

The Space Flexibility of Techno Park Facility for Vocational Education Development in Cimahi City

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Abstract—Cimahi has an integrated area that allows the growth of creation, interaction, and collaboration between Creative Industry stakeholders (academics, business, government, community, and media). Cimahi Techno Park supports skills and competency development activities such as training, exhibitions, seminars, accelerations, incubations, etc. All facilities are available free of charge as a form of government support in improving quality human resources. This research aims to describe the flexibility space which was applied in Cimahi Techno Park. With so many functions and activities, the space processing is needed that will affect the flow of dynamic activities, thus it can create optimal activities in using the creative area. Then, the application of space flexibility is a solution in managing space to suit your needs in accommodating various activities at Techno Park. The research was focused on the application of space flexibility on the space that accommodated vocational activities in Cimahi Techno Park. The method of this research was evaluative descriptive research with Post Occupancy Evaluation (POE). The data accumulation was implemented by observation, interview, and literature study. The results showed that the application of flexibility in layout in the category low and medium, flexibility in dimensions of space in the category medium and high, and the flexibility of multifunctional space in the category low, medium, and high.

Keywords—*techno park, flexibility space*

I. INTRODUCTION

Cimahi Government is one of the most advanced in West Java in terms of support for creative industry development. The government began to explore the potential of its territory so that it would have a direct impact on the development and equalization of the creative economy in general. There are many ways that the government can create conditions to keep the creative industries growing. Cimahi Techno Park has a building area of $\pm 2,000$ m² which is used as a platform to create, interact and collaborate with creative actors, this area accommodates the diversity and complexity of the activities of actors in it. Cimahi Techno Park itself always involves many parties meaning this creative area is very open for all institutions to discuss with each other to add value to economic growth.

Telematics and animation clusters as highlighted clusters and at the same time as the most active clusters in organizing activities in 2019. Activities in collaboration with governments, businesses, creative communities, and academics. Many participations and engagements between industry and vocational schools or universities, this shows the success of link and match vocational education programs. Link and match programs are expected to have great potential in improving competent human resources, therefore vocational education can know what the industry needs. Vocational activities such as organizing industry visits, workshops, festivals, and competitions. Cimahi Techno Park does not close other clusters to create similar activities. All activities need to be packed in one area, then the principle of flexibility can be a solution, to increase the advantages and functionality of the building itself.

The design of the space in a public area should also handle attention to the social processes that occur in it so that in addition to the physical aspects of the building, non-physical aspects such as activities and social behavior of its users. With many functions and activities, it takes the processing of space that will affect the flow of dynamic activities so as to determine optimal activities in using the creative area. Therefore, space flexibility is very important to consider the complexity of activities, user capacity, and the efficiency of space usage. So that under certain situations space can be adapted adjusting the capacity to be accommodated, the situation of the space you want to display, and the function of the space you want to create. Based on the exposure, this research was conducted to find out the general picture of space in Cimahi Techno Park, as well as evaluate the application of the principle of space flexibility in Cimahi Techno Park.

II. REVIEW OF RELEVANT LITERATURE

A. Techno Park

Science Techno Park is defined as a professionally managed area aimed at improving the welfare of its members through the creation and improvement of ecosystems that support innovation to increase the competitiveness of the industries and institutions within its auspices [1]. Techno Park is an area (based on technology) where various technologies

can be exhibited, displayed, used, developed, and commercialized [2]. It can be concluded that Techno Park is a means of developing creative ideas as well as the science results from research. It is equipped with modern facilities to encourage the growth of technological innovation with the involvement of all stakeholders such as governments, businesses, academics, and the public. The objectives of technopark are as follows:

- Produce a wide range of innovative products based on science and technology.
- Give to develop new companies.
- Commercialized products resulting from innovation to have a broad impact on the community on benefits, and have an economic impact on regional development.

B. Flexibility

The flexibility of space usage is a possible nature of the use of space for various properties and activities, as well as the ability to change the arrangement of the space according to the needs without changing the order of the building [3]. Flexibility in buildings is a response to change and reacts to the building's shape, adapting to new changes, so it is not stagnant [4]. So in this case, the flexibility of space in architecture is a concept that allows the space to change by adjusting to the activity needs of its users.

There are several factors under which space flexibility is needed, including Human Factors, Technology Advancement Factor, and Economic Factors. There are three concepts in space flexibility [3], namely:

- **Expansibility.** It is a designed space designed to enable growth through the expansion of space concerning the function of the space. There are flexible spaces that are restricted to temporary limitations as a way of dealing with them.
- **Convertibility.** It is a space designed with the possibility of changes in orientation, layout, and usage needs, without a major change of existing rooms.
- **Versatility.** It is a space design that accommodates other spaces in it so that it can accommodate various activities in the period of one building. Or treat various inside activities at different times. Versatility leads to the functioning of the space taking into account the suitability of the treated activities, the possibility for several types of use of activities, interference from activities carried out concurrently.

While, there are five concepts in space flexibility [5], namely:

- **Adaptable.** It is a principle defined as a fixed structure (fix component) that can be adapted with movable or altered partitions for each use (non-fix component).

- **Universal.** Design principles with ease to be adapted to a wide range of different uses. Often identical to open floor design or free typology.
- **Moveable.** It is a building design consisting of relocatable or repositionable structures or buildings that can be torn down and reinstalled in other locations.
- **Transformable.** Design principles characterized by modular design (able to add or remove units or components), transformable structures can also open, close, change shape, or change color.
- **Responsive.** It is a building design by responding to several stimulants from the outside and can adjust its use so that it can display different characters.

From both theories of flexibility, there are three indicators of space flexibility namely as follows:

- **Flexibility of space layout.** Change orientation and atmosphere according to needs. The flexibility indicator layout or spatial layout adapts from the convertibility theory of Toekio, and moveable from Geoff.
- **Flexibility of space dimensions.** Respond to space needs by expanding or modifying spaces and customizing them. Indicators of the flexibility of the area or dimensions of space adapt from the expansibility theory of Toekio, and adaptable and transformable from Geoff.
- **Flexibility of space multifunctional.** Allows the use of space that can accommodate more than one activity function. The flexibility indicator of the multifunctional nature of space adapts from the versatility theory of Toekio, and is universal and responsive from Geoff.

All indicators can be felt directly to achieve the efficiency and effectiveness of space so that the creation of flexibility of space that can accommodate a variety of activities.

III. METHODS

This research uses a descriptive evaluative approach, in the form of after-habitation evaluation or known Post Occupancy Evaluation (POE). Post-occupancy evaluation (POE) method is a review of the building and or residential environment, there are three aspects of POE: technical, functional and behavioral [6]. Researchers limited the study's focus to functional aspects related to flexibility. Functional aspects concern all aspects of buildings that directly support the user's activities with all their attributes (as individuals or groups). Layout affects user activity and overall functionality. Failures in design can lead to the inefficientness of a building.

There are steps in conducting Post Occupancy Evaluation (POE) research as follows Planning The POE, Conducting The POE and Applying The POE [7].

A. Planning the POE

The initial steps are implemented to formulate research problems according to the conditions in the field. Then do a research plan.

B. Conducting the POE

At this stage, researchers prepare for the collection of the necessary data in the study. The data accumulation was implemented by observation, interview, and literature study. And finally analyze the data that has been obtained. Analyze data with use category by comparing the conditions studied with the parameters. Calculations in the analysis to produce category of high, medium and low flexibility levels on each sub-variable.

C. Applying the POE

The collected data is then created in the form of writing or reports, then obtained suggestions and recommendations.

improving competitiveness and social empowerment through the utilization of the superior potential of Cimahi. The area has a building area of 5,627 m² with a two-floor building, one basement, and green open space around the area. As a public space, Cimahi Techno Park becomes a container frequented by Cimahi society.

Based on the results of observations, the use of space is carried out at the same time and the variety of activities then it is necessary to examine the flexibility of space in Cimahi Techno Park. The selection of research objects is based on spaces that accommodate a variety of vocational activities. Vocational education has a role to play in the development of the creative economy. One of the efforts that the purpose of vocational education is to maximize its role in economic development is to build harmony (link and match) with the world of work in particular [8]. Vocational education leads to more actual learning than textual and demands pro-active vocational education closer to the world of work. Vocational activities such as workshops, industry visits, festivals, and competitions. Here's the basis for room selection based on vocational activities (see table 1):

IV. RESULTS AND DISCUSSIONS

Cimahi has one of 100 Techno Parks developed in Indonesia called Cimahi Techno Park. Cimahi Techno Park aims to be a creative and innovative area integrated into

TABLE I. TABLE ACTIVITIES

No	Area	Activities	Users
1.	Co-working space	As an working space and sometimes an exhibition place. A shared office that can be used by interns.	governments, businesses, creative communities, and academics.
2.	Creative corner	For discussions and meetings with a touch of more interactive design.	
3.	Training room	Where to develop and lead competency skills.	
4.	Multimedia Room	Where to develop and lead competency skills with computer media facilities. sometimes as a place of competition in telematics and animation.	
5.	Convention Hall	Meeting places, exhibitions, and festivals. Many vocational schools or colleges carry out industrial visits.	

Source: analysis result, 2020.

Vocational activities give benefit skills, industry insights, science, and technology insights, and increase the sense of competing in the world of work. Vocational activities are open to collaborating with governments, industry, creative communities, and academics. There is a lot of participation and engagement between the industry and vocational schools

or colleges, this shows the success of the link and match vocational education program in the telematics and animation clusters. Therefore, five spaces have the potential to accommodate a variety of activities, namely a training room, multimedia room, co-working space, creative corner, and convention hall.

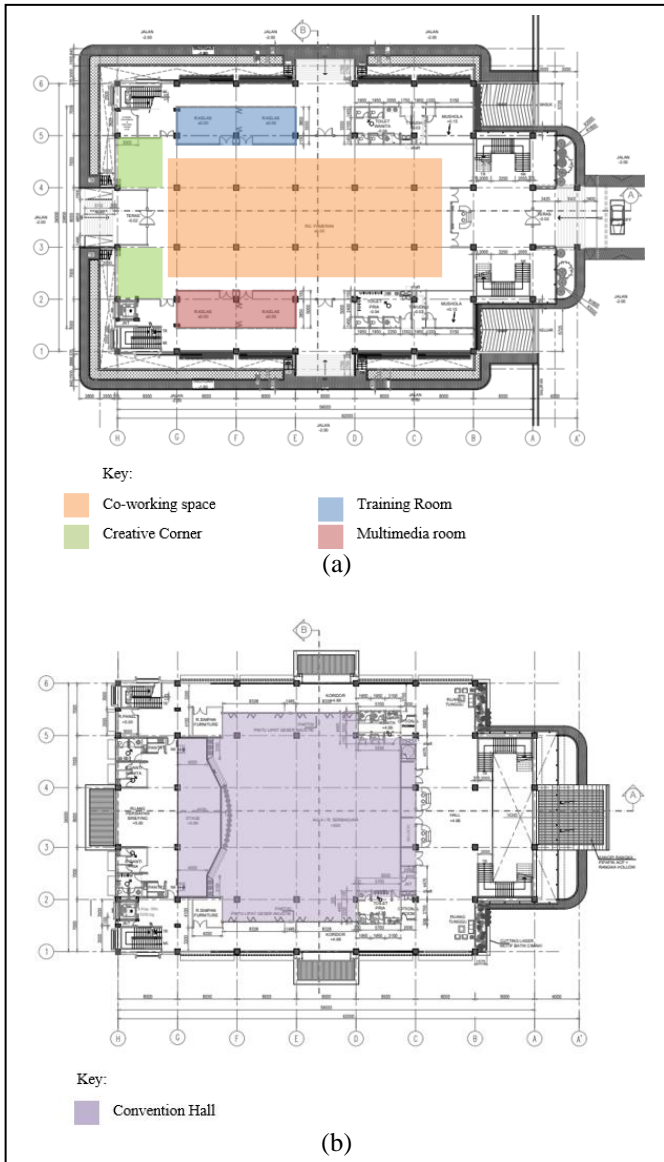


Fig. 1. (a) 1st Floor Plan of Cimahi Techno Park, (b) 2nd Floor Plan of Cimahi Techno Park (Source: UPT Cimahi Techno Park, 2020).

Based on figure 1, on the 1st floor of Cimahi Techno Park building is filled by a space that houses various activities. Before entering the center area, the initial section is a lobby that provides reception and lounge services. Then enter the center area separated by a space limitation, there is a co-working space, creative corner, training room, and multimedia room. In addition to the room, there is also a service room, namely toilet and prayer room for Cimahi Techno Park users. As for the 2nd floor of Cimahi Techno Park building is mostly allocated for the convention hall and the management area. Access to reach the 2nd floor can be through the two main stairs available in the lobby area. Cimahi Techno Park has not installed elevators as vertical circulation but has provided elevator rooms from the planning stage. In reviewing the flexibility of space in Cimahi Techno Park, 3 sub-variables will

be examined. The observation results can be dimensional data and conditions in each room with several indicators.

A. Flexibility of Space Layout

To organize a space, the correct arrangement of proportions will create an atmosphere of comfortable space. Even more, if the arrangement of furniture with the correct proportions adds to the sense of comfort and harmony of the space. Determining the flexibility of layout needs to know the layout of the furniture. Because the ease of activity is influenced by the setting of the room, namely easy circulation and the laying of furniture in a space that is not intrusive.

Laying furniture is important in organizing space, a space often makes layout changes. But that change will be hampered if the furniture used is impractical, heavy, and not as needed. Furniture layout can form circulation lines as well as space limitations. Finding by its mobile or moving nature, the easier the higher the flexibility. So that furniture can facilitate as needed now or in the future. This is supported by easy use in terms of shape and material.

TABLE II. FLEXIBILITY OF SPACE LAYOUT RESULT

No.	Room	Persentase	Flexibility
1	Training room	44,4%	Medium
2	Multimedia room	26,6%	Low
3	Co—working Space	22,2%	Low
4	Creative corner	60%	Medium
5	Convention Hall	20%	Low

Source: analysis result, 2020.

Based on the observation results, not all rooms in Cimahi Techno Park meet the flexibility of the room concerning furniture in flexibility of space layout (see Table 2). The space in Cimahi Techno Park is not entirely appropriate in selecting and placing furniture. The selection of furniture should be considered the material of its shape and function to suit the needs of its users. Therefore, flexibility is very important in considering the complexity of activities by adjusting the situation of the space that wants to be displayed so that the spaces can support a variety of vocational activities. Furniture is one of the ever-existing categories of design elements and is an intermediary between architecture and humans [9]. Flexible furniture meets efficient, multifunctional, and adaptable elements. While in placing furniture, avoid placements that can interfere with the circulation of users in activities in the space. As the manager of Cimahi Techno Park said, that the use of furniture is flexible. The use of furniture in one room can also be used by other spaces to suit the needs of the activities.

B. Flexibility of Space Dimension

The Flexibility of space dimensions is determined by the size of the room including the capacity, as well as the space limiting element used. To create a space study based on the flexibility of the area, it is necessary to know the standard of the occupant capacity, the space limiting element, and the space opening element.

To determine the need for space area or dimension, a standard of space is required based on literature studies. Here is a table of analysis of the suitability of existing space conditions in Cimahi Techno Park with room standards based on the architect's data by Neufert.

Room capacity analysis, the training room has not met the room standards. For a training room with a capacity of 30 people with an area of 40 m². This means that 1 person has only an area of 1.3 m², while the standard is 2 m²/person. The multimedia room already meets the standard of space, the capacity of 13 people with an area of 40 m². This means that 1 person has an area of 3.07 m², while the standard is 2 m²/person. The co-working space already meets space standards. For co-working space the capacity of 80 people with an area of 788 m². This means that 1 person has only an area of 9.8 m², while the standard is 4 m²/person. Creative corner already meets the space standard, having a capacity of 20 people for the southern area and 12 people for the northern area

with an area of 40 m² per space. This means that one person has an area of 2.1 m² in the south and 3.5 m² in the north, while the standard is 2 m²/person. And the Convention Hall already meets the standard of space with a capacity of 1000 people and an area of 840 m². This means that 1 person has only an area of 0.84 m², while the standard is 0.8m²/person.

Walls are needed to limit space or divide the types of activities, so a temporary limitation is required that can cope with a large or small quantity of users. space design enables growth through the expansion of space with regard to the function of space. The easier the expansion that can be done in the room the higher the flexibility. The selection of temporary limitations aims that in the event of a transfer of the primary space function to the next does not affect the structure of the building. There are several types of walls used in Cimahi Techno Park, namely brick walls as main walls, partition walls, and acoustic walls.

TABLE III. FLEXIBILITY OF SPACE DIMENSION RESULTS

Room	Existing	Desc.	Flexibility
Training room Multimedia room		Brick wall and operable partition	Non Fix Medium
Co-working space		open plan concept	Non Fix High
Creative corner		Brick wall and space limiting temporary	Non Fix Medium
Convention hall		Acoustic wall with carpet finishing and operable partition	Non Fix Medium

Source: analysis result, 2020.

Based on the observation results, the entire space in Cimahi Techno Park meets flexibility related to the space limiting element in the Flexibility of space dimensions (table 3). Therefore, flexibility is very important in considering the expansion of space by adjusting the capacity to be accommodated so that the spaces can support a variety of vocational activities. As the management of Cimahi Techno Park said, the implementation of wall limitation has been considered at the planning stage. As in training rooms and multimedia rooms that use operable partition because it is able to provide a limited quantity of people or more. The application of walls is precise in dividing the spaces according to their function. And it meets the elements of non-fix space that can be changed in size and boundaries without affecting the structure of the building.

C. Flexibility of Space Multifunctional

The function of the room with the possibility to accommodate several types of use of activities or interference from activities carried out simultaneously. The more diverse activities that can be done in the room the higher the flexibility. This makes it easy to adjust to a wide range of different uses.

TABLE IV. FLEXIBILITY OF SPACE DIMENSION RESULT

Room	Activities	The nature	Flexibility
Training room	Training	closed	Low
Multimedia room	Training	closed	Low
Co-working Space	Office Exhibition	opened	Medium
Creative corner	Meeting Development	opened	Medium
Convention Hall	Gathering Seminar Festival dan Exhibition	closed	High

Source: analysis result, 2020.

The training room and the multimedia room is closed because the room has a special function as a training space. Both spaces are restricted from the outside view to meet the comfort and privacy needs when the activity takes place indoors, so the Flexibility of space multifunctional is in a low category because it only accommodates one variety of activities (table 4). The co-working space and creative corner have an open plan because it has a space function that houses more than one variety of activities. The open plan also allows space to more easily connect with other spaces. so the Flexibility of space multifunctional is in a medium category because it is able to accommodate more than one variety of activities. The convention hall is able to host three kinds of activities, but this space has an enclosed because in its uses the space limits from disturbances that provide inconveniences such as sound, vibration, and light. So the Flexibility of space multifunctional is in a high category because it is able to accommodate three kinds of activities.

Based on the observation results, some rooms in Cimahi Techno Park have been able to host a variety of activities, especially vocational activities of animation & telematics. The more diverse activities that can be done in the room the higher the flexibility. Therefore, flexibility is very important in considering the efficient use of space by adjusting the function of the space that wants to be created so that the spaces can support a variety of vocational activities. The space that has been studied meets the flexibility of space, which is the space that can accommodate various activities in the period of one building, or host various activities at different times. As the manager of Cimahi Techno Park said, that many activities are done together on the 1st floor. This is because it has considered the need for connections between spaces that are easier, open, and have a less formal impression. Here's an overview of the function of the convention hall.

1) *Meeting function:* As a meeting function, the convention hall is able to accommodate up to ±100 people with the configuration of the gala dinner model. Where each audience is formed in a small group in one dining table (figure 2).



Fig. 2. Layout of meeting function (Source: analysis result, 2020).

2) *Seminar function:* As a seminar function, the convention hall is able to accommodate up to ±250 people with the configuration of the classic model (figure 3).



Fig. 3. Layout of Seminar Function (Source: analysis result, 2020).

3) *Festival and exhibition function:* As a area for festivals and exhibitions, the convention hall is able to accommodate up to ±1000 people with a small configuration of classic model seats and several booths on the side and back of the audience (figure 4).



Fig. 4. Layout of festival and exhibition function (Source: analysis result, 2020).

Of all spaces, the Convention Hall becomes the most flexible concerning the Flexibility of space multifunctional. The function of the convention hall can accommodate according to the needs of its users, as a meeting place, seminar, festival and exhibition. The layout can be configured to customize the type of activity.

V. CONCLUSIONS

By viewing in terms of the completeness of facilities the space in Cimahi Techno Park has been fulfilled and in good condition. All activities can be well facilitated. For the development or change of space is dynamic and flexible to keep up with the needs of the user, but still has a long-term and medium-term plan.

The application of flexibility of space layout to Cimahi Techno Park has been met in the low and medium categories. The application of flexibility of dimension in Cimahi Techno

Park, reviewed from the capacity of the room obtained results that there is only training room that does not meet the standard. While, when reviewed expansion capabilities, all rooms meet the medium and high categories. The application of flexibility of multifunctional in Cimahi Techno Park obtained the result that all room meet the category of low, medium and high.

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