

# An agent based model of Creative Social Entrepreneurship Behaviour in the context of creative economy

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## An agent based model of Creative Social Entrepreneurship Behaviour in the context of creative economy

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### Abstract

This paper presents an agent-based model that illustrates creative-social entrepreneurial behaviour and its impact on socio-economic development and local resources sustainability. This study conducted an agent-based model simulation test to demonstrate the potential of the model developed through a literature review. The model approach assumes the interactions between agents are influenced by three purposes, which are profit entrepreneur, social entrepreneur and hybrid entrepreneur. The process is captured from the ability of entrepreneurial creativity in exploiting and conserving local resources. The results show the success of a dynamic model in integrating characteristics and creative-social entrepreneurial behaviour. The final model used as a reference to validate the impact and the relationship of creative-social entrepreneurial action on the socio-economic development and sustainability of a region's local resources.

Keywords—Creative-social Entrepreneurship, Agent Based Model, Hybrid Entrepreneurs, Socio-Economic Development Local Resources Sustainability

### Abstrak

Makalah ini menyajikan model berbasis agen yang menggambarkan perilaku wirausaha kreatif-sosial serta dampaknya terhadap pembangunan sosial-ekonomi dan keberlangsungan sumber daya lokal suatu daerah. Penelitian ini melakukan tes simulasi model berbasis agen untuk menggambarkan potensi dari model yang dikembangkan melalui kajian literatur. Pendekatan model mengasumsikan pergerakan antar agen dipengaruhi oleh tiga tujuan dasar yang dimiliki oleh entrepreneur yaitu ekonomi, sosial dan hybrid. Tinjauan proses dilihat dari kemampuan kreativitas wirausaha dalam melakukan eksploitasi dan pelestarian sumber daya lokal yang dimiliki suatu daerah. Hasil penelitian memperlihatkan keberhasilan model yang dinamis dalam mengintegrasikan antara karakteristik dan perilaku wirausaha kreatif-sosial. Model akhir dari penelitian ini juga digunakan sebagai acuan untuk memvalidasi dampak dan pengaruh hubungan perilaku wirausaha kreatif-sosial terhadap pengembangan sosial ekonomi dan keberlangsungan sumber daya lokal suatu daerah.

Kata kunci—wirausaha kreatif-sosial, agent-based model, hybrid entrepreneurs, pembangunan sosial-ekonomi, keberlangsungan sumber daya lokal

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## I. BACKGROUND

The creative economy is driven by three resources, namely the number of innovative human resources, abundant renewable natural resources and unique and diverse sources of cultural heritage. All three are the driving forces for sustainable creative economic growth (OPUS-BEKRAF, 2017). Creative human resources in this research is a person that used creativity to create changes in society. Mirzanti, Simatupang, & Larso (2015) states that "entrepreneurship is an important breakthrough in the development of the creative economy so that it can have a major impact on the economic quality of a country". Most of the entrepreneur literature agreed that the concept of entrepreneurship is a process of generating ideas and creations then manifested in the form of economic activity. An entrepreneur requires the motivation to move it to be active in carrying out an innovation related to create a business and make a profit (Pratoom & Savatsomboon 2012). Drucker (2014) also explains entrepreneurship definition as "nature, character, and characteristics inherent in someone who has a strong will to realize innovative ideas into the real world of business and can develop them strongly". While, other perspectives believe entrepreneurship plays an essential role in the development of social mission in creating changes, in a new term called as social innovation (Bornstein & Davis, 2010; Sen, 2007; Mulyaningsih & Dhewanto, 2013). Therefore, entrepreneurial behaviour is related to the activities driven by the characteristic of the values and needs that motivate entrepreneur to participate.

This study used data from previous research to do the simulation with an agent-based model. Most study related to entrepreneurial behaviour used the theoretical concept of "Theory of Planned Behaviour" based on Ajzen (1985;1991). There are several models of entrepreneurship behaviours towards socio-economic growth for examples Zahra (1993) that focusing entrepreneurship on firm behaviour, Bujor & Avasilcai focusing on creative entrepreneur behaviour. Previous research focusing on social entrepreneurship behaviour (Abu-Saifan,2012; Mulyaningsih & Dhewanto, 2013; Abdou & El-Ebrashi, 2015). Therefore, this research used the resources-based theory as a concept to build the model (Alvarez & Busenitz, 2001). This research tries to develop a model of entrepreneurship behaviour to fill the gap between creative and social entrepreneurship behaviour by Wells (2016). We believe that local resources need to sustain and renewable to create economic values. Therefore, this research aims to test the creative-social entrepreneurship behavioural model by simulating the interaction between variables treated as an agent. We use Agent-Based Model to test the model. We analyze the model by testing the correlation between variables such as entrepreneur characteristic, local resource/environment on entrepreneurial behaviour and socio-economic development. The finding of this study offers contributions on enlarging theoretical and practical perspectives related to inclusive entrepreneurship concept.

## II. LITERATURE REVIEW

### A. *Creative-Social Entrepreneurship*

Entrepreneurship is not only about designing business plans and establishing new businesses but also about how to be creative and innovative to support economic growth and sustain the environment (Wennekers & Thurik, 1999; Carree & Thurik, 2010; Mulyaningsih & Dhewanto, 2013). Entrepreneurship is a science that examines the spirit of creativity and courage to take a risk to realize the ideas (Bujor & Avasilcai, 2014). Previous literature from Wells (2016) studied about creative-social entrepreneurship axiology. Jaleesa Wells (2015) defines creative social enterprise as organizations concerned with the beneficial effects of enterprise intentions on creative and social activities (the hybrid values). Her research synthesized creative-social enterprise (CSE) values based on the intersection between the theories of creative entrepreneurship and social entrepreneurship.

### B. *Entrepreneurial Characteristics and Behaviour*

Entrepreneurial behaviour process carried out by a person to obtain a change in new behaviour, as a result of his own experience in interaction with his environment (Wulleman & Hudon, 2016; Permatasari & Agustina, 2018). Local resources, including the heritage, not only need to exploit but also need to sustain. This research model also adopts the model of entrepreneurship behaviour impact on economic growth in the multi-level analysis (Wennekers & Thurik, 1999). This research assumes that the characteristics of creativity and social mission or called empathy are essential characteristics that need to be the attributes of creative-social entrepreneurship.

The character of the creative-social entrepreneur is influenced by values of creative social entrepreneurship such as creative, social and enterprise (Wells, 2016). Entrepreneurship value is often used on defining entrepreneurial intention and the opportunity search. The results show that the characters can be determined as an innovator, initiative taker, leader and risk-taker. The results are still related to the Littunen (2000) found that “the characteristic of an entrepreneur is the good nose of business, the desire to take a risk, the ability to identify business opportunities, the ability to correct errors effectively and ability to grasp profitable opportunities”. Bornstein & Davis (2010) define a social entrepreneur as a person who understands social problems and uses the ability of entrepreneurship to make social change. Social value on action process of exploitation, the opportunity shows that empowerment as the primary key of the characteristic (Kraus, 2017).

In contrast, creative values are dominant in the decision to exploit the opportunity. Creativity process will contribute to innovation by creating new ideas in developing business (Amabile, 2012). Therefore, creativity values are used by the entrepreneur in managing the resources and delivered social change in their entrepreneurial activity.

### C. Socio-Economic Development

Socio-economic development is the process that involved local governments and communities in encouraging and triggering business activities to create jobs. Socio-economic development is known as the impact of implementation on the economic conditions in the rural area (Athiyaman et al., 2007). While, according to World Bank Group (2016), socio-economic development is a process whereby development actors, working collectively with partners from the public, private and non-government sectors, to create changes and better conditions for economic growth and employment opportunities. Economic development focus on how local government and community-based groups manage existing resources and enter into the arrangement to create new jobs and stimulate local economic activities (Gawlik, 2015; Kania, 2020). The main characteristic of resources focuses on using the potential of local human, institutional and physical resources. While Baierl et al. (2014) define social changes occur in humans and society caused by development activities are referred to as social impacts. The social effects that arise are caused by activities such as programs, projects or policies that are applied to the community (Gawlik, 2015). Based on those previous facts, we develop a model of creative-social entrepreneurship behaviour to test by an agent-based model (Figure 1).

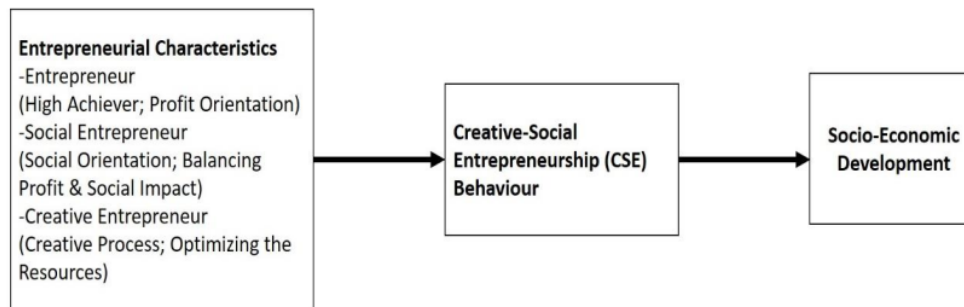


Figure 1. Creative Social Entrepreneurship Behaviour Value Framework (Permatasari et al., 2020)

### D. Agent-Based Modeling

Agent-Based Modelling (ABM) define as a computational model for simulating the interaction between the actors (individual, organizational or the elements of the system). ABM is one of the approaches to do simulation modelling. Model is a representation of an object or actual situation (Bonabeau, 2002). The model shows direct and indirect relationships and reciprocal links in terms of cause and effect. At the same time, simulation is a reliable analysis tool for planning, designing, and controlling complex system processes (Wilensky & Rand, 2015). Simulation models can help describe the situation that occurs when a decision is applied. Therefore, ABM has the advantage to be applied to systems composed of different individuals who interact with one another (North & Macal, 2007). In social research, Agent-based Modelling also used for experiments by looking at the bottom-up approach of how the interaction of individual behaviours can influence system behaviour.

### III. RESEARCH METHOD

This research method in this study used an Agent-Based Model (ABM). ABM is a computer-based simulation to model all behaviours of entities (agents) involved in the real world in the hope that interactions between entities can produce or illustrate critical traits that can be used again as tools for explanation or prediction in making decisions in the real world (North, & Macal, 2007; Ramadhan et al., 2013). The ABM approach uses the following steps (1) Model Design: Identifying agents and behavioural theories of agents, identify relationships between agents and look for views about interactions between agents, looking for data needs between related agents. (2) Validate the agent behaviour model. This part shows in model explanation. (3) Run the model and analyze the output of the model that has been made. This method was chosen based on benchmarking research such as resources common pool sustainability by Schill et al. (2016), creativity in context of rural development (Malik et al., 2015) and entrepreneurship behaviour by Alvarez & Busenitz (2001) and Audretsch & Keilbach (2004). The ABM, tools of analysis used for this research using the net logo (Wilensky & Rand, 2015).

#### A. Model Design

The components model is shown in Table 1. There are three types of agents; the first is an entrepreneur that has strong to exploit local resources to gain profit. The second is a social entrepreneur that has an orientation to balance the profit and social values in their activities. The third is a creative-social entrepreneur that focuses on sustaining resources and exploiting the values (social, economic, enterprise). The other inputs that use as characteristics of CSE (agent controls) are creativity and empathy. The interaction process between the agents categorize into three factors, which are environment, activities (exploit and sustain) and behavioural controls the number of local resources and year of exploitation (thick). The outputs from the model show the process results which are determined from CSE growth, wealth rates and the number of local resources.

Table 1. The components of CSE Behaviour Model

INPUTS	PROCESS	OUTPUTS
<b>Type of Agents</b> Creative Entrepreneur (profit orientation) Social Entrepreneur (social orientation) Creative-Social Entrepreneur (hybrid)	<b>Environment</b> The availability of Local Resources Access & Infrastructure  <b>CSE Behaviour</b> To Produce → Exploit/Explore  To Share → Sustain	<b>Socio-economic Development</b> Entrepreneur Growth rates Wealth rates (GINI Index) Strengthening local resources
<b>Agent Controls</b> Empathy Creativity	<b>Behavioural Controls</b> Qty-Local Resources Year-exploit/explore	

#### A.1 Agents

An agent is a component in the system that has the status of attributes, behaviour, and can make decisions (Wilensky & Rand, 2015). There are three types of agents shown in the net logo as a "person":

- 1) *Agent, a person-> Entrepreneur, demonstrated with the colour yellow.*  
 Entrepreneur character is a person with high achiever in creating profit. This character of entrepreneurs has an intention to exploit the resources with a high level of creativity and less empathy.
- 2) *Agent b person-> Social Entrepreneur showed with the colour blue.*

Social Entrepreneur is a person that has a character of creating social values, focusing on balancing equal life of society (social welfare) and solving the social problems. The profile also has an intention in creating economic values (profit). This character of entrepreneurs has a purpose balancing the resources with a high level of empathy but a lower level of creativity.

- 3) *Agent b person-> Creative Social Entrepreneur (CSE) shown with colour green*  
 Creative social Entrepreneur (CSE) is a person that has a character of creating social values and economic values also sustaining the resources. The resources can be visually seen as local resources of natural resources, heritage etc. The difference with other is CSE used their creativity to renewable the resources with valued-added creation (sustain and regrowth).

The simulation setup agents:

1. Three hundred (300) of entrepreneur that has high achiever on profit with characteristic level of creativity seven (7) and level of empathy one (1).
2. Fifty (50) social entrepreneur that have characteristic social changes with the level of creativity two (2) and level of empathy six (6).
3. 10 CSE that have characteristic creative and social changes with the level of creativity two (2) and level of empathy (six) 6.

A.2 Interaction

The interaction between the agents is visual the behaviour between the type of agents (agent to agent) and agent to the environment (local resources). The interaction of agents caused the changes in behaviour from entrepreneur profit or social entrepreneur to be CSE. The action is controlled by year of exploit.

A.3 User interface

Figure 2 shows the CSE model user interface for the simulation.

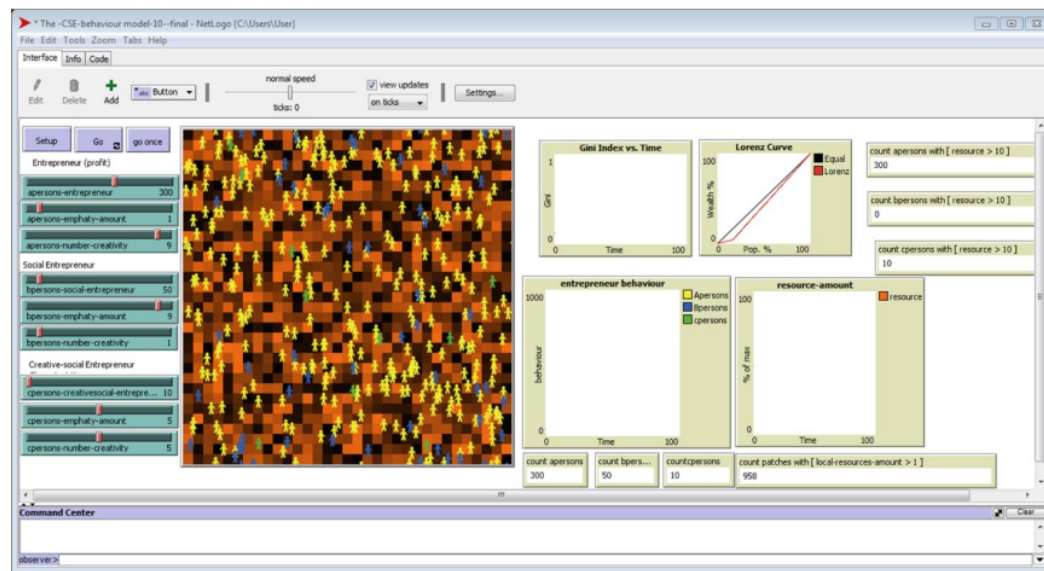


Figure 2. CSE Model User Interface

A.4 Environment

The environment is related to local resources' availability, access and infrastructure. The local resources are a patch with a colour of orange. The environment changes caused by the interaction behaviour or activities between agents such as exploitation and sustainability. Interaction between agents and environment is controlled by the number of local resources and the year of exploitation. The environment changes will show in the graph (Figure 2) which are local resources (growth), the increasing number of entrepreneurial behaviour and GINI index (equality of welfare) and Lorenz curve.

A.5 Flow chart

Figure 3 shows the flow chart that develops in the simulation. First, we set up the environment into local resources, characteristics and GINI Index. Second, set up three types of agents. The process continues with two major activities, such as exploit and sustain. The role of exploit means that the model will increase the frequencies of local resource exploitation and decrease the number of local resources. In contrast, the part of the sustained process will raise the local resources and balance the frequencies of exploitation. The output of the resources will impact behavioural changes that show in the output monitors.

IV. RESULTS AND ANALYSIS

A. Model Explanation

The function of the model can be classified into three categories, namely descriptive, predictive, normative/perspective models (Ragsdale, 2010). In this research, the model is designed to describe creative-social entrepreneurial behaviour in the context of the creative economy. All of the agents will interact with each other and influence each other to changes becoming creative-social entrepreneurship. Each of the entrepreneurs also interacts with local resources. The model assumes that the characteristics of CSE social consist of creative and entrepreneurial values (Wells, 2016). The characteristic will influence agent towards creative entrepreneurial behaviour. The behaviour of CSE will drive socio-economic growth. We assume that the characteristic of creativity will stimulate innovation and create changes. Entrepreneur as an agent will become more productive and innovate. The other character, empathy, we expect it will drive the entrepreneur to keep the sustainability of local resources.

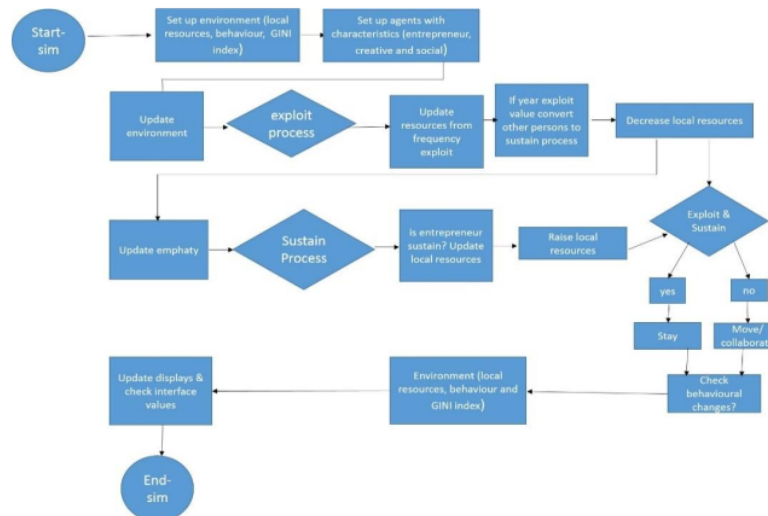


Figure 3. CSE Model User Interface

*B. Model result and analysis*

During the simulation, we change the control variable of empathy and creativity to verify the different type of agents range between 1-10. For an entrepreneur, we choose level 1 for empathy and 9 for creativity. At the same time, it becomes the opposite for creativity elements. We were also set the number of environment control, such as the number of local resources, the procedures of exploitation and sustainability. The results show that creativity is a fundamental rule on innovation. This study focuses on the creative process that leads creative-social entrepreneur in producing social innovation. The social innovation will strengthen the concept of a creative-social entrepreneurship behaviour model. We verified the model based on the literature review regarding entrepreneurship behaviour and simulated five-time and have the same results (Figure 4).

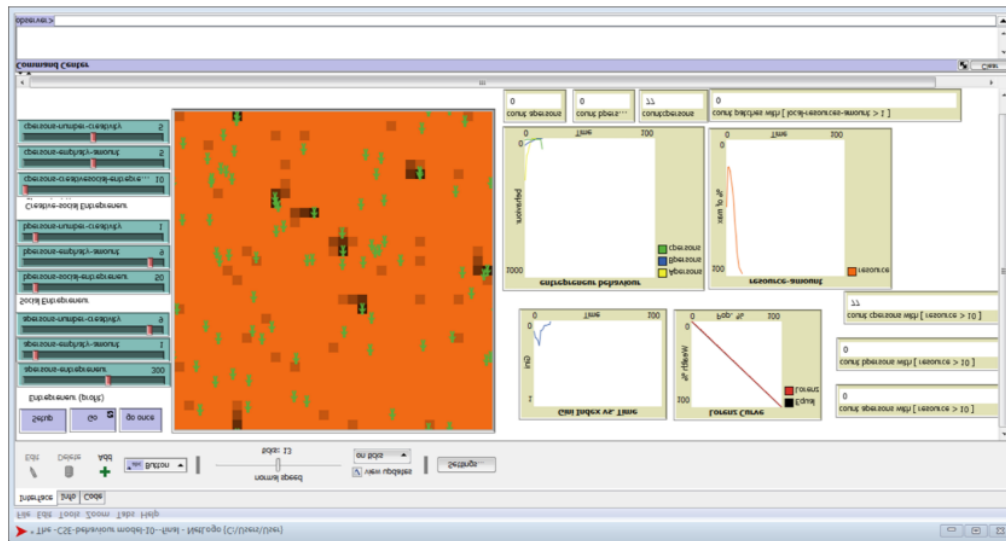


Figure 4. Research Model User Interface

The results show that the characteristic of CSE consists of creative, social and enterprise values. Those values transform to an element of creativity and empathy as an indicator. The simulation results show that CSE behaviour influence another entrepreneur to follow the activities of CSE or they die (Figure 5). The differences in creativity and empathy level pushed CSE to become innovator by creating another local resource.

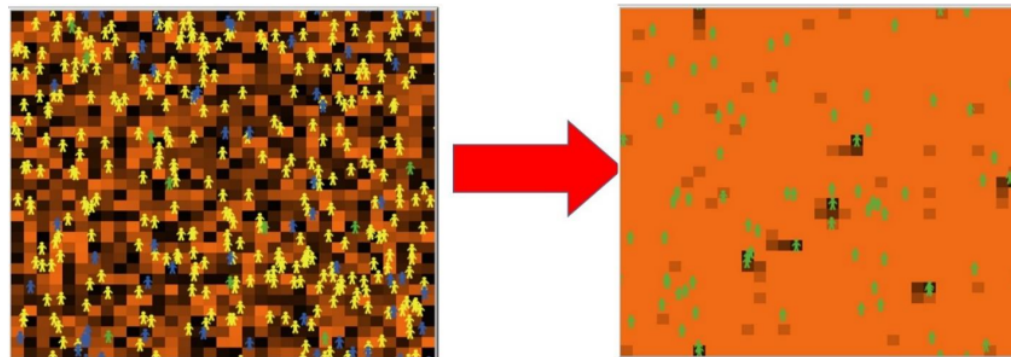


Figure 5. The Results of CSE Behaviour (Simulation)



As we can see in Figure 6, they have two option “if the resources already limit” so the other type of entrepreneur (blue and yellow) simulated die or transform to CSE. The interaction between agents proved to increase the number of entrepreneurs behaviour. The simulation shows in the between thick 11-13, or it can simulate as years (1 thick=1 year). There are still few entrepreneurs of creative-social entrepreneur that sustain the resources (more than 30). They lived and kept sustaining the resources. The results of the environment as an output can be seen in Figure 6. The results show that inequality of wealth can be achieved if the number of CSE high or low. In this case, the results show that the behaviour of CSE proven to strengthen local resources. The model of creative-social entrepreneurship behaviour is proven to have an impact on socio-economic development.



Figure 6. Research Model User Interface

### C. Discussion and Implication

Models and simulations of social-creative entrepreneurial behaviour identified by each agent are believed to have a real impact on socio-economic development in the system. However, the simulation results are only able to show the potential effects of each different entrepreneurial character. The social-creative entrepreneurial behaviour model in this study only includes the factors which are considered to have the most significant influence on socio-economic impacts; namely the difference in character/orientation, the number of entrepreneurs and the number of local resources available. The parameter values listed in the table are not real values but are only indications to see the direction of value change (Pablo-Martí et al., 2013). Based on the ABM simulation results, there are significant differences in the parameters between the scenarios. All the characteristics have not the same goals on balancing economic and social values. Social entrepreneur characteristic focus on pursuing social values (Bornstein & Davis, 2010). While most of the entrepreneurs concerned on profit. Even though the behaviour of CSE will produce social value, sustain the resources and create economic values. Social entrepreneurship characteristic is connected to the elements of creativity. Amabile (2011) stated which creative thinking skill to solve the problems. Creativity as abilities to develop new ideas on problem-solving and transform it into opportunity. According to Drucker (2014), creativity on entrepreneurship is abilities to combine new things and see the connection between elements. The other characteristic of entrepreneurs, including initiative, assertiveness, social orientation, commitment to communities. Therefore, the goals of CSE more concerned about balancing economic and social values (hybrid) (Wells, 2016; Permatasari et al., 2019).

This study found that three characteristic agents will influence entrepreneurial behaviour to support socio-economic development in the local area. The three characters correlate with one another and are systemic. This condition has implications on local resources sustainability (Wulleman & Hudon, 2016). However, among these three characters, the creative-social entrepreneur is considered the most potential to increase socio-economic impact (Athiyaman et al., 2007). Creative-social entrepreneur (CSE) commitment to used local resources is an advantage. Creative-social entrepreneur characteristic supports the statement “dominant economic values need

not necessarily exclude social or other values. But the realities of the competitive market economy seem to require tolerance of these values” (Timmons, 1978). It also becomes a vital factor to determine creative-social entrepreneur based on three values such as social, creative and enterprise (Wells, 2016). Therefore, the existence of creative-social entrepreneurial behaviour will significantly determine the behaviour of other entrepreneurs, and its presence will increase the social-economic impact on the local area.

#### V. CONCLUSION AND RECOMMENDATIONS

The analysis shows the model can produce simulation outputs for the impact on socio-economic development. Creativity and empathy are the characteristics of an entrepreneur that related to the behaviour of a creative social entrepreneur. From the simulation creative-social entrepreneurship of the term of creativity and empathy proven to be critical value as indicators that make characteristics of CSE were the difference. Even though the analysis using an agent-based model is a computational model, but the simulation can give new insight into the multi-level analysis. The finding shows creative-social entrepreneurial behaviour has a significant role in supporting socio-economic development in the local area. However, this research only showed a small part of the ability of agent-based modelling in illustrating the relationship of entrepreneurial characteristics on entrepreneurial behaviour and its impact on socio-economic development. The accuracy of the model output is still in the annual range. The model needs to develop and validating with the evidence. In future research, we will continue to do a qualitative study to explore other attributes of entrepreneurship as new variables. Through this modelling, the results will help academician and policymaker to test a social-creative entrepreneurial behaviour model design before applying it to the real world. For further research, it is hoped that agent-based modelling can be used to design the model that exploit creative-social entrepreneurs.

# An agent based model of Creative Social Entrepreneurship Behaviour in the context of creative economy

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