Surabaya, Bali and Lombok. The embroidery products include *kebaya*, Islamic clothing, *kerudung*, tablecloth, pillow case, etc. Processing Bordir Icik takes 2 weeks to months. The price of Bordir Icik varies from three hundred thousand to millions Rupiahs depending on the complexity level and materials used.

4.2 Embroidery Industry Problems

Kudus's typical Bordir Icik is local asset which is getting rare, in which the craftsmen state that embroidery sale, particularly Bordir Icik, is weakening. Kudus Embroidery starts to be replaced by Chinese computerized embroidery with many motif variations and models at lower price. The problem in developing Bordir Icik in Kudus includes production matters related to raised price of raw material, like silk fabric from Rp125,000 to Rp180,000. Good quality silk fabric is now sold for higher than Rp300,000. Yarn price also raises from Rp250 per unit to Rp1,000.

From the perspective of human resource, the constraint faced is worker availability, in which it is difficult to have worker for Bordir Icik processing. The long duration of Bordir Icik processing requires patience and prevents the youth's interest in preserving Bordir Icik. The workers are mostly old who lack of enthusiasm to take skill training, while the youth mostly prefer to be workers of garment factory and cable factory in Mayong, Jepara. The embroidering learning culture after school is hardly found now in Padurenan, Kudus.

From the perspective of marketing, there is nonconformity of market segment to product. Most of Bordir Icik products are sold in traditional markets. With good quality, finer, strong and more expensive characteristics, Bordir Icik is more suitable for middle to upper segment, but it is marketed in traditional markets which target lower middle class. Lower middle consumers lack attention to quality, while they desire cheap product with many models. This is the reason Bordir Icik gets replaced. Most of consumers in traditional market are more interested in Chinese embroidery with its rich variations and lower price. Bordir Icik products are more suitable for modern markets. However, the craftsmen find it difficult that they do not have the network to access the modern market.

Limited capital and practicability make embroidery craftsmen open perfunctory and inadequate showroom at home as their promotional site. That they rely on consumers who come by, they cooperate with collectors to develop their marketing. This cooperation makes the craftsmen's bargaining power in determining the selling price get weakened and the collectors gain higher profit than the craftsmen.

4.3 Quadruple Helix's Role

4.3.1 Government's Role

The actual driver of economic growth is creative city and clustering of productive and talented people (Afonso, Monteiro, & Thompson, 2010). In line with this statement, in 2009 with the OVOP (one village one product) program and in cooperation with the Bank Indonesia Office (KBI) Semarang, Bank Jateng, the Provincial Office of Manpower Productivity Development of Central Java, consultant institution *Swisscontact*, and PT Pertamina, the Government of Kudus Regency has stipulated Padurenan as a convection and embroidery cluster.

The government plays a role in giving marketing support (Arnkil, Järvensivu, Koski, & Piirainen, 2010). The marketing support given by the government includes making Padurenan a Tourism Village. As a Tourism Village, the Government includes Padurenan Village into Kudus tourism map. The travel route will include Padurenan Village when tourists visit the Menara Mosque complex, the Tomb of Sunan Kudus, and the Tomb and Mosque of Sunan Muria complex. This is to introduce Padurenan's potentials to tourists and attract them to buy the various products manufactured by local people, particularly embroidery and convection crafts. This attempt may liven up the business climate in Padurenan Village and serve as an effective promotional medium to market the products.

Currently, another facility required to support Padurenan as a tourism village is tourism terminal, which is still prepared by the Government. In this terminal, there will be kiosks where Padurenan's typical embroidery products are sold. This terminal is supposed to be a transit for tourism vehicles, but the construction is currently uncompleted and seems to be stalled. The constraints in funding and other facilities like representative road are the reason the construction is

not completed yet.

In operating its role to open dialog forums as an effort of skill enhancement (Arnkil, Järvensivu, Koski, & Piirainen, 2010), the Government has formed Padurenan Jaya Cooperative for small industry players in the area. Besides cooperative, the Government also establishes village library as part of a program to enhance the competitiveness of small industry in Padurenan.

4.3.2 Business sector Role

As the subject of small industry, business players' activeness and creativity are highly required to develop their business. This conforms to the idea of Arnkil et al. (2010) that business player's role is to develop product, develop network and join dialog forums to enhance their skill. As an effort to develop product, embroidery is currently not only applied to kebaya, but also to a range of items, such as tissue holder, hijab, tablecloth, tablemat, wallet, pencil holder, etc. The skill of developing embroidery products is acquired from trainings held by either the government or academic.

Besides, some craftsmen also make innovation in their marketing system. They have opened showrooms at home or sold their products in traditional market all the time. Some embroidery craftsmen think that the market is not created only in traditional market or merely by waiting for consumers to come by, but there are other potential places to work on to maintain the business. The concerned potential places are schools and institutions. In cooperation with salesmen, the embroidery craftsmen engage schools and institution that will to be supplied with embroidered uniforms/attributes. One of the craftsmen even has cooperated with 75 schools from Rembang, Kudus, Sulawesi and Kalimantan.

Other embroidery craftsmen also make marketing innovation. The concept of market carried by these embroidery craftsmen is embroidery house. This embroidery house has showroom to display their embroidery products, and a separate building for production process. Embroidery house offers embroidery shopping tourism, so that when tourists visit the embroidery house, besides shopping in a convenient place, they may also directly observe embroidering process and learn embroidering.

The other role played by the small embroidery industry players is to form community and join the Multi-Purpose Cooperative "Padurenan Jaya". Based on the data of Cooperative Padurenan Jaya, there are currently 30 embroidery entrepreneurs registered as its members, five of which are bordir icik entrepreneurs. The benefits the cooperative members acquire include facilitation of working capital, obtaining raw material at affordable price, obtaining facilities for discussion, comparative study, consultation, etc.

4.3.3 Academic's Role

University is a partner in the research to analyze the market changing tendency and for new technology inventions. It serves to be a partner in transfer of knowledge and technology to develop the industry (Gunn & Twynmore, 2015). University or academic plays a role of intermediary institution (Landabaso, 2012), which is to mediate the government's limitedness in case of expert, or any parties whose fund is to be distributed to small industry players. In addition, it is stated that university holds the role of pure coaching pattern in developing small businesses as part of one of the Three Pillars of Higher Education, which is to serve the society. Pure coaching pattern means a coaching pattern which has no direct correlation, which is business relationship, between the coach and business partner (Kuncoro, 2009).

The realization of role between Padurenan embroidery creative industry and university is to develop the marketing system, which is online marketing through website. The website made by the academic with a concept of shared marketing is quite helpful to the craftsmen to access wider market. Previously, the website is managed by the embroidery community cooperative, which is KSU "Padurenan Jaya". The constraint in synergizing the academic's role is the limited human resources for website management. That the management is not good, the online marketing facility is not used.

Besides, the academic plays a role in education. Many researches in Indonesia, particularly in Central Java take Padurenan embroidery as their research object. However, according to the craftsmen, the researches' benefit and contribution to the craftsmen are perceived unclear.

The other role of academic in transfer of knowledge is through outreach and skill trainings in support of the craftsmen's business. The trainings given include design making training, marketing training, financial training, etc. Based on the small industry players' response, the embroidery craftsmen or other business players in Padurenan prefer outreach programs and trainings performed by some universities to their research. The reason is that training and outreach are deemed more applicative in support of their business. This conforms to the statement of Gunn & Twynmore (2015) that research results have indeed been released, but companies, particularly small companies, have no access to such journals or publications, and most of the articles are not actually read by small business players.

4.3.4 Civil Society's Role

Civil Society in this case is association of convection and embroidery craftsmen integrated in a cooperative as the medium. The cooperative "Padurenan Jaya" is a Multi-Purpose Cooperative which plays a role as the management of convection and embroidery cluster in the area. The Cooperative Padurenan Jaya is established in 2009 with its main business of saving and loan, trade (raw materials and supporting materials), and embroidery service. KSU Padurenan Jaya has 5 divisions, which are 1) marketing division (display of cooperative, outlet/shop, cooperation with external parties, bazaar & showroom), 2) procurement division (raw materials and supporting materials), 3) saving and loan division, 4) service division and 5) development & training division (development of product design, public relation, and training for members). The development and training division cooperates with universities (academics) by facilitating its members in case of training, comparative study, member discussion, etc. This cooperative serves as a medium to distribute the roles of the other helices like government, academic and the business player itself. Therefore, any donation from the other helices will not directly be received by the craftsmen, but will pass the KSU "Padurenan Jaya". This conforms to the opinion of Hudani & Dhewanto (2015) that civil society serves to be the cover of gap or as connector with the other three helices' roles.

The purpose of cooperative formation is to realize Diamond Cluster of Embroidery and Convection in Productive Village of Padurenan Jaya. The KSU Padurenan has realized its purpose of forming joint supply of raw materials and supporting materials for the cluster through the fund from Bank Jateng managed by the cooperative, thus the cooperative members can easily obtain supporting materials at affordable price. Non-member villagers are also allowed to gain benefits from the cooperative's facilities such as buying raw materials or renting embroidery equipment.

KSU Padurenan Jaya as an implementation medium of cluster management should still synergize with the Government. The continuous synergy with the Government to realize Padurenan as a Tourism Village in integration with Religious Tourism in Kudus is made in the form of provision of village's facilities and infrastructure, tourism map, sale center/kiosks through conversion of village land, parking area, toilet, reuse of online marketing, etc.

In addition, the Cooperative is in partnership with PT Telkom to build a Digital Village of SMEs (*Kampung UKM Digital*) as an effort to revive the online marketing. The concept of Digital Village of SMEs is to utilize information and communication technology together with SME players in a comprehensive and integrated manner in support of business process (Prahadi, 2015). The Digital Village of SMEs helps business player market their products through online marketing by utilizing applications in Telkom such as BosToko, blanja.com, www.smartbisnis.co.id, and jarvis-store. The cooperative also serves as a source of data and an information center of embroidery industry for academics in relation to research.

Managing the role of quadruple helix requires an organization to lead the quadruple helix structure. This organization should be independent, non-profit, and able to manage funds from the

government and private sector for business development (Delman & Madsen, 2007). This has been formed in Padurenan Village through the community of craftsmen who join the Cooperative Padurenan Jaya above. The cooperative has managed the fund for its members derived from the Government or from other sectors.

4.4 Innovation Ecosystem

According to the discussion, it is clear that the innovation ecosystem arising from respective role of the quadruple helix consists of

1. Government with its policy
 - Serves as driver of creative city with OVOP clustering program (embroidery and convection center)
 - Provides marketing support with development of Tourism Village
 - Creates dialog forums through formation of Cooperative Padurenan Jaya
2. Business Player
 - Develops product
 - Develops network
 - Joins dialog forums to enhance their skill
3. Academic
 - Partner in research
 - Intermediary Institution between Government and Business Player
4. Civil Society through Cooperative
 - Covers the gap or connects with the other three helices' roles: intermediary to distribute the role of other helices, such as government, academic and business player

Therefore, the innovation ecosystem of interaction between the actors may be illustrated as follows.

The innovation ecosystem of Padurenan embroidery and convection center consists of the government, academic, cooperative and business player. Mutually supporting systems in the ecosystem will bring innovation which leads to enhancement of business player's competitiveness. The reflection of the ecosystem conforms to the opinion that one strategy of small industry to acquire competitive advantage is to implement the quadruple helix model, in which the model is collaboration and synergy of four actors, namely government, business, university and creative civil society, which serve as the driver of innovation and creativity growth (Ratnamurni, 2015). A combination of perspective wider than the quadruple helix emphasizes on an innovation ecosystem which generates cooperation in evolution of knowledge and innovation through pluralism of actor diversity (Carayannis & Campbell, 2012). Innovation ecosystem success requires varied partners like collaboration between university, business player and government (Rohrbeck, Hölze, & Gemünden, 2009).

According to the overview of innovation ecosystem of embroidery and convection center, cooperative plays a central role as the cover of role gap between helices. Consequently, in correction of the innovation ecosystem, it will be more meaningful through improvement of institutional quality of existing cooperative as recipient and distributor of role of the other helices. In line with the statement, Sarjito (Embroidery Business Player, Cooperative Member) argues that:

If our cooperative is big and developing, we will find it easier to obtain fund and promote our products. That our cooperative is our center of business development, raw materials are from the cooperative, the fund is from the cooperative, marketing or exhibition events are also through the cooperative.

Mujiatno (Administrator of Cooperative Padurenan) expresses his view that:

Cooperative is the one to support financing and marketing of embroidery SMEs' products since it is the

only institution easily accessed by the craftsmen here.

Besides focusing on enhancing cooperative's institutional quality, the serious and basic problem in developing the innovation ecosystem is the intensity of interaction and quality of communication between quadruple helix. Rian (Academic, SM University) explains in his opinion:

There are so many researches and massive research activities of which output cannot be directly utilized by business players. The reason is incompatibility of science and technology generated with what is needed by business players.

Panggah (Government of Kudus City) adds:

Appropriate policy and regulation in various sectors which may directly influence actors' performance and their interactions are highly needed for the success of innovation ecosystem. Therefore, the government always attempts to collaborate with the other parties in quadruple helix, since the success of innovation ecosystem is the result of interaction between the actors.

Innovation cannot occur in a vacuum, but innovation may develop with interaction between actors and supporting condition in an innovation ecosystem instead. The supporting factors in innovation ecosystem are clustering and keeping of further communication (Mercan & Göktaş, 2011).

Furthermore, Innovation Ecosystem is an environment where an innovation system grows and develops. Hidayat (Academic, MK University) expresses his opinion:

As an integrated system, in case an actor's role ceases, the other ecosystem life will be disrupted, thus interaction and communication are absolutely required to build synergy. Not only strengthening each institution, but enhancing the intensity of interaction and communication is more crucial.

With more intense interaction and communication, the flow of information of business players' needs will be clearly unraveled, thus the use of science and technology as external element of the innovation ecosystem becomes relevant and more oriented in real needs. Communication constraints need to be solved in such a system, considering that innovation ecosystem consists of actors with different purposes, expectations and behaviors (Durst & Poutanen, 2013).

The foundation to build the embroidery and convection innovation ecosystem is preservation of culture, tradition and high values of the nation in order to be preserved and to become advantageous sector in economy. This conforms to the statement of Ahonen & Hämäläinen (2012) that quadruple helix's activities are instilled in regional actors' local network formed from socio-cultural factors to explain the formation or development of an area by involving civil society in the innovation ecosystem and constitute a mixture of some roles attempting to generate the best outcome. Therefore, interaction between actors should always lead to preservation of culture which becomes the characteristic of local advantage and wisdom.

Meanwhile, factors which determine the success of innovation ecosystem are resource, governance, strategy and leadership, culture, human resource management, society, partner, technology and clustering (Durst & Poutanen, 2013). In relation to this, Hidayat (Academic, MK University) argues:

Besides requiring communication and interaction of actors involved in ecosystem, the success of innovation ecosystem requires qualified partner, skilled worker, supporting government policy and regulation, and abundant raw materials.

As a system, this innovation ecosystem will encounter environmental changes. Therefore, this system cannot stop with giving solution to only one problem, but this system is expected to continuously develop and encounter opportunities and threats arising from environmental changes through actors' collaboration and synergy.

5. Conclusion

Quadruple helix has implemented its roles in building innovation to develop embroidery industry in Kudus. Some roles have successfully solved existing problems in embroidery industry in Kudus. The quadruple helix's roles have indirectly, successfully formed an innovation ecosystem. Encountering the environmental changes of ecosystem, a role should develop to provide solution to any new arising problems. If one role of the actor ceases, the other ecosystem will be disrupted. Therefore, this role implementation needs a mapping of implementation of synergy and collaboration of role for the actors, thus there will be no overlapping implementations. Clear tasks and intense communication between quadruple helix actors will strengthen collaboration and synergy. Incomplete role implementation will result in new problems in developing a business, thus it needs an indicator capable of assessing how successful the roles implementation is.

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