

## Designing The Concept of Innovation Profiling with Case Study

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### Abstract

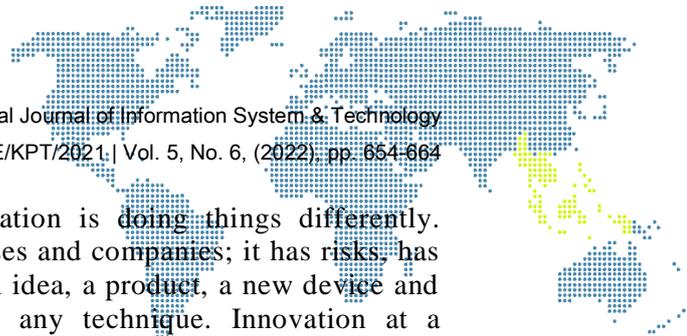
*Innovation is very important in developing a smart city. Therefore, Innovation must be flexible to be applied when developing an area. We must not look only at one side in developing Innovation; Innovation must be broader than it should be and can provide significant changes in others' lives. This article is a long-term process, where this is gradual research, starting from a concept that will then be continued on a prototype and an application to measure a smart city's performance. The main problem is that there are still gaps and difficulties in understanding and implementing innovations. A definite basic concept is needed to execute Innovation right on target. In this article, the method used is from previous research, some formula from smart city 5.0. Moreover, this article's results are the basic concepts of Innovation, formulas, four basic types of Innovation, and seven types of innovation profiling: the innovation profiling framework. We have explained this research roadmap so that readers will know and understand the research process we are doing. It is very important because producing something must have a strong concept. What is produced can be more structured, systematic and on target in its application, especially smart city profiling.*

**Keywords:** Innovation, Profiling, Smart City, Future, Concepts

### 1. Introduction

Innovation is a word that contains the nature of deep conceptual thinking, a change in the form of something or a thing, a solution to problems and opinions that can have a big impact on the community. Furthermore, Innovation undergoes a significant change in nature and form in a certain period. People start to create product/service innovations to cope with their situations. Is it a necessity for everyday life? The tools to make a process more efficient and a concept to be tested, whether the concept can have added value that can be used or understand knowledge deeper and high quality. In Innovation, three dimensions must be understood: (1) very in-depth thinking for analysis, (2) being open-minded to something so that information can be processed into something new, (3) asking if you do not understand what you see or read is not make our perceptions based on what see or read because we do not necessarily know and understand everything. These three dimensions form an innovation that can provide solutions if applied simultaneously rather than separately; therefore, someone who understands the meaning of Innovation must see and understand what "needs" to be heard and not what "wants" to see and understand.

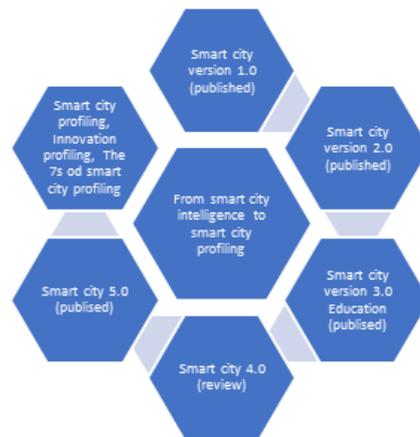
Several articles and experts say Innovation is an important thing to do if you want to change the future. It can cite as follows: (1) Teresa Graziano (2021): "Technology development can be considered a comprehensive strategy[1], (2) Skirmantė Mozūriūnaitė (2020): "Smart city elements and indicators must be manageable with complex and integrated solutions"[2], (3) Anneli Stenberg (2016): "The key to innovation development must involve three important things, namely science, cost and technology. Innovation comes from the Latin "Innovare, which



means" to be new ". The definition of Innovation is doing things differently. Furthermore, Innovation is often used in businesses and companies; it has risks, has a long time, and costs a lot. Innovation can be an idea, a product, a new device and technology; we think beyond the present and any technique. Innovation at a fundamental level is the result of combining ideas to provide solutions for the future"[3], (4) Dr Mita Mehta (2014): "Innovation is a process to determine organizational welfare"[4], (5) Harry Boer (2001): "The main activities in innovation are formulating goals, designing, organizing processes, monitoring process progress, adjusting goals"[5], (6) Pedro López-Rubio (2020): "Innovation and science are in two areas of research that interconnected with spatial economics and economic geography. Regional science focuses on human activities, dimensions, and coordination and is only implicitly devoted to studying Innovation.

On the other hand, innovation system research studies economic actors who contribute to the innovation process"[6], (7) Tor Helge Aas (2016):" Linear innovation processes are formulation, planning and control, while non-linear processes are processes of exploitation, informal learning, ad hoc and unsystematic"[7]. Therefore, it is very important to develop innovations to face globalization and develop a smart city. Furthermore, Innovation is needed to deal with developments and situations that are currently out of the ordinary, problems such as an increase in unemployment due to a situation, infrastructure that is not ready and human resources and resources that have not maximized their full potential. Therefore, Innovation is needed to deal with these things so that seven categories of Innovation can create an innovation profiling framework.

This article is a long-term process in which this research will begin by building a strong concept, which will eventually produce a smart city profiling application.



**Figure 1.** The circle of innovation profiling

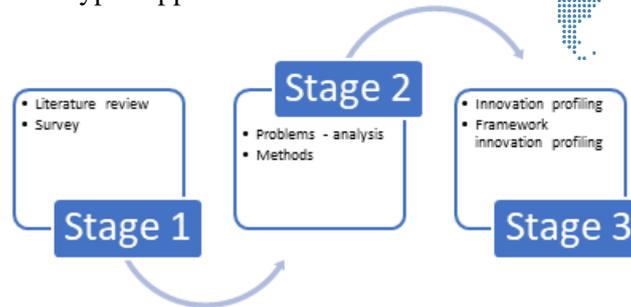
Figure 1 describes our research roadmap, and this article is an extension of previously published articles.

## 2. Research Methodology

### 2.1. The process of research

Figure 2 explains that stage 1 is the initial stage is a literature review and surveys 200 people, including lecturers (30-40 years old), students (20-21 years old), and private employees (35-45 years old). Stage 2 analyzed the existing problems and found the right method, namely the method found in Smart City 2.0, namely the seven stages of Galliers & Sutherland. This method has seven levels, but we will focus on stage 6, Integrated Harmonious Relationships, in this article. This section

will develop into innovation profiling and how Innovation can develop from stage 6. Stage 3 is an innovation profiling framework in a smart city and a basic concept in developing innovation types applicable to an area.



**Figure 2.** The process of research

## 2.2. Survey & Questioners

Lecturers (30-40 years old): 20 people, students (20-21 years old): 20 people, private employees (35-45 years): 160 people. The questions asked are: (1) Is there a significant innovation development in your area? (1: There is no innovation development, 2: It is not clear in the development of Innovation, 3: hesitates in answering, 4: There is little innovation development, 5: Needs infrastructure support in developing Innovation, (2) Is it necessary to establish an innovation centre in an area? (1: No need, 2: hesitant in answering, 3: Information technology infrastructure support is needed, 4: Human resource support is needed, 5: International cooperation is needed, (3) Is Innovation developing in your area consistently? (1: Not at all, 2: hesitant in answering, 3: There is no management in developing innovation, 4: Need support in developing Innovation, 5: It takes process integration in developing Innovation).

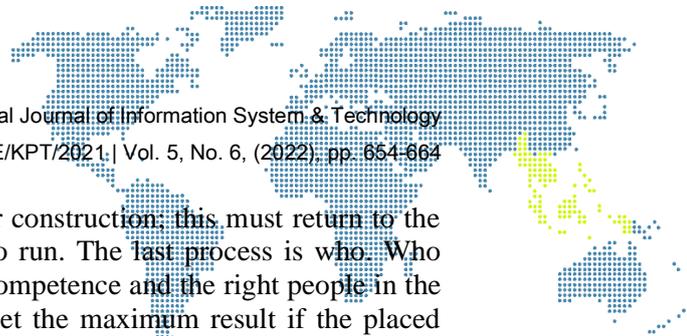
## 3. Results and Discussion

### 3.1. Survey-results

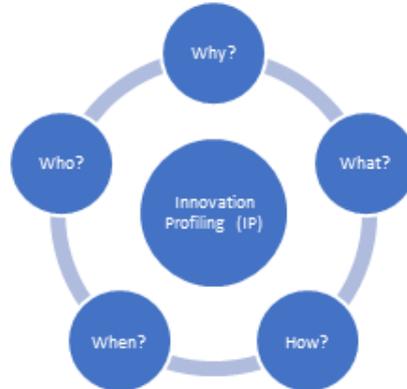
Question 1: 52.5% (Needs infrastructure support in developing Innovation), 13% (There is little innovation development), 13% (Hesitates in answering), 10.5% (It is not clear in the development of Innovation), 11% (There is no innovation development), Question 2: 33.5% (International cooperation is needed), 32.5% (Human resource support is needed), 11% (Information technology infrastructure support is needed), 12.5% (Hesitant in answering), 10.5% (No need), Question 3: 41% (It takes process integration in developing Innovation), 23.5% (Need support in developing Innovation), 11% (There is no management in developing Innovation), 13% (Hesitant in answering), 11.5% (Not at all)

### 3.2. Innovation Profiling

Figure 3 describes the five initial stages of understanding Innovation. Innovation started by asking the question of why should this Innovation be done? What is the basis for this? We must understand the real reason and the urgent need to carry out this Innovation in the why and what process. Everything that is done must go through first, answering why and what. The next process is after we can answer exactly why and what, we must ask how to execute this Innovation? This section must be detailed because this section is a short term, medium-term and long-term planning? This section must also make detailed business processes, standards, and the products/services needed to innovate. Now that we've got a detailed how-to, the next process is when. Time is very important in terms of resources and infrastructure in the when process. Time here in the sense of Innovation can only occur if the infrastructure and human resources are very



ready if there is none and it will only build or under construction; this must return to the how-to process. When means everything is ready to run. The last process is who. Who includes the people involved in it with attention to competence and the right people in the right position? The innovation execution will not get the maximum result if the placed people aren't in that position. Who means people who have the competence, commitment and executors who can quickly implement and implement the Innovation?

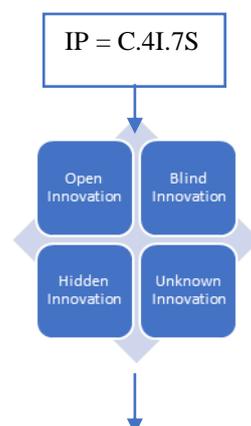


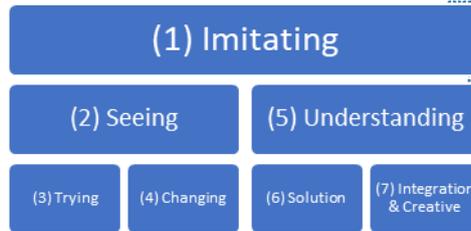
**Figure 3.** The circle of basic Innovation

### 3.3. Framework Innovation Profiling & Implementation

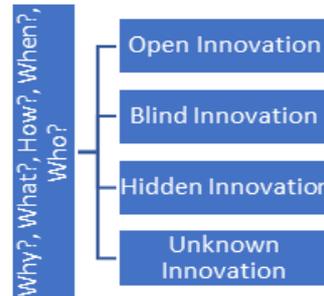
Figure 4 describes several process stages to reach the framework innovation profiling stage. The first stage starts with the formula  $IP = C.4I.7S$ , where IP: innovation profiling, C: The circle of basic Innovation, 4I: four types of basic Innovation, 7s: seven types of Innovation.

The first stage explains in the section of the circle of basic Innovation, where this stage is a basic understanding of the concept of Innovation. It can be more systematic, well-directed, and a mindset structure built as a basis for developing Innovation. The second stage is four types of Innovation, including (1) open innovation: Open to change. Here, a region opens itself up to the international world and tries to apply what is best and can implement in that area. (2) blind Innovation: Innovation that has an open and closed nature. An area has limitations in terms of culture, habits and things that will influence the overall existing in the area, (3) hidden Innovation: an area does not have the assets to build and implement Innovation and lacks human resources, (4) Unknown innovation has the highest risk since it uses unknown resources to develop unknown or random objectives. The relationship between the circle of basic Innovation and the four types of motivation is as follows:





**Figure 4.** Framework innovation profiling

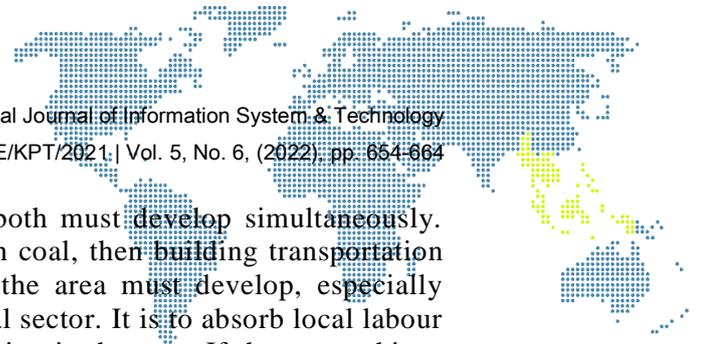


**Figure 5.** The connection between the circle of basic Innovation & four types of basic Innovation

Figure 5 explains that each type must answer the questions in the basic innovation circle. It will explain further in the implementation and case study. The final stage is the seven types of Innovation which are the most important, where this is the final process of the profiling innovation concept. Profiling Innovation divided into seven important parts: (1) imitating: in this type, an area imitates products/services that already exist and is applied in the area to improve people's lives, (2) Seeing: in this type innovation carry out by looking at what's already there. The difference with imitating is creating from what already exists and then adapting it to the area's conditions, whereas seeing is making a little innovation on the product/service and then adjusting it to the area's conditions. In this case, both are the same in implementing it, namely adjusted to the area's conditions and a slight difference in Innovation. (3) In this type, Innovation does by trying something new or what is already there, unifying old and new. The essence of this type is: creating new things, combining new and old things, (4) Changing: in this type, Innovation is done by changing the total or changing some / little of existing products/services, (5) Understanding: this type has Innovation in studying existing products/services then creates new things, (6) Solution: this type creates practical innovations, where the products/services created are short-term and medium-term so that they quickly meet people's needs, (7) ) Integration & Creative: this type is an innovation that combines technology from various sources and creates something innovative and can make a big contribution at the national and international levels. The important question that asks here is: how do you apply these things? It can explain as follows:

### 3.3.1. Case study 1: Area A

Area A is an area that is difficult to reach and has transportation difficulties in reaching it, but the area has good natural resources. The first question is why a smart city should build in this area, and what will be added value for the people in the area and its impact on building a smart city in that area? For example, the area chooses coal mineral resources which are very useful and very large in number. Still, with the difficulty of the area reached, the first thing that must prepare is transportation to reach the area. It must understand that we should focus on one



side, but human resources in the area neglect; both must develop simultaneously. Area A is mapping natural resources focusing on coal, then building transportation infrastructure that simultaneously education in the area must develop, especially human resources related to competence in the coal sector. It is to absorb local labour and improve the standard of living of the population in the area. If these two things can build simultaneously, it answers the questions in the circle of basic Innovation. Initially, because the area will be in the position of unknown and hidden Innovation, developed until blind Innovation at the mid-term level, open Innovation is long-term. Batara Surya (2021) said, "Community economic development is through entrepreneurship, which will impact economic growth, increase community productivity, and develop technological innovation" [8].

Furthermore, Dominica Šulyová (2021) said: "The smart city knowledge database is the key to success with Innovation and all its activities, where the factors of collective learning, prediction, social, cultural and public opinion as well as the benefits of human resources are indicators, which accelerates economic growth" [9]. These are what case study A should build on.

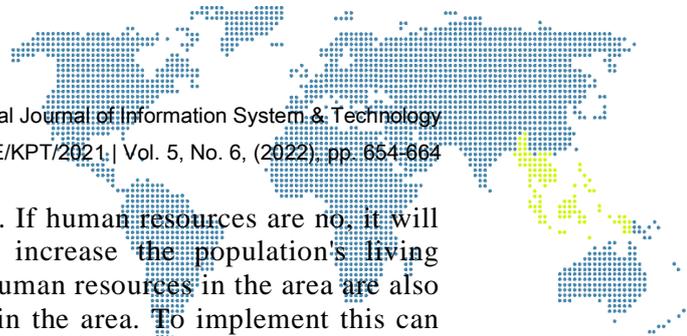
Moreover, if it links to the seven types of Innovation, the first thing to do is imitate, change, understand, and solve. Until the construction of a coal factory that is increasingly developing at the international level, it will upgrade to integration and open Innovation in the long term. But, of course, this can be implemented if the area's human resources are truly ready.

### 3.3.2. Case study 2: Region B

Region B is an area that has good natural resources and is quite good in human resources. In this position, area B can be quite good and develop easily. For example, this area has a batik cultural craft known nationally and maybe recognized internationally, but Innovation and implementation are still lacking. Transportation to reach these areas can be easy, and there is no problem. However, human resources, information technology and infrastructure development still need further development. These things are sufficient to answer because the area already has a batik sales centre, a centre for tourism and batik shopping, which is a characteristic of the area. Things that need to develop in this area are blind and open Innovation. A factory must produce higher quality batik and cooperate with the national and international levels. Saymon Ricardo de Oliveira Sousa (2020) said, "The management system continues to experience challenges globally" [10]. Seunghwan Myeong (2020): "The concept of a smart city connected to infrastructure, networks, information, there is also accountability, collaboration, and participation.

Furthermore, data and transparency play an important role in transforming the city system into a smarter system, increasing the effectiveness of limited resources and enabling better decision-making" [11]. Amna Iqbal (2020): "Smart cities take advantage of infrastructure by providing smarter services, including health, smart home, transportation, smart work, smart government and many others" [12]. Francesco Gerli (2020): "Social entrepreneurship is experiencing a technological transformation" [13]. Carmen Cantuarias-Villessuzanne (2021): "The technological dimension refers to several sensory devices that cooperate with larger infrastructures with a focus on data processing, exchange, storage and security" [14]. These points should apply to case study B.

Furthermore, area B can apply the type of Innovation: solution, integration, and creativity. The batik can innovate into unique products to add variety in offering a product. The important thing to note here is that batik technology and human resources must also develop. Remember, both must go hand in hand, which means that we only focus on infrastructure development but not carry out human resource development. Then what will happen is social inequality, where the batik factory

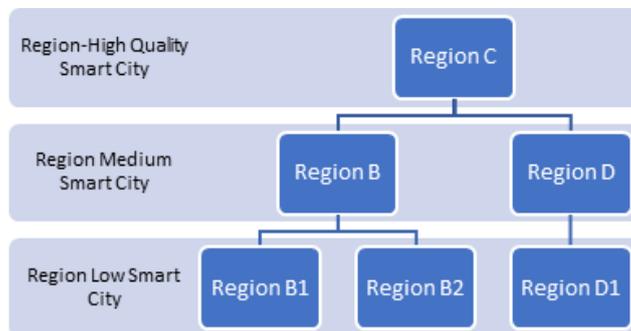


established with more advanced batik technology. If human resources are no, it will use human resources from abroad to slightly increase the population's living standards in the area. It's a different story if the human resources in the area are also ready, then the workforce used is local workers in the area. To implement this can also be used the imitation and seeing the type of Innovation: We shouldn't waste time on unnecessary things; for example, we are too focused on technology creation.

In contrast, there is already technology to manage batik. Therefore, we can use what already exists. For the long term, we do research & development for developing batik technology to be better than what already exists. Education factors in the area must also get attention because one of the most important demands in a smart city is that human resources must have competence.

### 3.3.3. Case study 3: Area C

Area C can be called a city with a fairly high or very good activity level. This type can say that this is a big city with excellent infrastructure, large human resources, and a very good implementation of information technology. In this type, open Innovation and the solution and integration & creative type must develop what is already good. These regions/cities must truly integrate what already exists in terms of transportation, systems, and other matters related to smart cities. This city's main thing must be city layout and management, technology development, location management, and more sophisticated human resources[15]. Suppose the city is located not far from area B. In that case, integration of transportation, transfer of information technology and transfer, and human resources can do. It is the first step to developing area B with assistance from area C. Area A can consider other areas adjacent to area A to help develop a smart city. It can simulate as follows:



**Figure 6.** The development & implementation of smart city

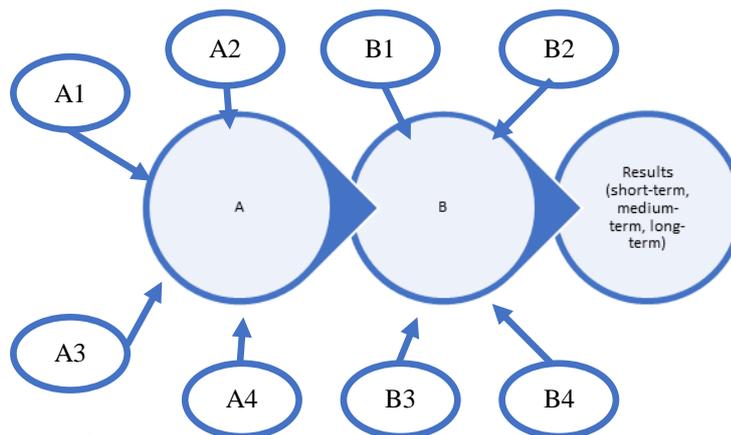
Figure 6 describes region C, a large city that assists in developing B and D in human resource development and competency development and infrastructure development. Here, we need to understand that resource mapping is indispensable. It is right on target in implementation. When area B has increased and is almost towards the high-quality smart city area, which is in the middle position between high quality and medium, area B can help other nearby areas, namely area B1. So, on B2, this is done by region D. The aim of this is a region that has already progressed in terms of technology, human resources and other things that can develop the surrounding area in the long term.

The following will explain how to make this Innovation achieve the maximum. The case study above described is a small part of the case study. A more detailed case study will explain in the next article regarding the seven stages in building and measuring a smart city's performance in an area.



**Figure 7.** Integrasi Innovation Profiling

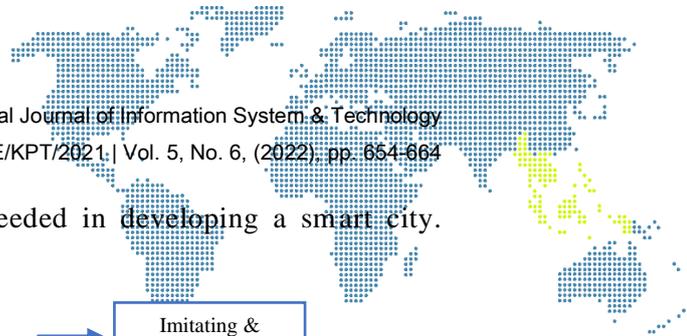
Figure 7 explains that each region must connect, especially nearby areas. It will help the development of Innovation to be more systematic, structured and right on target. In the first stage, each region must map what innovation needs can do in its region. For example, open Innovation can carry out in areas with a strong foundation in infrastructure and human resources that meet smart city standards. Blind Innovation can carry out in areas that already have half the standards of open innovation areas. Areas still lacking in infrastructure and human resources are hidden and unknown. The integration and connection that supported by people's activities can describe as follows:



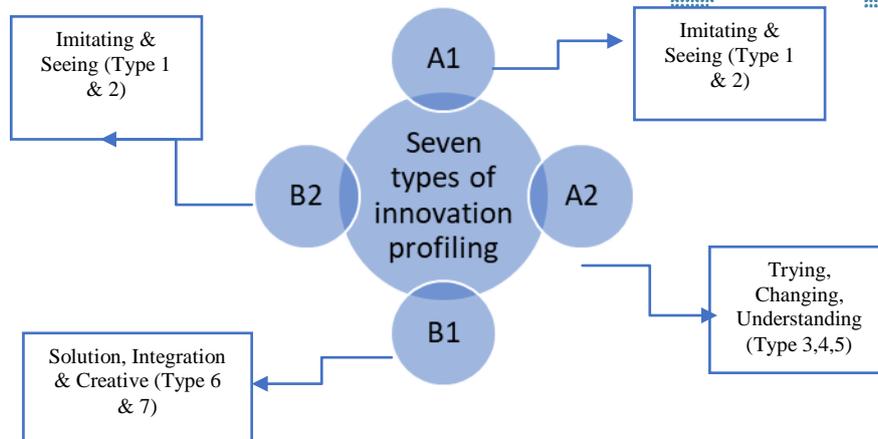
**Figure 8.** Integration of Innovation between regions

Figure 8 describes the innovation relationship between regions, where mapping in each area needs Innovation. The first thing is mapping the characteristics, uniqueness, and things that are the centre of the area's strength. Then, of course, those with high or high promotional value, selling value and profit level improved and developed in Innovation. Without a detailed and clear mapping, it won't be easy to develop innovations in that area because we don't have detailed data. For example, an area has onions and salted eggs as its characteristics; what innovations can make in the area? What technology can be applied? And are human resources ready if Innovation is applied? What about the location? Is it available for innovation development? And what things could be a problem in the long run? What about the security factor in the area?

It should understand; Innovation can carry out flexibly by applying the innovation profiling framework, which includes seven types of Innovation: (1) imitating and (2) seeing, these two types of Innovation can combine simultaneously, (3) trying, (4) changing, and ( 5) understand, three types of Innovation can combine as well, while for (6) solutions and (7) integration & creative specifically for areas that already have good basic strengths in infrastructure and the availability of



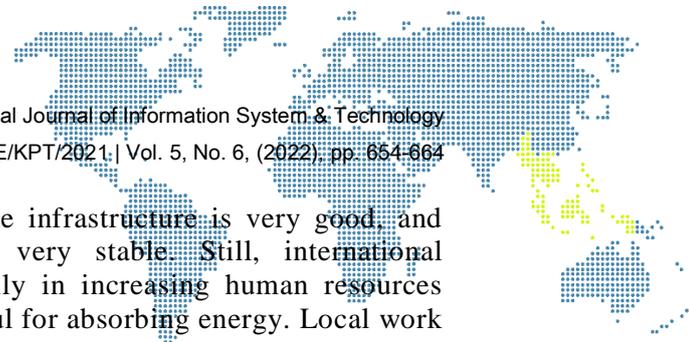
human resources who have the competencies needed in developing a smart city. Therefore, it can describe as follows:



**Figure 9.** Implementation- the seven types of innovation profiling

Figure 9 explains the application of the seven types of innovation profiling in more detail. In area A1, after mapping, the area can apply types 1 and 2, namely imitating and seeing, meaning that the area is still in the early stages of Innovation and requires assistance and support from human resources, information technology infrastructure and other facilities in developing Innovation. The first thing to do is to do a mapping of what products can develop in the short, medium and long term; of course, this has to answer the questions in the circle of basic Innovation again. This region must map three products that are characteristic and strengths of the area. Of course, it must also ask whether the human resources in the area are ready to implement it. The three products then mapped in more detail into priorities. It is determined in the short term what products can be developed first without wasting a lot of time and money and can innovate with the resources available in the area. These three products must be significant in providing benefits to the people in the area. Therefore, in-depth research and analysis of these products are required. It will help the region to have a strong brand at the national level, and many people will know that if they come to the area, then the product is the main character and is known as an area with products 1,2,3, which is a strength. It also occurs in area B1, which has the same characteristics as A1. For these regions, support and assistance are needed in infrastructure development, human resources, and integration with regions with good basic strengths. It will assist regions A1 and B1 in developing Innovation. The education factor must also be able to run simultaneously. Of course, with training, competency development, and mentoring programs, regions A1 and B1 are needed to increase their Innovation to types 3,4 and 5. Then in the long term, levels 6 & 7, which is international level, can provide significant benefits and increase people's living standards in the area.

Region A2 is an area that can be quite good and implements innovation profiling types 3,4, and 5. There are already main products that characterize the area, supported by infrastructure facilities, information technology, and human resources. They have enough competence. Integration has also occurred with the centre; it is only fully implemented and still requires further development and development. In this area, only easier development and support need because almost everything is available, so what is needed is to improve what already exists. It needs to be understood; this region already has what need at the national level; therefore, if you want to increase it, there must be international level cooperation so that investors and smart city development in the area will be more advanced.



Region B1 can be a premium area, where the infrastructure is very good, and information technology integration has been very stable. Still, international cooperation must be further enhanced, especially in increasing human resources because increasing competence will be very useful for absorbing energy. Local work and increase the capability of this region to compete with other countries that have developed rapidly.

Finally, this research will continue to develop. This stage has reached the almost final stage, where two to three more concepts are needed to make a smart city performance measurement application. This innovation profiling is part of the seven phases of smart city profiling currently being drafted in more detail. This innovation profiling can flexibly adjust to each area's situation and conditions by considering cultural factors, changes, and local community habits. The most important thing is maintaining a balance in smart city development from two sides: infrastructure and increased competence—human Resources.

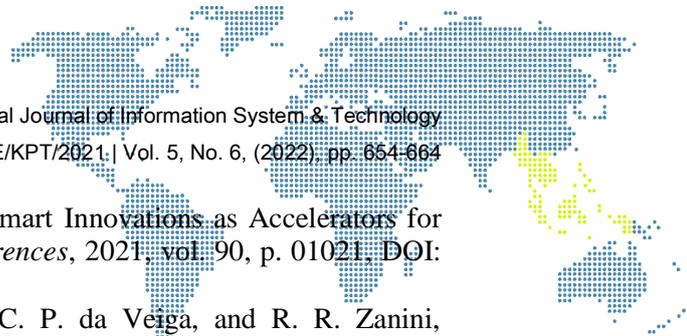
#### 4. Conclusions

The conclusions of this article are as follows:

- a) Innovation profiling must pay attention to the balance between building infrastructure and human resources competence.
- b) The circle of basic Innovation as a basis for questions that must be answered first before implementing a smart city in an area, then combining it with the four basic types of Innovation
- c) seven types of innovation profiling can apply, including (1) imitating and (2) seeing, (3) trying, (4) changing, and (5) understanding, (6) solutions and (7) integration & creative.

#### References

- [1] T. Graziano, "Smart technologies, back-to-the-village rhetoric, and tactical urbanism: Post-covid planning scenarios in Italy," *Int. J. E-Planning Res.*, vol. 10, no. 2, pp. 80–93, 2021, DOI: 10.4018/IJEPR.20210401.0a7.
- [2] S. Mozūriūnaitė and J. Sabaitytė, "To what extent we do understand smart cities and characteristics influencing city smartness," *J. Archit. Urban.*, vol. 45, no. 1, pp. 1–8, 2021, DOI: 10.3846/jau.2021.12392.
- [3] A. Stenberg, "What does Innovation mean—a term without a clear definition," p. 2, 2016, [Online]. Available: <http://www.diva-portal.org/smash/get/diva2:1064843/FULLTEXT01.pdf>.
- [4] M. Mehta, A. Chandani, and B. Neeraja, "Creativity and Innovation: Assurance for Growth," *Procedia Econ. Financ.*, vol. 11, no. 14, pp. 804–811, 2014, DOI: 10.1016/s2212-5671(14)00244-5.
- [5] H. Boer and W. E. During, "Innovation, what Innovation? a comparison between product, process and organizational Innovation," *Int. J. Technol. Manag.*, vol. 22, no. 1–3, pp. 83–107, 2001, DOI: 10.1504/ijtm.2001.002956.
- [6] P. López-Rubio, N. Roig-Tierno, and A. Mas-Tur, "Regional innovation system research trends: toward knowledge management and entrepreneurial ecosystems," *Int. J. Qual. Innov.*, vol. 6, no. 1, 2020, DOI: 10.1186/s40887-020-00038-x.
- [7] T. H. Aas, N. Jentoft, and M. Vasstrøm, "Managing innovation of care services: An exploration of Norwegian municipalities," *Cogent Bus. Manag.*, vol. 3, no. 1, 2016, DOI: 10.1080/23311975.2016.1215762.
- [8] B. Surya, F. Menne, H. Sabhan, S. Suriani, H. Abubakar, and M. Idris, "Economic Growth, Increasing Productivity of SMEs, and Open Innovation," *J. Open Innov. Technol. Mark. Complex.*, vol. 7, no. 1, p. 20, 2021, DOI: 10.3390/joitmc7010020.



- [9] D. Šulyová, M. Gabryšová, and J. Vodák, “Smart Innovations as Accelerators for SMEs in Rural Areas,” in *SHS Web of Conferences*, 2021, vol. 90, p. 01021, DOI: 10.1051/shsconf/20219001021.
- [10] S. R. de Oliveira Sousa, W. V. da Silva, C. P. da Veiga, and R. R. Zanini, “Theoretical background of innovation in services in small and medium-sized enterprises: literature mapping,” *J. Innov. Entrep.*, vol. 9, no. 1, 2020, DOI: 10.1186/s13731-020-00135-3.
- [11] S. Myeong, Y. Kim, and M. J. Ahn, “Smart City Strategies—Technology Push or Culture Pull? A Case Study Exploration of Gimpo and Namyangju, South Korea,” *Smart Cities (MDPI)*, vol. 4, no. 1, pp. 41–53, 2020, DOI: 10.3390/smartcities4010003.
- [12] A. Iqbal and S. Olariu, “A Survey of Enabling Technologies for Smart Communities,” *Smart Cities*, vol. 4, no. 1, pp. 54–77, 2020, DOI: 10.3390/smartcities4010004.
- [13] F. Gerli, V. Chiodo, and I. Bengo, “Technology transfer for social entrepreneurship: Designing problem-oriented innovation ecosystems,” *Sustain.*, vol. 13, no. 1, pp. 1–19, 2021, DOI: 10.3390/su13010020.
- [14] C. Cantuarias-Villesuzanne, R. Weigel, and J. Blain, "Clustering of smart European cities to understand the cities' sustainability strategies," *Sustain.*, vol. 13, no. 2, pp. 1–20, 2021, DOI: 10.3390/su13020513.
- [15] A. Nurhindarto and I. Gamayanto, “Developing Smart City 5 . 0 Framework to Produce Competency,” *J. Appl. Intell. Syst.*, vol. 5, no. 1, pp. 23–31, 2020.