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# Activity Space for Online Activities: An Opportunity for Building Resilience in Industry 4.0 Era and Post-Covid-19 Pandemic

*Iredo* Bettie Puspita[1,2,*], *Andri* Kurniawan[3], and *Muh* Aris Marfai[3,4]

[1] Doctoral Candidate in Faculty of Geography, Universitas Gadjah Mada
[2] Institut Teknologi Nasional (Itenas) Bandung
[3] Faculty of Geography, Universitas Gadjah Mada
[4] Indonesia Geospatial Information Agency

**Abstract.** Industry 4.0 era and the Covid-19 pandemic have driven a transformation in online activities, enabling people to engange in various tasks from anywhere, which in turn has altered spatial behavior. This study explored the correlation between the characteristics of online activities and the choice of activity space represented in land use patterns. The study classifies online activities into seven clusters using the Self-Organizing Mapping (SOM) introduced by Kohonen. The spatial distribution of these clusters is visually represented on a land-use map overlay. The study employs Contingency Coefficient C analysis to assess the correlation between online activity characteristics and space selection. The results of data analysis of online activity actors in Semarang City and Yogyakarta City showed that the online activities were spatially distributed at random. This is supported by a chi-square significance value above 0.05 and a Contingency Coefficient C value around 0.3, indicating no significant correlation between the characteristics of online activities and space choice. These findings suggest that online activities can be conducted anywhere, without specific spatial requirements, thereby reducing physical exposure in urban areas. The reduced physical exposure of an area was one indicator of urban resilience from the physical and environmental aspects.

## 1 Introduction

Currently, the world is entering the era of Industry 4.0, also known as the digital industry, a form of industrial transformation influenced by the development of information technology and telecommunications [1]. The manufacturing concept has changed from machine-based manufacturing to digital [2-3]. Network-connected intelligent systems could realize self-regulated production systems in which people, machines, equipment, and products communicate with each other [4-5]. With this concept, the main goal of Industry 4.0 was the flexible, economical, and efficient use of resources in every production process or human activity in production [4]. In Industry 4.0 era, the Internet of Things/IoT has become an inseparable part of every human activity.

An indication of the industry 4.0 era in people's lives is the existence of virtual or online activities where people can be mobile while communicating with anyone at any time to fulfill their needs. The online activity allows people to shop freely by accessing one marketplace application from their phones. They do not need to be physically present in the store. People can also perform various basic banking activities, such as opening an account, checking account balance, transferring funds, paying bills, and many others without coming to the bank. Online learning can be done independently anywhere at any time through applications. Students can access interactive education-based services and take lessons as if they were studying in an actual classroom.

The development of online activity in Industry 4.0 is growing more rapidly with the outbreak of the Covid-19 pandemic since the end of December 2019. The fatality of this new coronavirus disease had forced people to maintain personal hygiene, limit mobility, and avoid crowds as the best solutions to prevent transmission and reduce the number of virus spreads in the community, besides taking vitamins, getting vaccinated, and many others [6-10]. As part of the implementation of health protocols, the demand to always perform physical distancing and limit mobility has encouraged people to carry out online activities by utilizing ICT in their daily lives. Community activities previously not commonly done online, e.g., online health consultations or telemedicine, online teaching and learning activities, online workouts, and online meetings, have become an inseparable part of people's lives as the ‘new normal. Furthermore, other online innovations that have already developed before the outbreak, i.e., online shopping, online payments, and online banking, have experienced a significant increase in their usage due to the Covid-19 pandemic.

The massively increasing development of online activities will affect the pattern of physical space utilization in the long term. With online activities, people were no longer bound to a specific physical space to carry out their activities because the activity transaction of online activities was not carried out face-to-face [11-12]. Conceptually, online activities

*Corresponding author: iredobettie@itenas.ac.id

do not require a specific space since they can be done anywhere. In this regard, someone does not have to work in an office or go to a shopping center to buy anything since everything can be done online. The characteristic of online activity in terms of physical space can change the land use pattern. In the future, this positive pattern of land use will make it possible to build urban resilience in terms of the physical environment.

Although conceptually correlated, the previous studies have not explicitly discussed this matter. No prior studies have observed a direct relationship between the characteristics of online activities and the choice of physical activity space for online activities. Only two studies by Yu and Shaw looked into this matter but only conceptually [13-14]. The non-conceptual studies conducted previously were only limited to studying patterns of changes in human behavior due to the development of online activities [15-18], which tend to lead to changes in space utilization. With these considerations, this study explores the relationship between the characteristics of online activities and the choice of activity space represented in land-use patterns as an opportunity to build urban resilience in the industry 4.0 era and post-Covid-19 pandemic.

## 2 Data Collection and Research Methods

This section describes the study areas, data sources, and the methods used in the analysis.

### 2.1 Study Area and Data Sources

This study observes and explores the characteristics of online activities from the active actors domiciled in Semarang City and Yogyakarta City, Indonesia. These two cities were chosen as the study areas with three main considerations. First, the dominance of e-commerce businesses which represents the presence of online activities is seen in both cities. Based on the Statistics Indonesia (BPS) data, Semarang City and Yogyakarta City were among the ten cities in Indonesia with many e-commerce businesses [19]. Second, both cities act as provincial capitals (Yogyakarta City is the capital city of the Special Region of Yogyakarta, while Semarang City is the capital city of Central Java) and the centers of the development of built-up areas. As the capital city, both Semarang City and Yogyakarta City become the center of the government and the economic growth for the province. It creates the dominance of built-up areas as indicated by the percentages of 37% for Semarang City and 84% for Yogyakarta City with a positive growth rate; there was an increase of 13% for Semarang City and 1.18% for Yogyakarta City during the period of 2008-2018) [20-22]. Third, various potential disasters in Semarang City and Yogyakarta City [23-26] motivate both cities to implement urban resilience policies.

The data used were obtained from 436 respondents who performed online activities through the distribution of online questionnaires randomly from May 24 to June 20, 2021, using an online survey application platform ArcGIS Survey123. The respondents were people living and working in Semarang City and Yogyakarta City. They carried out online activities as service providers, such as sellers of goods, providers of online courses, and the like. Each participating respondent was allowed to fill out the questionnaire to avoid bias and duplicate answers. The respondents answered the question about the characteristics of their online activities (type, intensity, and frequency) and their preferences for activity space, and the needs for that space. All formulated questions in the questionnaire were related to the factors that influence people to choose a location or space for their activities, namely the costs, distance, characteristics of the activity, the actor, and the location, policies, and the availability of supporting infrastructure. In addition, the questionnaire also contained several questions about the choices of space, with location tags in the online survey application ArcGIS Survey123 for the locations most often used by the respondents to conduct online activities.

### 2.2 Method 1: Self Organizing Map

This study applied the Self Organizing Map/SOM method introduced by Kohonen to examine different online activities based on the factors that influence the selection of locations or spaces. This method was a part of the unsupervised machine learning process. SOM was used to study the pattern of self-organizing neurons without a specific achievement targeted based on the proximity of the possessed characteristics [23-25]. This method was used because the characteristics of online activities and the assessment indicators vary. There were 33 input indicators derived from 7 variables that influence the choice of activity location or space: cost, distance, characteristics of the activity, actors, location, policies, and availability of supporting infrastructure [26-28], as seen in Table 1.

This study used the Kohonen SOM packages in R run on RGui version R x64 4.1.0. The Self-Organizing Mapping was carried out to form 7 clusters of respondent characteristics for the analysis. The clustering was based on seven land-use types at a spatial scale of 1:25,000. These seven types of land use were identified as being affected by the shift of seven offline activities to online ones. The seven land-use types were residential, offices, education facilities/schools, public health facilities, trade and service centers, open spaces, and other uses. In map visualization, seven land-use types were reduced to five types: residential, office, open space, trade and service, and others to simplify. Meanwhile, the seven types of online activities included online shopping, online working (working from home/WFH), online education, online health services/telemedicine, online banking, online entertainment, and other online activities, identified from the results of surveys by GlobalWebIndex [29] and the Demographic Institute of the Faculty of Economics and Business, Universitas Indonesia [30]. The SOM analysis was built using the analytical architecture displayed in Fig. 1.

The SOM was analyzed separately for each city as the specific characteristics. There were 274 respondents for Semarang City and 162 respondents for Yogyakarta City. The hexagonal topology was used in SOM for each city because one neuron was close to six other neurons [31]. With this hexagonal topology, each neuron could observe the other adjacent neurons more closely so that the cluster members could be better formed. In the analysis, the iteration process was set to a maximum of 20,000 iterations (rlen = 20,000), meaning that after 20,000 iterations, the clustering process would be stopped. This number was chosen because the iteration process will generally converge before the 20,000$^{th}$ iteration. The default number of Kohonen SOM packages in R was 100 [32]. With the number of iterations of 20,000 clusters, the characteristics of the new respondents appeared to be convergent.

**Table 1.** Variables and Indicators

| VARIABLE | INDICATORS | CODE |
|---|---|---|
| **Cost** | preference for transportation cost factor as consideration for site selection | X1 |
| | preference for internet/data cost factor as consideration for site selection | X2 |
| | preference for place/location rental cost factor as consideration for site selection | X3 |
| **Distance** | preference for distance from house/residential area as consideration for site selection | X5 |
| | preferred distance to be willing to travel | X6 |
| | preference for distance from the market/consumers/users of other online activities as consideration for site selection | X7 |
| **Characteristics of the Activity** | preference for the existence of similar activities as consideration for site selection | X4 |
| | preference for the type of online activity as consideration for site selection | X10 |
| | the main type of online activity | X11 |
| | preference for the frequency of the online activity as consideration for site selection | X12 |
| | frequency of major online activities | X13 |
| | preference for partners to carry out online activities as consideration for site selection | X14 |
| | range of online activity | X15 |
| | preference for room area as consideration for site selection | X16 |
| | preference for the completeness of service facilities as consideration for site selection | X17 |
| | preference for the atmosphere of the place/location as consideration for site selection | X18 |
| | number of people involved | X19 |
| | average area/room requirement | X20 |
| **Actors** | preference for the urgency of online activities as consideration for site selection | X21 |
| | preference for personal motivation as consideration for site selection | X22 |
| | reasons in doing online activities | X23 |
| **Location** | preference for the suitability with the function of surrounding areas as consideration for site selection | X24 |
| | preference for the threat of disaster as consideration for site selection | X25 |
| **Policies** | preference for conformity with spatial planning policy as consideration for site selection | X26 |
| | preference for factors for disaster risk reduction efforts as consideration for site selection | X27 |
| **Supporting Infrastructure** | preference for the availability of internet network as consideration for site selection | X28 |
| | preference for proximity to the main road network as consideration for site selection | X8 |
| | preference for public transportation convenience as consideration for site selection | X9 |
| | preference for the availability of clean water as consideration for site selection | X29 |
| | preference for proximity to banks or ATMs as consideration for site selection | X30 |
| | preference for proximity to health facilities as consideration for site selection | X31 |
| | preference for proximity to schools and other educational services as consideration for site selection | X32 |
| | preference for proximity to malls, supermarkets, shops, and other trading facilities as consideration for site selection | X33 |

Sources: Healey & Illbery [26], Djojodipuro[28], and Basse et al.[27]

### 2.3 Method 2: Contingency Coefficient C Analysis

This study applied inferential analysis with the Contingency Coefficient C method to identify population conditions related to the influence of the characteristics of online activity on the choice of activity space. This method examined a relationship between the types of land use and the characteristics of combined online activities (the results of SOM analysis). This method was used to observe the correlation of two types of data, namely the nominal data and the r x k data of more than two categories [33-34], where r referred to the number of categories in the row and k referred to the number of categories in the column. The formula for calculating the Contingency Coefficient C was as follows [33-34]:

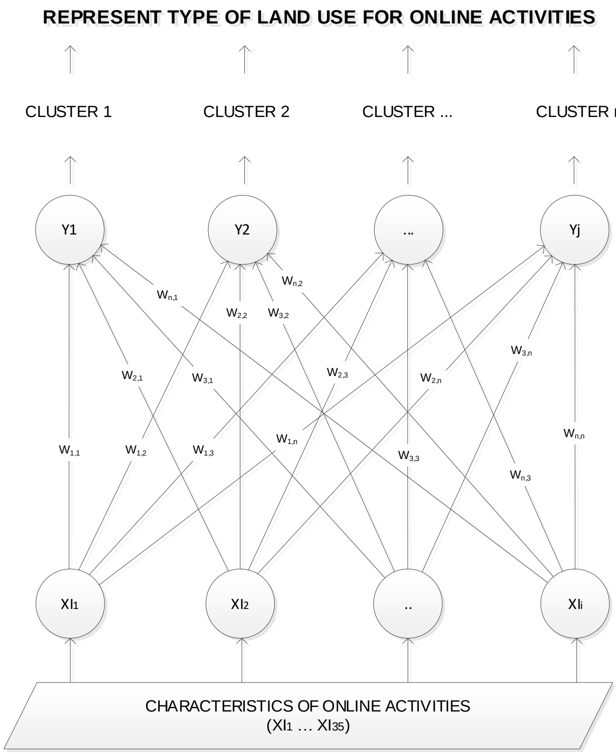



**Fig. 1.** SOM Architecture for the Present Study

$$C = \sqrt{\frac{Q}{Q+N}}$$ *(Equation 1)*

where C : Contingency Coefficient C
$Q$ : Test statistic for the independence hypothesis; in this study, the Chi-square test was used
$N$ : Number of data/objects

The calculation of this Contingency Coefficient was based on the Chi-square value, calculated by the following equation [35]:

$$Q = \sum \frac{(f_0 - f_e)^2}{f_e}$$ *(Equation 2)*

where $Q$ : the Chi-square value
$f_0$ : the cell frequencies observed
$f_e$ : the expected cell frequencies ((row marginal x column marginal)/N)
$N$ : number of data/objects

SPSS software was used for this calculation, with the hypotheses as follows:
$H_0$ : There was no relationship between the characteristics of online activities and the choice of space patterns
$H_1$ : There was a relationship between the characteristics of online activities and the choice of space patterns
The decision-making process for correlation was based on the resulting significance value of C, namely:

- If the significance of C was < 0,05, then $H_o$ was rejected, and $H_1$ was accepted
- If the significance of C was > 0,05, then $H_o$ was accepted, and $H_1$ was rejected

The identification of the strength of the relationship used the value of C generated from equation 1. This value of C had a minimum value of 0 and maximum value based on the following formula [33]:

$$C_{max} = \sqrt{\frac{(t-1)}{t}} \qquad (Equation\ 3)$$

where $t$ : minimum value of r, k

In this study, the minimum value (r, k) for the observed relationship pattern was 7, so the $C_{max}$ value was 0.93. Based on the $C_{max}$ value, the strength of the relationship was identified and compared with the identification presented in Table 2.

**Table 2.** The Relationship between the Value of C and the Strength of the Relationship

| Value of C | Strength of Relationship |
|---|---|
| 0 – 0,309 | Weak |
| 0,310 – 0,618 | Moderate |
| >0,619 | Strong |

*Source: calculated based on Gibbons and Chakraborti [33]*

## 3 Results and Discussion

### 3.1 The Clusters of the Characteristics of Online Activities: Results of the SOM Analysis

Based on the various variables and indicators used to describe the characteristics of online activities, seven clusters of respondents were formed in SOM. The formation of these seven clusters did not explicitly indicate a clear cluster based on certain variables or indicators. Respondents who became the objects of this study were divided into clusters based on the dominant characteristics for preference indicators. The proximity of the neighboring relationships was used to determine the clusters, bringing each object closer to the same preference choices, not based on the basic characteristics of online activities (e.g., type/variation of activities, frequency, choices of activity location/space, actor's age, background, or motivation to carry out online activities, interaction patterns/range, and average space requirements). Such a clustering pattern occurred as the basic characteristics of the online activities had the same tendency compared to respondents' preferences.

Since the data for Semarang City and Yogyakarta City were analyzed separately, the characteristics of the formed clusters were also different (Table 3). Although the SOM analysis of the two cities did not form clusters with the same characteristics, the formed cluster patterns were relatively similar. There were three typologies of the clusters formed, namely clusters with a great dominance in positive preferences ('considered' to 'highly considered'), clusters with a great dominance in negative preferences ('not considered' to 'highly not considered'), and clusters with a tendency of choices to be evenly distributed in each preference.

The difference lay only in the composition of the cluster typology. Yogyakarta City only had clusters with fewer negative preferences than Semarang City. There were 2 clusters in Semarang City had a dominant-negative preference (13% of all analyzed cases). In Yogyakarta City, there was only 1 cluster, and the number of cluster members was relatively small (6% of all analyzed cases). Clusters with negative preference dominance in the two cities had various online activities with a dominance of online shopping. It indicated that the variables and indicators of location selection remained the main consideration for online activity actors in the two cities, especially in Yogyakarta.

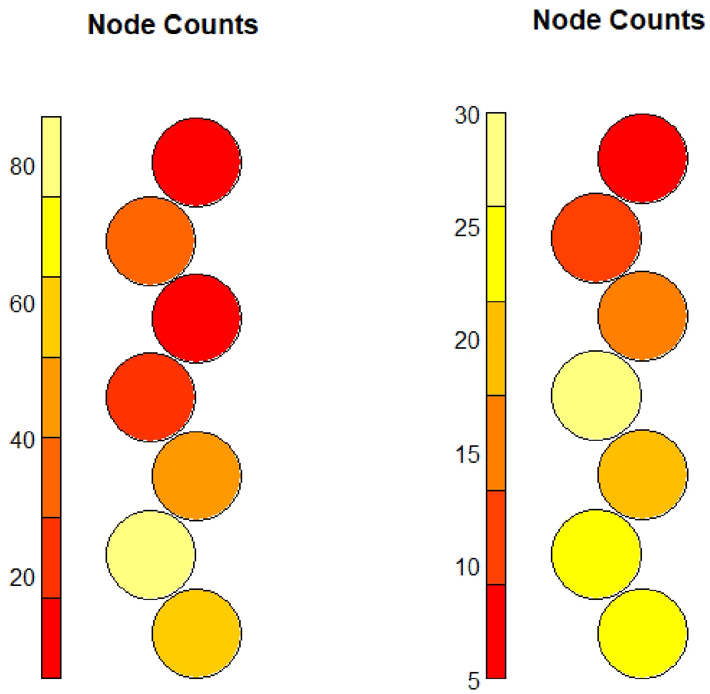
As seen in Figure 2, the node distribution also illustrated these counts formed after the clustering process, where the three cluster colors represent the three cluster typologies. Of the three cluster typologies, both in Semarang City and Yogyakarta City, extreme dominance with positive preferences was much greater than the other two.

**Table 3.** Profiling of the Characteristics and Number of SOM Cluster Members Formed

| | Semarang City | | Yogyakarta City | |
|---|---|---|---|---|
| Cluster 1 | The dominance of preferences in the choice was 'highly considered' | 23% | The dominance of preferences in the choice was 'highly not considered' | 6% |
| Cluster 2 | The dominance of preferences in the choice was 'quite considered' | 32% | The dominance of preferences in the choice was 'not considered', with equal variation for the other options | 9% |
| Cluster 3 | The dominance of preferences in the option was 'considered' | 18% | The dominance of preferences in the choice was 'highly considered', with even variation for the other options | 5% |
| Cluster 4 | The dominance of preferences in the choice was 'highly considered', with a variation of 'neutral', 'moderately considered', and 'considered' choices | 8% | The dominance of preferences in the option was 'considered' | 30% |
| Cluster 5 | The dominance of preferences in the choice was 'highly considered', with a variation of 'neutral' choice | 6% | The dominance of preferences in the choice was 'highly considered', with a variation of 'neutral', 'moderately | 7% |

| | | | | |
|---|---|---|---|---|
| | | | considered', 'considered', and 'not considered' choices | |
| Cluster 6 | The dominance of preferences in the choice was 'not considered' | 11% | The dominance of preferences in the choice was 'quite considered' | 25% |
| Cluster 7 | The dominance of preferences in the choice was 'highly not considered' | 2% | The dominance of preferences in the choice was 'highly considered' | 19% |

*Note:*
*clusters with dominance in positive preferences* (green)
*clusters with dominance in negative preferences* (pink)
*clusters with choices that tend to be evenly distributed for each preference* (yellow)




(a) Semarang City (b) Yogyakarta City

*Note: difference color represented difference cluster characteristic, color similarity indicates to a similar characteristic tendency*

**Fig. 2.** Node Counts in SOM using Kohonen SOM Packages in R

The clusters formed tended to choose the same location for online activities (Table 4). The dominant choice of location from each cluster formed in both cities was the residential areas, such as houses, boarding houses, apartments, etc. Besides the residential area, the trade and service area were also dominant physical spaces chosen for online activity. Trade and service areas became the second choice after residential areas in almost all clusters at two case studies. A different location choice only occurred in Cluster 7 of Semarang City, where trade and service centers were the dominant choice of location, and residential areas were not chosen as location activity. In Cluster 7 of Semarang City, the dominant choices were 'not considered' in almost all preference indicators, with the spatial distribution shown in Fig. 3. Cluster 7 of Semarang City was concentrated in the downtown area with complete urban infrastructures, and the other clusters were dispersed. The spatial distribution of each cluster in Yogyakarta City (Fig. 4) was relatively dispersed, except Cluster 3. Cluster 3 of Yogyakarta City was concentrated in the northern area as the activity center and the downtown area. It indicated no specific pattern in choosing a location or space for online activity. No matter what kind of online activities, there was always a tendency to select the residence as the activity location/space or the other location that was comfortable for online activity actors. In other words, the place was not a significant matter when the activities were carried out online as long as it was convenient.

**Table 4.** Distribution of SOM Cluster Frequency in Each Type of Land Use

| **Semarang City** | |
|---|---|
| **Type of Land Use** | **SOM Cluster** |

| | Cluster 1 | Cluster 2 | Cluster 3 | Cluster 4 | Cluster 5 | Cluster 6 | Cluster 7 |
|---|---|---|---|---|---|---|---|
| Residential (Housing) | 52% | 48% | 38% | 41% | 38% | 58% | 0% |
| Offices | 5% | 6% | 10% | 0% | 0% | 3% | 20% |
| Education Facilities/School | 3% | 2% | 6% | 5% | 25% | 0% | 0% |
| Public Health Facilities | 0% | 0% | 2% | 5% | 6% | 0% | 0% |
| Trade and Service Centers | 29% | 32% | 34% | 36% | 19% | 23% | 60% |
| Open Spaces | 2% | 5% | 2% | 5% | 0% | 10% | 20% |
| Others | 10% | 7% | 8% | 9% | 13% | 6% | 0% |
| Total | 100% | 100% | 100% | 100% | 100% | 100% | 100% |
| | | | | | | | |
| **Yogyakarta City** | | | | | | | |
| **Type of Land Use** | **SOM Cluster** | | | | | | |
| | **Cluster 1** | **Cluster 2** | **Cluster 3** | **Cluster 4** | **Cluster 5** | **Cluster 6** | **Cluster 7** |
| Residential (Housing) | 44% | 57% | 50% | 40% | 58% | 39% | 40% |
| Offices | 11% | 7% | 0% | 10% | 8% | 10% | 10% |
| Education Facilities/School | 11% | 7% | 13% | 10% | 0% | 2% | 3% |
| Public Health Facilities | 0% | 0% | 25% | 6% | 0% | 5% | 7% |
| Trade and Service Centers | 33% | 14% | 13% | 15% | 25% | 22% | 27% |
| Open Spaces | 0% | 0% | 0% | 0% | 0% | 0% | 3% |
| Others | 0% | 14% | 0% | 19% | 8% | 22% | 10% |
| Total | 100% | 100% | 100% | 100% | 100% | 100% | 100% |

Although there was no specific pattern of activity location choice for each online activity characteristic, the location selection factors were still considered. Location selection factors (**Table 1**) that lead to the convenience and completeness of facilities remained the main consideration for online activity actors, especially in Yogyakarta City. Residential and trade and service areas were attractive locations as physical spaces to carry out virtual activities due to convenience and completeness of facilities, including online learning, online working, online health consultation. This relationship was then proven by correlation analysis.

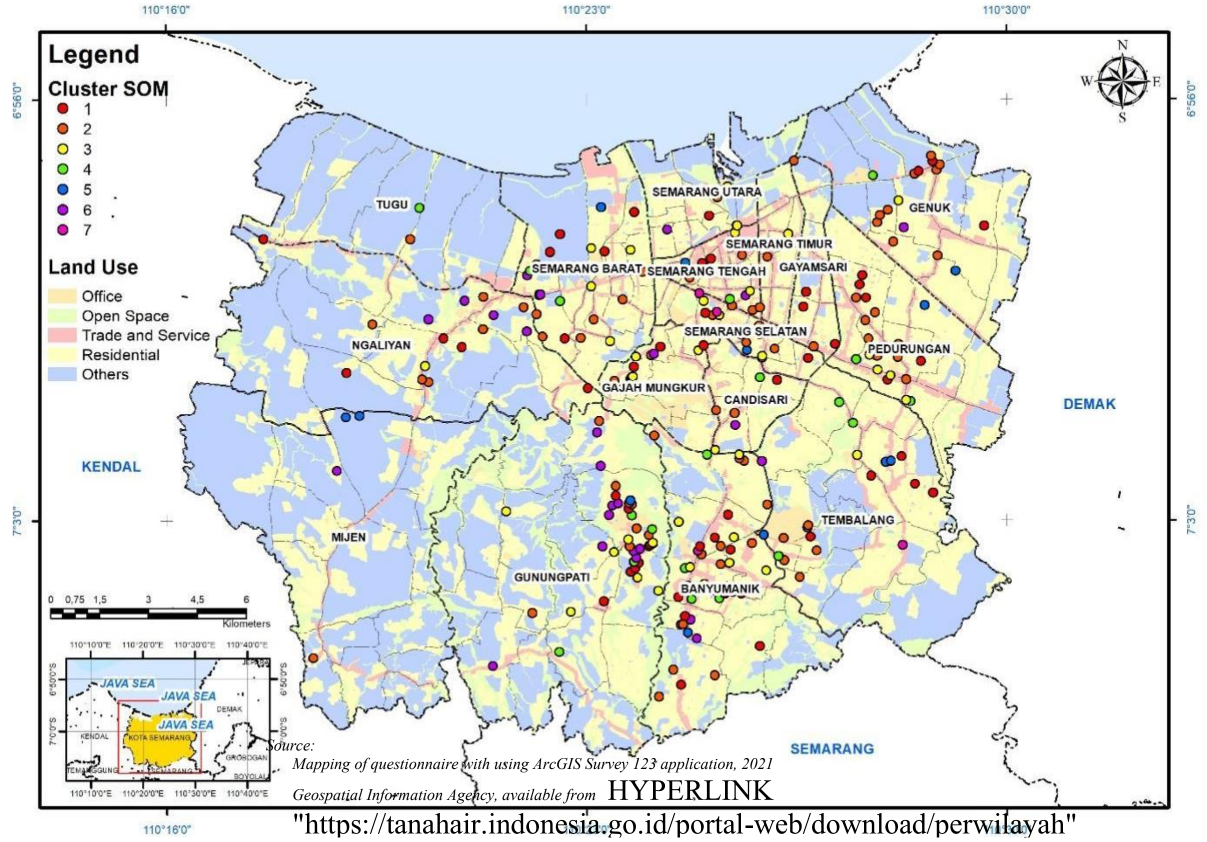



**Fig. 3.** SOM Cluster Distribution Maps on Land Use in Semarang City

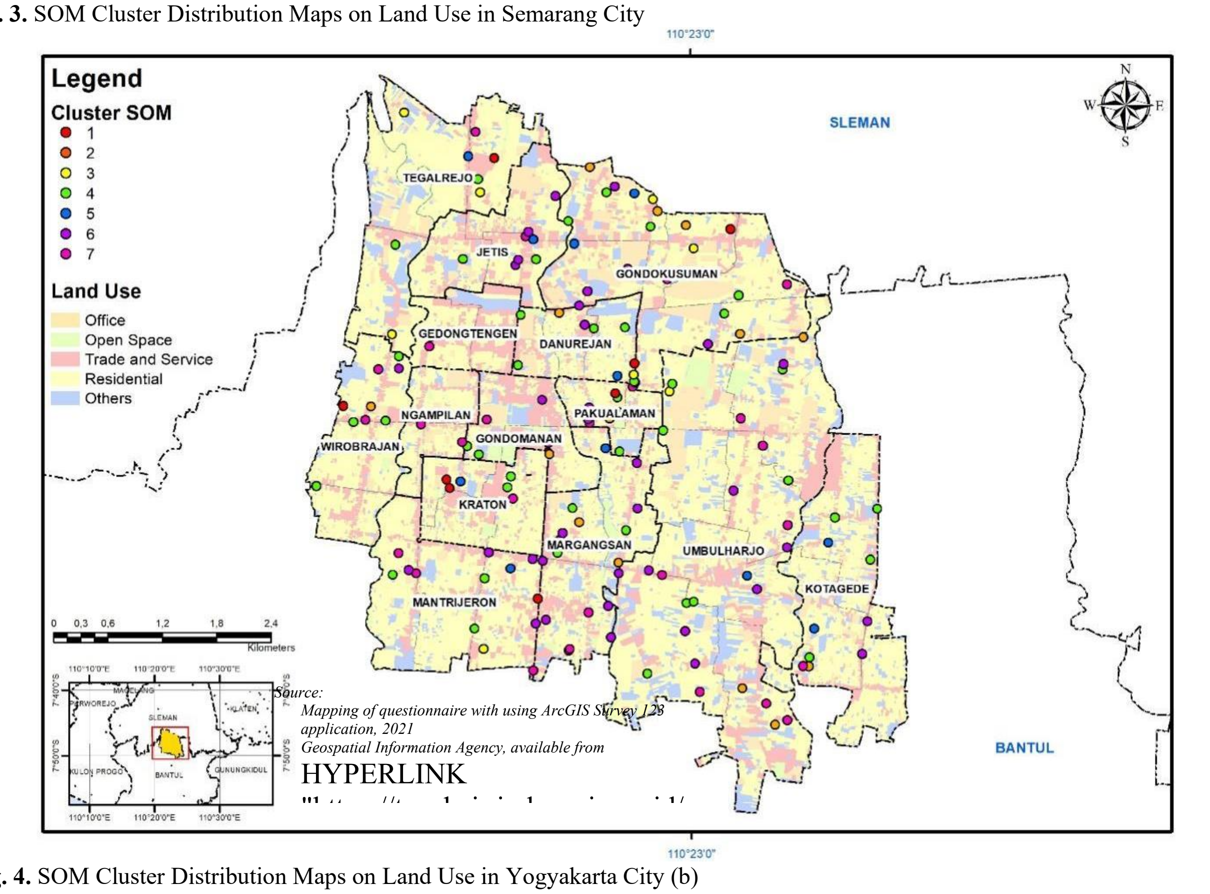



**Fig. 4.** SOM Cluster Distribution Maps on Land Use in Yogyakarta City (b)

### 3.2 The Influence of the Characteristics of Online Activities on the Choice of Activity Spaces

The analysis was carried out using the Contingency Coefficient C method. The variables identified as related to the characteristics of online activities (represented in the SOM clusters and their constituent variables) on the choice of space (represented by the types of land use). Based on the analysis results utilizing the SPSS software, the resulting significance value of Contingency Coefficient C was greater than 0.05 (a value of 0.05 was used because the tolerable error rate was 5%). It means that $H_0$ was accepted and $H_1$ was rejected. The characteristics of online activities and the choice of space did not have an exclusive effect on each other. The value of Contingency Coefficient C was identified as being in the range of 0.300 (0.395 for Semarang City and 0.378 for Yogyakarta City) (Table 5). According to Table 2, these values were moderate relationship strength with a low tendency. This relatively weak relationship further strengthens the hypothesis that the characteristics of the online activities did not influence the choice of location or space for conducting online activities and vice versa. These results proved that online activities could be done anywhere without specific locations or implementations.

**Table 5.** Value of C and Significance Value of C

| | Semarang City | Yogyakarta City |
|---|---|---|
| **Value of C** | 0.395 | 0.378 |
| **Significance Value of C** | 0.52 | 0.861 |

The development of online activities broke down physical boundaries in the initial concept of space for a person to carry out various activities. For example, when people did online shopping activities, they did not need to come to a certain location or space designated specifically for buying and selling activities such as stores, malls, supermarkets, and the like. Likewise, other types of activities carried out online did not require a specific location according to the characteristics of the activities. Direct face-to-face interaction between interested parties was unnecessary for these online activities. The exchanges of goods or services were carried out in the internet network and took place in the virtual space. The activity space of online activity moved to virtual space, a computer-generated or invisible space where interactions and activities of the users occur in an IoT network system [13, 36, 37]. This virtual space was formed due to the exchange of information when carrying out activities, which were not limited by clear physical space boundaries. Physical space became less important when someone was doing an online activity.

The results of this study were in line with the conceptual idea put forward by Yu and Shaw [13], stating that the existence of online space or virtual space made physical space less considered by people to carry out their activities. In addition, the results of this study also showed the phenomenon of space increasingly losing its physical dimension, as stated by Virilio [38]. This physical dimension disappeared as everyone could interact with other individuals in different physical spaces or locations. The factors of distance and time attached to this spatial dimension no longer become barriers for individuals to carry out their activities and interact with other individuals who are not in the same location.

The characteristics of online activities that could be done anywhere were open opportunities for urban resilience development. Urban resilience was the ability of communities and urban systems to survive, recover, and actively adapt and change themselves to various possibilities that occur in the present and the future so that the sustainability of the city and the life in it could be maintained [39-41]. The characteristics of this free choice of activity space allowed online activities to reduce the physical exposure of an area. The reduced physical exposure of an area was one indicator of urban resilience from the physical and environmental aspects. Online activities made it possible to reduce physical exposure while maintaining environmental balance through pro-disaster mitigation land-use arrangements. Both were part of efforts to create urban resilience from the physical and social aspects of the environment [39-42].

## 4 Conclusions

The absence of a relationship between the characteristics of online activities and the choice of activity space indicated that any online activity did not require a specific type of physical space represented in a land-use pattern. Online shopping activities did not need to be carried out in the trade and service area. Online learning and online health consultation activities did not need to be carried out in the education and health areas. The characteristic of physical space as activity space is getting less considered. It is due to virtual space as the real activity space for online activity. The virtual space is imaginary and not visible, but its existence is real.

It has implications for land use patterns that no longer depend on the type of human activity. Online activities can be carried out on any type of land use as long as there is an internet network and the location is convenient according to the preferences of each actor. There will be land-use efficiency because there is a tendency for several types of productive uses that are no longer needed in large areas. Therefore, if many community activities are carried out online, land use can be arranged more as needed. In the long term, this pattern will lead to urban resilience.

In terms of implementation, the development of online activities to build resilience is possible in Industry 4.0 era and post-Covid-19 pandemic. It is related to the various uses of IoT in human life in the industry 4.0 era, accelerated by the outbreak of the Covid-19 pandemic, which forces people to maintain a safe distance and limit mobility. In such a situation, the development of online activities can become an effort to build urban resilience, especially in the physical and social aspects of the environment. The conclusion of this study will be complete if it is followed by research that observes the level of influence of the development of online activities to increase the resilience of a city.

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