EVALUATION OF EDUCATION TYPES UTILIZING MCDM METHODS

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ABSTRACT

Different education types have been introduced to eliminate the problems in traditional face-to-face education, such as insufficient quota, commute costs, operation costs, and adverse environmental effects. Although distance education has eliminated these problems, they have brought technological costs, a lack of communication, and a lack of motivation. This study discusses the effects of traditional face-to-face education, synchronous distance education, and blended education types in terms of students, academicians, and university management, which are the most important stakeholders of university education. In line with these, it is aimed to choose the best type of education for different stakeholders.

Keywords: Face-to-face education, Distance education, AHP, PROMETHEE, VIKOR

1. Introduction

University education, which started with the establishment of the University of Bologna in 1081, has been realized face-to-face in the classroom environment for centuries. However, there are obstacles, such as physical, geographical, financial, and class capacity, etc., in front of reaching this education. These problems hindered the expansion of university education. Different types of education have been introduced to overcome these problems. Although various universities used different types of education, face-to-face education was generally preferred. With the COVID-19 pandemic, universities had to take a break from face-to-face education and changed their education types. Among these, the prominent types of education were synchronous distance education and blended education. Although these types of education have eliminated the problems encountered, new problems have emerged, such as disconnection in communication, the inability of students to study in groups, inability to access the internet, distractions during the lesson, lack of motivation, and unfair evaluation system. In addition, these differences between education types take different forms for students, academicians, and university management stakeholders involved in university education. For this reason, it is aimed to make the best decision by evaluating traditional face-to-face education, synchronous distance education, and blended education types, which have different effects on these three stakeholders.

2. Literature Review

There are studies in the literature that deal with different types of education from different perspectives. Olekulehin and Panda (2011) discussed traditional and distance education in terms of individual expenditures of students. Tepe (2021) evaluated face-to-face, distance, and hybrid education types by applying AHP, TOPSIS, and VIKOR methods by interviewing 4009 university students and found face-to-face education as the best option. Griffith et al. (2021) stated that there is no difference between traditional classroom education and distance education in terms of students' success. Alqahatani and Rajkhan (2020) found blended education as the best alternative in their study, which also includes

synchronous distance education, ICT-supported face-to-face learning, asynchronous education, and flipped classroom. Oliveira et al. (2018) stated that distance education is 90% more environmentally friendly than face-to-face education.

3. Objectives

The model proposed in this study aims to calculate the criteria importance used in evaluating the education types and determining the best alternatives for student, academician, and university management stakeholders from university departments that do not require lab work.

4. Methodology

The evaluation criteria are determined according to the literature review and judgments of experts (students, academicians, and university managers from the industrial engineering department of Istanbul Technical University and Yıldız Technical University). The decision model for student stakeholders has 11 criteria grouped under 4 main criteria, the decision model for academician stakeholders has 12 criteria under 5 main criteria, and the decision model for university management stakeholders has 5 criteria. Then, a pairwise comparison questionnaire survey is conducted to reveal the judgments of the experts (students, academicians, and university managers from the department of Turkish universities that are not required laboratory work), which will be used to determine the priorities of the criteria and the sub-criteria. The geometric mean is used to aggregate the judgments. The AHP method is used to calculate the importance of the criteria. Finally, each education type is assessed with respect to each criterion on a 5-point rating scale by the stakeholders. This time, the arithmetic mean method is used to aggregate the judgments. PROMETHEE and VIKOR methods are used to rank the alternative education types.

5. Model Analysis

The aggregated pairwise comparison judgments are used to prioritize the criteria utilizing AHP method. At this step, Super Decisions software was used. Appendices 1, 2, and 3 exhibits the revealed priorities of criteria from the point of view of students, academicians, and university managers, respectively. The inconsistency ratios are also checked, and none of them is found to be greater than 10%. The scores of the alternative education types with respect to criteria assessed by the stakeholders are given in Appendices 4, 5, and 6. Afterwards, the ranking of alternative education types is obtained by applying the PROMETHEE method in Visual PROMETHEE (Appendix 7). In addition, the rankings are also obtained by the VIKOR method, and the results for student, academician, and university management stakeholders can be seen in Appendices 8, 9, and 10, respectively.

6. Limitations

Depending on the purpose of the institution, each stakeholder may have different degrees of importance. However, since the participants were not from a single university, a degree of importance could not be established for stakeholder groups. In addition, stakeholders such as administrative staff affected by university education may also participate in the study.

7. Conclusions

The most important criteria for students, academicians, and university administration were the cost of accommodation, academician-student communication, and fair evaluation of students, respectively. After determining the importance of criteria with AHP method for 3 stakeholders, alternative ranking was carried out with VIKOR and PROMETHEE methods. Thus, two different scenarios emerged for each stakeholder. Traditional face-to-face education was found to be the best alternative in all scenarios for all stakeholders.

8. Key References

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9. Appendices

Appendix 1. The Importance of Student Stakeholders' Criteria

Main criteria	Priorities	Criteria	Priorities
Communnication factor	19.48%	Student-academician communication	11.98%
		Student-student communication	7.50%
Technological factor	18.10%	The internet accessibility	11.27%
		The use of required technology	6.83%
Cost factor	30.55%	Accommodation cost	19.13%
		Technological cost	11.42%
Educational factor	31.88%	Motivation	8.49%
		Perception of being assessed fairly	7.80%
		Ease of understanding	6.73%
		Diploma quality perception	5.50%
		Comfort zone	3.36%

Appendix 2. The Importance of Academician Stakeholders' Criteria

Main criteria	Priorities	Criteria	Priorities
Communication factor	25.84%	Academician-students communication	17.90%
		Academician-academician communication	7.94%
Technological factor	17.72%	The use of required technology	10.52%
		The internet accessibility	7.20%
Cost factor	11.02%	Commute cost	2.45%
		Technological cost	8.57%
Educational factor	32.56%	Fair evaluation of students	11.66%
		Motivation	9.19%
		The total time spent for class	5.95%
		Learning environment	3.73%
		Comfort zone	2.03%
Environmental factor	12.87%	Environmental impact	12.87%

Appendix 3. The Importance of University Management Stakeholders' Criteria

Criteria	Fair evaluation of students	Access to more students	Environmental impact	Technological cost	Operational cost
Priorities	39.03%	24.61%	13.41%	12.73%	10.23%

Appendix 4. Alternatives' Criteria Score of Student Stakeholders

	Diploma quality perception	Student-student communication	Student-academician communication	Motivation	Perception of being assessed	The internet accessibility	The use of required	Ease of understanding	Technological cost	Comfort zone	Accomm. cost
Traditional Face-to-face	4.29	4.25	4	3.8	3.75	3.66	3.59	3.44	3.2	3.08	1.66
Synchronous Distance	2.83	2.31	2.83	2.32	2.14	1.37	1.93	2.86	2	4	4.15
Blended	3.46	3.07	3.24	3.02	2.83	1.95	2.44	3.08	2.36	3.54	2.27

Appendix 5. Alternatives' Criteria Score of Academician Stakeholders

	Academician-students communication	Motivation	Academician-academician	Fair evaluation of students	The internet accessibility	Learning environment	Technological cost	Comfort zone	The use of required technology	The total time spent for class	Commute cost	Environmental impact
Traditional Face-to-face	4.52	4.16	4.11	4.05	4	3.9	3.44	3.38	3.23	2.25	2.07	2
Synchronous Distance	2.54	3.05	2.43	2.18	2.54	2.9	2.33	3.9	1.93	2.48	4.66	3.85
Blended	3.31	3.41	3	3	2.91	3.31	2.49	3.44	2.16	2.26	3.08	2.97

Appendix 6. Alternatives' Criteria Score of University Management Stakeholders

	Fair evaluation of students	Technological cost	Access to more students	Environmental impact	Operational cost
Traditional Face-to-face	4.11	2.89	2.54	2.46	2.14
Synchronous Distance	2.36	2.36	3.86	3.75	3.46
Blended	3.18	2.46	3.04	3.07	2.96

Appendix 7. PROMETHEE II Scores

	Student	Academician	Univ. Mgmt.
Traditional Face-to-Face	0.4430	0.5755	0.0785
Synchronous Distance	-0.2207	-0.3361	0.0193
Blended	-0.2224	-0.2393	-0.0978

Appendix 8. Q Values of Student Stakeholders in VIKOR Method

v	v=0	v=0.2	v=0.4	v=0.5	v=0.6	v=0.8	v=1
Traditional Face-to-Face	1	0.8	0.6	0.5	0.4	0.2	0
Synchronous Distance	0	0.2	0.4	0.5	0.6	0.8	1
Blended	0.34	0.43	0.52	0.57	0.61	0.7	0.79

Appendix 9. Q Values of Academician Stakeholders in VIKOR Method

v	v=0	v=0.2	v=0.4	v=0.5	v=0.6	v=0.8	v=1
Traditional Face-to-Face	0.28	0.22	0.17	0.14	0.11	0.06	0
Synchronous Distance	1	1	1	1	1	1	1
Blended	0	0.17	0.33	0.42	0.5	0.67	0.84

Appendix 10. Q Values of University Management Stakeholders in VIKOR Method

v	v=0	v=0.2	v=0.4	v=0.5	v=0.6	v=0.8	v=1
Traditional Face-to-Face	0.21	0.17	0.13	0.11	0.08	0.04	0
Synchronous Distance	1	0.9	0.8	0.75	0.7	0.6	0.5
Blended	0	0.2	0.4	0.5	0.6	0.8	1