



Mapping Facilities and Infrastructure at the Postgraduate Program at Jambi University with the Analytic Hierarchy Process Method

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Abstract. Provision of facilities and infrastructure needed to support the teaching and learning process at the postgraduate program at Jambi University. Open space for yards and building rooms needed in education are influenced by Visibility, Accessibility, Flexibility, Beauty and Comfortable. This study aims to determine the weight of facilities and infrastructure in supporting the teaching and learning process at the Postgraduate Program at the University of Jambi based on the Analytical Hierarchy Process (AHP) method. The results of the AHP analysis showed that the building rooms had a weight of 0.83 and an open yard of 0.17. Then for the open page, the largest weight was found on Accessibility with a weight of 0.31 while the building space the largest weight on Flexibility with a weight of 0.34. Then for open yard has the largest weight on Accessibility with a weight of 0.31 while the building rooms weighs the largest on Flexibility with a weight of 0.34. Alternative facilities and infrastructure needed show that the Lecture Room and Seminar Room have the largest weight of 0.76. The construction of facilities and infrastructure for education is very necessary, especially for a more flexible building rooms for lecture room activities and student seminars.

Keywords: Accessibility · AHP · Flexibility · Lecture Room

1 Introduction

The establishment of the Postgraduate Program at the University of Jambi began in 2001 by organizing the Strata-2 (S2) Program, namely the Master of Management (MM) Study Program at the Faculty of Economics, University of Jambi based on Decree of the Director General of Higher Education of the Ministry of National Education of the Republic of Indonesia No 51/DIKTI/Kep/2001 date February 20th 2001. Further based on Decree of the Director General of Higher Education of the Ministry of National Education of the Republic of Indonesia No 2298/D/T/2001 date July 4th 2001, The Higher Education grants permission to implement the Master of Development Economics Study Program for the Strata-2 (S2) and in 2005, the Faculty of Law, University of Jambi opened a Master of Law Program with a permit to implement Decree of the Director General of

Higher Education of the Ministry of National Education of the Republic of Indonesia No 3126/D/T/2005 date September 22th 2005. In 2007 Jambi University established the Master of Educational Technology Program based on the permit to implement Decree of the Director General of Higher Education of the Ministry of National Education of the Republic of Indonesia No 3807/D/T/2007 date November 16th 2007. The Agribusiness Masters Study Program was opened in 2008 based on the Decree of the Director General of Higher Education of the Ministry of National Education of the Republic of Indonesia No 1690/D/T/2008 date May 27th 2007 and the opening of the Master of Science Education Study Program based on the Decree of the Director General of Higher Education No 221/D/O/2010 date December 17th 2010 and Master of Animal Science Study Program.

The current condition of the Jambi University Postgraduate Program has 24 study programs consisting of 5 (five) Doctoral Programs and 19 (Nineteen) Master Programs. Postgraduate programs are divided into monodisciplinary and multidisciplinary programs. The existence of monodisciplinary programs exists in the faculty for multidisciplinary programs under postgraduate management. There are 7 (seven) study programs managed by postgraduates, namely; Doctoral Study Program in Education, Doctoral Study Program in Mathematics and Natural Sciences Education, Doctoral Study Program in Agricultural Sciences, Master of Environmental Science Study Program, Master of Population and Employment Study Program, Master of Science Education Study Program and Master of Educational Technology Study Program.

In realizing the Vision and Mission of the University of Jambi and Postgraduate, in addition to the need for superior human resources and supporting infrastructure for the implementation of the Teaching and Learning Process (PBM) is also needed. The facilities needed for the smooth running, comfort of lectures and management of Doctoral and Master Program students under postgraduate management require infrastructure for the leadership room (Postgraduate Director's room, Deputy Director's room), academic staff room, financial staff room, facility care building, room for study program managers, lecturer room, room for lectures and seminars, laboratory room, computer room, room for thesis and dissertation exams and library room. A good space will support the academic atmosphere both during lectures and to complete the final project (Thesis and Dissertation).

The current condition of the use of facilities and infrastructure at the Postgraduate Program at the University of Jambi is not optimal so that it has an impact on the teaching and learning process and services for postgraduate students. The facilities and infrastructure needed include open spaces such as courtyards or yards and building spaces. Determination of the needs of facilities and infrastructure can be determined from weights based on the Analytical Hierarchy Process (AHP) [1, 2]. For weight determination, it is necessary to conduct a study on mapping facilities and infrastructure in supporting education, because educational facilities and infrastructure greatly affect the smoothness and continuity of the learning process for each study program under the management of the Postgraduate Program of Jambi University.

This study aims to determine the weight of facilities and infrastructure in supporting the teaching and learning process at the Postgraduate Program at Jambi University based on the Analytical Hierarchy Process (AHP) method..

2 Methods

Place and Time of Research

The research was conducted in the Master and Doctoral Study Program at the Postgraduate Program at the University of Jambi. The time of the study was conducted from June to September 2022.

Data Collection Methods

The study used primary data and secondary data. Primary data are obtained by making observations, survey calculations and room measurements in each study program. Primary data is the result of measuring room capacity and room usage from each study program. Then the secondary data is taken from the existing system at Jambi University, such as; siakad@unja.ac.id. Data analysis using AHP software [1].

In AHP, an assessment of the criteria, subcriteria and alternatives is carried out. The criteria are divided into building room and open space for the courtyard. Sub criteria is divided over; Visibility, Accessibility, Flexibility, Beauty, Comfortable. Being alternative is divided over; Self-Study Room, Common Room or hall, Lecturer Room, Pray Room, Lecture Room and Seminar Room, Laboratory Room and Library Room, Tendik Room, Computer Information Technology Room.

Data Analysis

Data that has been collected through surveys and observations directly (primary data) and secondary data will be analyzed using descriptive methods using a quantitative approach [3]. A descriptive research method is research intended to investigate circumstances, conditions or other things already mentioned, the results of which are presented in the form of a research report [4]. While quantitative research methods can be interpreted as research methods based on the philosophy of positivism, used to examine certain populations or samples [5]. The data that has been collected is then analyzed using AHP [6].

The working principle of AHP is the simplification of a complex problem that is unstructured, strategic, and dynamic into its parts, and organizing in a hierarchy. Graphically, the AHP decision issue can be constructed as a multilevel diagram, which starts with goals, then criteria, subcriteria, and alternatives. Criteria and alternatives are then assessed through pairwise comparisons on a scale of 1 to 9 [1] in Table 1 of the following:

Table 1. Criteria and alternative comparisons in pairs

| Value | Information |
|---------|--|
| 1 | Criterion/alternative A is as important as criterion/alternative B |
| 3 | A is slightly more important than B |
| 5 | A is definitely more important than B |
| 7 | A is very clearly more important than B |
| 9 | A is absolutely more important than B |
| 2,4,6,8 | When in doubt between two values close together |

Relative comparison values are then processed to determine the relative rating of a criterion/alternative, then weights or priorities are calculated by manipulation of matrices or mathematical equations. After weighting, a consistency test is then carried out to find out whether the paired comparison has been carried out consequently or not.

In AHP, consistency calculations are required. The CI (Consistency Index) calculation which states the deviation of consistency and the CR (Consistency Ratio) states a measure of whether or not a judgment or weighting of comparisons in pairs is consistent.

It is necessary to test the consistency level of weighting, because in the actual circumstances there will be some deviations from the relationship, so the matrix is not perfect consistency. This happens due to inconsistencies in one's preferences. Deviations from consistency are expressed by a consistency index, with the equation:

$$CI = \frac{\lambda_{maks} - n}{n - 1}$$

where λ_{maks} = maximum characteristic root

n = matrix size.

Consistensi Index (IC) is a random matrix with a valuation scale of 9 (1–9), along with its opposite as a random index (RI).

$$CR = \frac{CI}{RI}$$

To find out the consistency thoroughly from various considerations can be measured from the Consistency Ratio (CR) value. The Consistency Ratio value is a comparison between the Consistency index (CI) and the Random index (RI), where the RI value has been determined. The comparison matrix is acceptable if the CR value ≤ 0.1 [1, 7], when > 0.1 , then the previous steps must be repeated again.

3 Results

The provision of facilities and infrastructure to support education in the master's program and doctoral program at the Postgraduate Program at the University of Jambi is very necessary. Division of space by its function and utilization. The space is divided into 2 parts, namely an external space which is an open space as a courtyard or vehicle parking and a building space for learning activities. The processed results show that the criteria for building space has a weight of 0.83 while the open space for the courtyard has a weight of only 0.17, can be seen in Fig. 1.

The measurement results of facilities and infrastructure in open spaces and building spaces based on visibility, Accessibility, Flexibility, Beauty and Comfortable show that for open spaces the highest weight is Accessibility (0.31) in Fig. 2, while in the building space Flexibility gives the highest weight (0.34) in Fig. 3.

The weight measurement of each alterntaif based on sub-criteria (Table 2 and Fig. 4) shows that the Lecture Room and Seminar Room have the highest weight (0.76). While the lowest weight is in the alternative Common Room or hall (0.30).

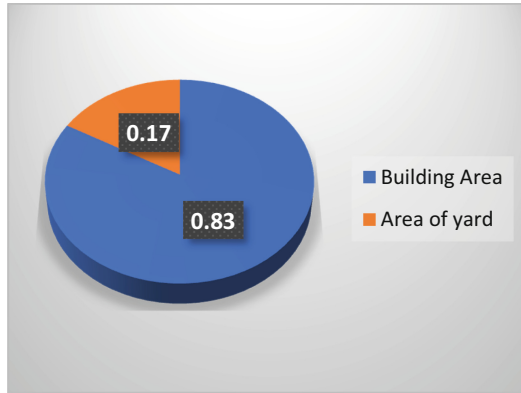


Fig. 1. Criteria for building area and area of yard

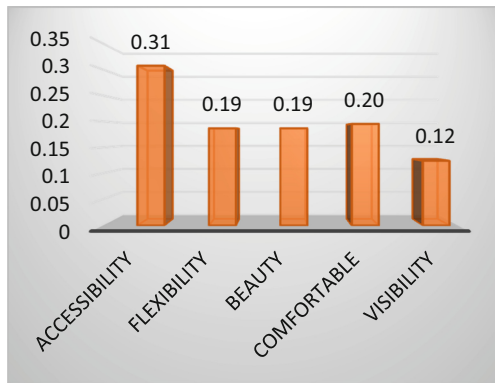


Fig. 2. Area of yard

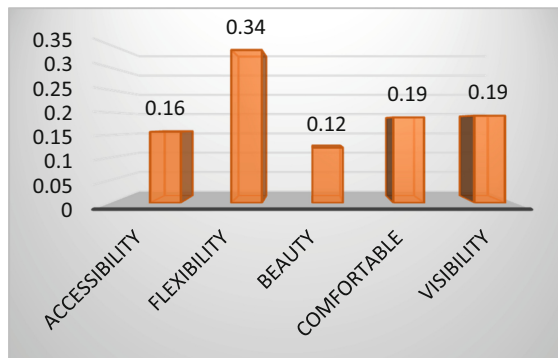


Fig. 3. Building area

Table 2. The weight of alternatives based on the sub-criteria of space facilities and infrastructure in postgraduate

| Alternative | Visibility | Accessibility | Flexibility | Comfortable | Beauty | Sum |
|---|------------|---------------|-------------|-------------|--------|------|
| Self-Study Room | 0.10 | 0.11 | 0.06 | 0.10 | 0.12 | 0.49 |
| Common Room or hall | 0.07 | 0.05 | 0.06 | 0.05 | 0.08 | 0.30 |
| Lecturer Room | 0.21 | 0.18 | 0.11 | 0.12 | 0.12 | 0.74 |
| Pray Room | 0.10 | 0.10 | 0.06 | 0.10 | 0.11 | 0.47 |
| Lecture Room and Seminar Room | 0.17 | 0.11 | 0.13 | 0.20 | 0.14 | 0.76 |
| Laboratory Room and Library Room | 0.06 | 0.06 | 0.07 | 0.14 | 0.10 | 0.43 |
| Management Room | 0.10 | 0.18 | 0.20 | 0.09 | 0.14 | 0.72 |
| Self-Study Room | 0.10 | 0.14 | 0.22 | 0.09 | 0.14 | 0.69 |
| Information and Communication Technology Room | 0.09 | 0.06 | 0.09 | 0.10 | 0.07 | 0.40 |

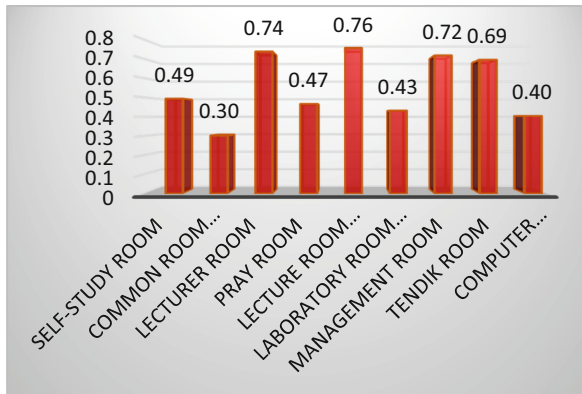


Fig. 4. Weight of each alternative

4 Discussion

Educational facilities and infrastructure are one of the resources that become a benchmark for the quality of higher education and need continuous improvement in line with the development of science and technology that is quite sophisticated and able to compete in the digital era economy. In providing education, infrastructure is needed to produce the best quality of graduates [8]. According to [9] that education managers must master

knowledge of the methods, processes, procedures and techniques of carrying out special activities and the ability to utilize and utilize facilities and infrastructure to support educational activities.

Facilities are facilities / equipment used in the learning process such as laboratory equipment, learning media. Infrastructure is a facility in the form of infrastructure assets (immovable) such as land, buildings, lecture rooms, laboratory rooms, and experimental fields/garden land. Learning Facilities and Infrastructure Standards are the minimum criteria regarding facilities and infrastructure in accordance with the needs of the content and learning process in order to fulfill the learning outcomes of graduates. Learning Facilities and Infrastructure Standards are the minimum criteria regarding facilities and infrastructure in accordance with the needs of the content and learning process in order to fulfill the learning outcomes of graduates [10] concerning National Standards of Higher Education) (2015).

Academic facilities and infrastructure owned by the Postgraduate Program of the University of Jambi until 2022 [11] are; classrooms for lectures (48 rooms), collaboration seminar room (8 rooms), commission and consultation courtroom (4 rooms), closed examination room (4 rooms), open examination room (4 rooms), administration and finance room (2 rooms), waiting room (rest area teaching staff) (2 rooms), manual library room (2 rooms), pray room (3 rooms), motor vehicle parking (4 rooms), and green open area (3 rooms). The average capacity of the Postgraduate Secretariat room (20 people), the collaboration meeting room (15 people), the collaboration examination room (16 people), the postgraduate hall room (58 people), the pray room (18 people), the library room (22 people), the classroom for lectures (24 people).

According to [12] the maximum capacity of a lecture hall is 25 people with an outdoor standard of 2 m^2 / student, a minimum area of 20 m^2 . The minimum capacity of a large lecture hall is 80 people with a standard space area of 1.5 m^2 / student. According to the [10] lecture halls must be provided with an area of at least 60 m^2 for 40 students, equipped with learning support equipment in the form of 40 chairs, lecturer chair tables, whiteboards.

According to [13] from an architectural point of view there are two kinds of space, are: outdoor space (space that exists outside the building) and inner space (the space that exists inside the building).

According to [8] Effective learning can start from a spatial climate that can create an exciting learning atmosphere. For this reason, it is necessary to pay attention to the arrangement and arrangement of the space and its contents. The classroom environment needs to be well organized to allow for active interaction between students and lecturers. There are several principles that need to be considered in arranging the physical environment, are; classes visibility (freedom of view), accessibility (easy to achieve), flexibility, comfort, and beauty.

Postgraduates must have a minimum quality standard of class A or equivalent, meet the standards of safety, health, comfort, and safety requirements, and be equipped with electrical installations with sufficient power, as well as equipped with domestic waste plants [14, 15].

Ideal Postgraduate facilities and infrastructure have a lecture room capacity of 20 people with a standard space area of 2 m^2 / student, the ratio of the area of the library

room is 0.2 m² per student of the education unit with a minimum total area of 200 m² and a width of 8 m, The ICT room can accommodate 2% of the number of students in the education unit, the minimum ratio of ICT room area is 2.5 m² / user, the minimum ratio of lecturer space area is 4 m² / lecturer, the minimum area is 24 m² for each study program, Independent study rooms are provided a minimum of 1/3 of the number of students, the minimum ratio of area is 4 m² / student, The common room can accommodate 40% of the number of master and doctoral program students, laboratories: - Computing laboratory / counseling / business 3 m² / student or at least 60 m². Leaders of Postgraduate Programs and Study Programs: a room with a minimum area of 12 m² / leader and a minimum width of 3 m that is easily accessible to guests, a tend room with a minimum ratio of 4 m² / employee, 8 m² of worship space per floor of the Postgraduate Program. According to [13] educational infrastructure is one of the important sources in supporting the learning process”.

5 Conclusions

The facilities and infrastructure that are indispensable for postgraduates at the University of Jambi are building spaces for flexible teaching and learning processes, especially for classrooms and seminar rooms. In providing facilities and infrastructure, the building room should be equipped with a self-study room, common room or hall, lecturer room, pray room, lecture room and seminar room, laboratory room and library room, management room, self-study room, information and communication technology room.

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