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An Application of MCDM on Dormitory Consideration

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Abstract*:* The objective of this study is to apply Multi-Criteria Decision Making (MCDM) on dormitory consideration system. All related criteria are investigated. Four criterias (rent, popular, facility and Uni Gate) are selected. Reviewing on MCDM techniques showed that Analysis Hierarchy Process **(**AHP) is the most suitable technique for this system. Then, the decision hierarchy is built. Weight of each criteria is calculated, while, the concurrency reasonable (CR) value is determined. Result shows that all CRs are significant ratio. Hence, these four criterias are suitable for the dormitory consideration system. Finally, the web site is developed based on the AHP.

Key words: AHP, Dormitory Consideration System, MCDM

INTRODUCTION

In context of Thailand, university which is in the countryside has the same environment. It is located at the center and surrounded by other facilities such as market, shop and dormitory. Selecting a dormitory for student is important due to Environment is a significant factor for learning. Student will pay attention on the study and understand it under the comfortable area. Dormitory is classified as the second home for student. Student will feel safe, comfortable and convenient when they stay in an appropriate dormitory for themselves. This leads to the good learning process. There are various factors that should be considered before selecting the dormitory. Multi-Criteria Decision Making (MCDM) is an effective method which can assist student/ parent to select the suitable dormitory. In this paper, an overview of MCDM is presented. Then the comparison of MCDM techniques (AHP, SAW and TOPSIS) is shown. Dormitory consideration system is revealed, finally, and conclusion.

MULTI-CRITERIA DECISION MAKING (MCDM)

MCDM is a well-known method which helps the decision maker for identifying and choosing alternatives based on the values and preferences of decision maker [1]. There are several techniques such as Analysis Hierarchy Process (AHP), Technique for Order Preference by Similarity to deal Solution (TOPSIS), Simple Additive Weighting (SAW), etc. AHP is a decision-making technique which compares the criteria based on determining the weight of each criteria. Selected information are classified as criteria. Then the concurrency reasonable (CR) value is calculated in order to evaluate the suitable of each criteria. An example of AHP structure is shown in Fig. 1. The structure of the AHP consists of factors associated with the decision. Level of AHP structure depends on the complexity of decision [2].

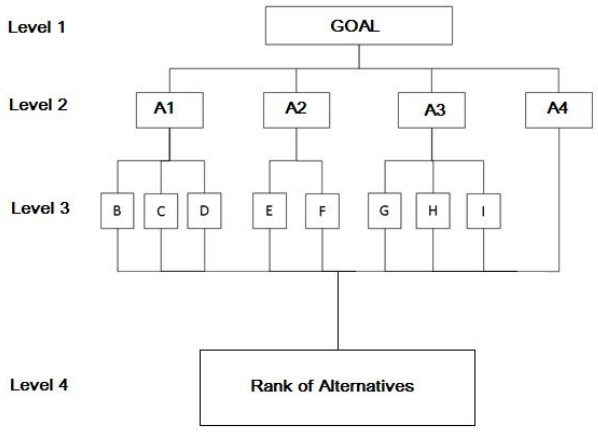

Fig. 1: Decision Hierarchy [2]

Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) would be helpful in resolving a decision problem involving positive/ negative idea. It offers both suggested alternatives. One, the best choice, is closer to the positive value. Another, on the other hand, is the worst choice which is closer to the negative value. Step-by-step of this technique is shown below

1. Calculate the value of normalized decision matrix
2. Calculate weight of normalized decision matrix
3. Find out the positive and negative idea value
4. Calculate the distance between both idea in No. 3
5. Calculate the relation of each criteria refer to the problem
6. Ranking the result of No.5

Simple Additive Weighting (SAW) [3] is a simple technique. Decision maker can define criteria and the weight of each criteria. Weight of each criteria multiply with the value of each criteria. The best alternative is the highest score and, probably, it is the first choice.

Analytical Hierarchy Process is an effective method which is used weighting and scaling techniques. It derives ratio

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scale from paired comparisons. Input can be both quantitative (e.g. salary, number of furniture) and quality (e.g. opinion, preferences) [4]. If it was compared with TOPSIS and SAW, the calculation of AHP was the most complex. On the other hand, TOPSIS works as a decision tree. It will select the best solution to solve the problem. But it does not guarantee that this solution is the most appropriate one. SAW is classified as un-reliability technique due to both criteria and weight of each criteria are defined by the decision maker. Some criteria may be missing. However, it might be useful in the particular group research. The comparison of these three techniques is shown in Table 1.

Table 1 The comparison of AHP, TOPSIS and SAW [3][5][6][7]

Techniques	Pros	Cons
AHP	- Certain structure and hierarchy. - Result is in the form of number. It is reliable - Easy to compare - Implementation in both individual decision and group decision problem - Anyone can access to its application	- Data collection is complicated - Take time to explain the level of significant to target. - In the case of complex and several criteria, the calculation and other processed need more time.
TOPSIS	- Suitable for decisions on quantitative criteria. - Suitable for decisions on both positive and negative criteria.	- If there were many alternatives, some errors maybe happen in determining the choice of the best or worst.
SAW	- Simple process - Used widely	- Assumption that there is no interaction between the determined factors. - Criteria is designed by the decision maker. Then it is a little reliable.

DORMITORY CONSIDERATION SYSTEM

The system was implemented at Naresuan University, Phitsanulok. The process is shown as following:

1. Information about student requirement is collected.

2. Information about dormitory detail is collected such all furnish in the room, room rate and other facilities.

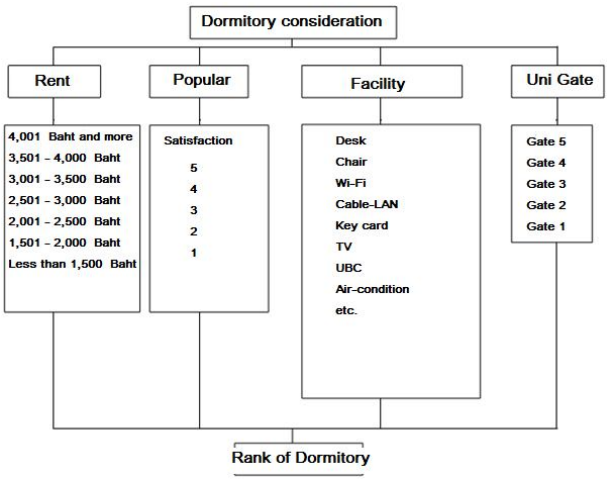

Fig. 2 Dormitory Consideration Hierarchy

3. Analyst stage – This step would help to create the decision hierarchy as shown in Fig. 2. Criteria for dormitory consideration system are rent, popular, facilities and university gate. According to the description of each criteria, the basic score is calculated

4. Calculate the weight based on the AHP. Weights are shown in Table 2. Regarding Saaty [4], Matrix calculation of four criterias and significant ratio shows that concurrency reasonable (CR) value was not over 9%. CR values of each criterias are 5.75% 5.75%, 4.40% and 5.52%. Therefore, these criterias are suitable for the dormitory consideration system. Then the calculation value of each criteria from No. 3 will be multiply with their own weight.

Table 2: Weight and CR of each criteria

Criteria	Weight	CR (%)
Rent	40.63	5.75
Popular	17.71	5.75
Facility	17.71	4.40
Uni Gate	23.96	5.52

5. . Comparison dormitory – The result from No.4 of each criteria of a dormitory will be merged together. Hence, one dormitory will be only one value. Next, the comparison between dormitory begins. Dormitory with the highest score is the most appropriate dormitory for particular student. However, the result will show a list of appropriate dormitory from the first one to the fifth.

6. Web site development –A web site is developed in order to select an appropriate dormitory for NU student. Information of twenty dormitories is in the database. There are three users for the system.

- Dormitory Manager – Entry all information of dormitory
- Administrator – Take care of this system and entry some data of criteria such as Popular.
- Student-Fill their requirement and get the result.

An example of screen shot is shown in Fig. 3.

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CONCLUSION

This paper presents the application of AHP to dormitory consideration for NU student. There are four factors: rent, popular, facility and uni gate. The result shows the acceptable weight of each factor. A web site is developed according to the NU environment. Rank of the most appropriate dormitory is revealed based on student information

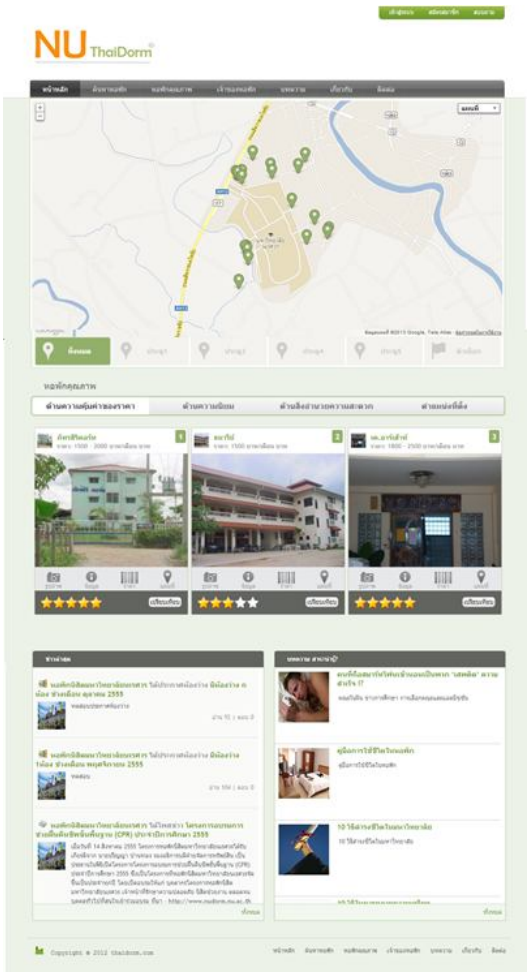

Fig. 3: A sample of the system screen shot

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