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Modeling the Strategic Enablers of Financial Sustainability in Saudi Higher Education Institutions Using an Integrated Decision-Making Trial and Evaluation Laboratory–Interpretive Structural Modeling Approach

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Abstract: Ensuring financial sustainability is paramount for higher education institutions (HEIs) to maintain financial viability and accomplish their strategic objectives by efficiently managing and utilizing resources. Studying strategic enablers' interconnections and influences on each other is essential to forming a profound understanding and guiding the execution of initiatives linked to achieving financial sustainability plans. The main objective of this research study is to construct a model and analyze the strategic enablers of financial sustainability in HEIs and their associated dimensions. An integrated modeling approach was followed based on the Decision-Making Trial and Evaluation Laboratory (DEMATEL) and Interpretive Structural Modeling (ISM) methods. Input data collected from experts with specialist experience in financial sustainability in HEIs were used in the modeling. The overarching finding is that starting with the development of regulations and legislation-related systems leads to good governance practices, enabling the achievement of financial sustainability in HEIs. The developed model unpacks the complex relationships among the enablers and their dimensions. It reveals their cause-and-effect relationship classifications, ranks based on relative importance weights, dependence and driving powers classifications, relationship directions, and interpretive structure. It provides an overarching view of the interconnected network that acts as a roadmap to achieving financial sustainability in HEIs.

Keywords: strategic enablers; financial sustainability; higher education; modeling; DEMATEL; ISM

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1. Introduction

Sustainability has become essential in the higher education industry to provide high-quality education and research promoting societal well-being. The achievement of sustainability helps higher education institutions (HEIs) transform communities' social, environmental, and economic facets. Embedding sustainability in HEIs' operations, education, research, and knowledge transfer might be revolutionary in achieving sustainable development goals (SDGs) and governance [1,2]. Specifically, the financial sustainability aspect is crucial because it helps HEIs maintain their financial viability to accomplish their objectives by efficiently managing and utilizing resources [3]. Thus, HEIs must align their strategies and governance structures to achieve financial sustainability and cooperate with stakeholders [4,5]. This is achieved by creating and sharing knowledge, improving skills and expertise, cultivating principles and beliefs, and involving the community to accomplish their SDGs [6,7]. This is in addition to expanding their sources of income, reducing expenses, and targeting strategic investments that ensure financial sustainability [4,6–11].

Consequently, several research studies have concentrated on different schemes to attain financial sustainability in HEIs [6–25]. Some of these studies focused on factors

affecting financial sustainability in HEIs [6,8,15,16]. Moreover, some studies focused on strategies for increasing income generation [21,23,24] and the performance evaluation of financial sustainability in HEIs [7,17] and their units [20]. Strategic planning for financial sustainability in HEIs and investment initiatives was also the focus of some studies [9–11]. Another study [12] also thoroughly reviewed the literature on sustainability funding in higher education. Other studies focused on region-specific financial sustainability challenges and opportunities in HEIs in countries and regions such as Zimbabwe [6], the United Kingdom [13], OECD country members [14], Kenya [17], Latvia [18], Malaysia [19], the Puntland State of Somalia [20], Indonesia [21], and China [25].

Nevertheless, attaining financial sustainability in HEIs is often hindered by economic issues [14–17] and worldwide occurrences such as pandemics and political conflicts, which impact the higher education industry globally. Such impacts include reduced government financing and alterations in educational legislation [10,26,27]. These changes affect the capacity of HEIs to promote and achieve sustainability. Therefore, HEIs should broaden their sources of income, reduce expenses, enhance efficiency, and adopt evidence-based approaches to build effective strategic plans for financial sustainability.

HEIs in Saudi Arabia are also subject to the same global situation. The Saudi 2030 vision encourages HEIs to expand their sources of revenue and achieve financial autonomy [28–31]. In alignment with this vision, the Ministry of Education in Saudi Arabia introduced the New Universities Law to fit its goals. This law regulates Saudi HEIs, guides their policies, and defines specific executive rules and regulations [32–34].

In response, King Abdulaziz University (KAU) [35] is optimizing its internal processes and developing strategies towards achieving financial sustainability. Some efforts have been exerted in areas such as capacity planning [36] and education quality standards and accreditation [37,38]. Also, KAU has established the Financial Sustainability Office (FSO), which developed the Green Ocean Strategy for Financial Sustainability (GOSFS) [9]. The development of the GOSFS was based on modified models of strategic planning tools to align with the concept of financial sustainability in HEIs [10]. The GOSFS consists of three main performance areas: resources development, good governance, and regulations and legislation.

The first performance area of resource development comprises 33 investment initiatives linked to 43 performance indicators, all falling under eight main pillars. These investment initiatives were prioritized following an original integrated multi-criteria decision-making (MCDM) approach combining a method based on the removal effects of criteria using the geometric mean (MEREC-G) with ranking the alternatives based on the trace-to-median index (RATMI) method [11].

For the second and third performance areas, good governance and regulations and legislation, ten strategic enablers (Table 1) were determined to ensure the execution of the financial sustainability plan [9,10]. These strategic enablers could be considered the basis for any Saudi HEI financial sustainability plan. Thus, studying how these strategic enablers are interconnected and influence each other is essential.

This study will assist in forming a profound understanding of the relationships among these strategic enablers, guiding the smooth execution of initiatives linked to achieving financial sustainability plans in HEIs. Furthermore, this study provides an integrated analytical approach for unpacking the complex relationships among the enablers and their dimensions. It allows for an overarching view of the interconnected network that acts as a practical procedure that increases the potential of achieving financial sustainability in Saudi HEIs. Therefore, the main aim of this research study is to investigate the ten strategic enablers of financial sustainability in HEIs. Table 1 lists and describes six enablers of the good governance dimension and four enablers of the regulations and legislation dimension, respectively.

Table 1. Strategic dimensions and enablers of financial sustainability in HEIs.

Dimension	Symbol	Strategic Enabler	Symbol	Description
Good Governance	D1	Administrative restructuring	E1	To integrate initiatives of the financial sustainability plan into the HEI's organizational structure, which includes establishing or developing units.
		Financial restructuring	E2	To include the initiatives of the financial sustainability plan in the HEI's financial structure, which includes updating the financial structure to align with the plan objectives.
		Defining tasks, authorities, and job descriptions	E3	To define tasks and authorities for all administrative units emerging from the financial sustainability plan and ensure commitment.
		Monitoring and control	E4	To achieve legal integrity of the procedures by putting in place guidelines for monitoring and control procedures in administrative units emerging from the financial sustainability plan and ensuring that the initiatives of the financial sustainability plan are well connected to the HEI's administrative structures.
		Restructuring job grades	E5	To adopt an integrated financial system, which includes creating a unified job grade structure for all personnel in the HEI.
		Updating governance systems and quality standards	E6	To verify quality control of the governance components in all HEI sectors and ensure their commitment, which includes issuing regulations to govern performance in achieving financial sustainability.
Regulations and Legislation	D2	Developing systems that stimulate the external environment	E7	To transform the HEI into an attractive and stimulating environment for investment, enabling it to implement all financial sustainability initiatives. Includes formulating systems, enablers, and executive rules that stimulate the investment environment externally.
		Developing systems that stimulate the internal environment	E8	To ensure that all sectors of the HEI and its personnel are in harmony with the objectives and initiatives of financial sustainability. Includes formulating systems, enablers, and executive rules that stimulate the investment environment internally.
		Developing systems that boost environmental sustainability	E9	To ensure the commitment of all owners of financial sustainability initiatives to environmental sustainability controls. Includes implementing procedural guidelines and indicators of environmental sustainability to be applied to all financial sustainability initiatives.
		Developing systems that stimulate change management	E10	To apply the specifications of financial sustainability to all sectors and personnel of the HEI and adhere to them. This includes establishing rules and regulations, change-management strategies that increase employees' awareness of financial sustainability objectives, and linking material and moral incentives to achieving them.

Note: all strategic dimensions and enablers are adopted from [9,10].

The primary purpose of this research study is to construct a model using the ten identified strategic enablers of financial sustainability in HEIs and their associated dimensions. This aim is attained by achieving two objectives. The first objective of the modeling process is to examine the important, influential linkages among the ten enablers and their associated dimensions, revealing their cause-and-effect identities, relative importance weights, and rankings as strategic enablers of financial sustainability in HEIs. The second objective is to develop an interpretive structure of the studied strategic enablers, revealing their levels and classifications based on their driving and dependence capacities as autonomous, dependent, linkage, and independent enablers of financial sustainability in HEIs. The aim of this is to build an integrated model that assists in achieving financial sustainability in HEIs. These two objectives of this study guided the use of a combined modeling approach based on the Decision-Making Trial and Evaluation Laboratory (DEMATEL) and the Interpretive Structural Modeling (ISM) methods. Both methods were used to achieve the study's first and second objectives and build an integrated model.

Several research disciplines have used the DEMATEL and ISM methodologies [39–43] to construct and evaluate intricate issue models by analyzing their constituent elements [44,45]. Nevertheless, integrating both methodologies enhances the results and provides deep insights into the examined issue. Consequently, several research studies [46–69] have followed the combined DEMATEL-ISM modeling approach. On the one hand, the DEMATEL method enables the construction and evaluation of the connections between problem components, categorizing these components into cause-and-effect clusters, identifying the crucial causal links, quantifying the strength of the relationships between the components of an issue, and establishing the relative relevance of each component to other components. On the other hand, the ISM method is used to analyze and understand the interconnections, the directions of relationships, and the driving and dependency capacities of these system components. Hence, this research study employs the integrated DEMATEL-ISM method to represent the strategic enablers of financial sustainability in HEIs. The following section will provide a detailed overview of the integrated approach and its significance concerning the study's two objectives. Additionally, it details the algorithms used for applying both methods. The remainder of the paper sections provide the results and analysis, a discussion of the obtained outcomes, and the conclusions.

2. Materials and Methods

The main aim of this research study is to construct a model using the ten identified strategic enablers of financial sustainability in HEIs and their associated dimensions, which are listed and described in Table 1. This aim is attained by achieving two objectives. The first objective of the modeling process is to examine the important, influential linkages among the ten enablers and their associated dimensions, revealing their cause-and-effect identities, relative importance weights, and rankings as strategic enablers of financial sustainability in HEIs. The second objective is to develop an interpretive structure of the studied strategic enablers, revealing their levels and classifications by measuring their driving and dependence capacities as autonomous, dependent, linkage, and independent enablers of financial sustainability in HEIs. This is to build an integrated model that assists in achieving financial sustainability in HEIs. These two objectives of this study guided the use of an integrated modeling approach using the DEMATEL and ISM methods. Both methods were used to achieve the study's first and second objectives and build an integrated model.

The DEMATEL approach involved data collection using a questionnaire. The questionnaire design was based on the identified enablers listed in Table 1. A total of 16 experts from different public and private Saudi HEIs and industry representatives who served on the HEIs' advisory committees were engaged in this study. They were engaged due to their specialist knowledge and extensive hands-on experience in financial sustainability in HEIs. Their involvement mainly included validating the set of enablers used for financial sustainability in HEIs and assessing each enabler's influence on other enablers based on

their experiences. Table A1 in Appendix A provides biographies of the responding experts. The assessment was performed with a pre-established integer scale in a paired fashion until all possible pair combinations of enablers were evaluated. The questions were designed for each pair of enablers in the system. The experts were asked to assign an integer score indicating the degree of influence of the first enabler in the pair on the second, and vice versa. The gathered data were used as inputs for the DEMATEL modeling approach. Applying the DEMATEL algorithm, the studied enablers were classified into clusters based on cause-and-effect relationships, revealing their interdependencies and respective weights of importance and ranks.

Subsequently, the strong influence relationships revealed among the enablers by the DEMATEL informed the directions of relationships, which were used as inputs for the ISM approach. Applying the ISM algorithm, the studied enablers were partitioned into levels and classified by measuring their driving and dependence capacities as autonomous, dependent, linkage, and independent enablers, revealing their interpretive structure.

Finally, the results obtained from the DEMATEL and ISM techniques were used to develop an integrated DEMATEL-ISM model of strategic enablers of financial sustainability in HEIs. The following subsections thoroughly explain the modeling procedures used in the DEMATEL and ISM algorithms in accordance with [43–45].

2.1. The DEMATEL Method

The data collected from the experts in financial sustainability in HEIs were used in the development of the Group Direct-Influence Matrix G. This matrix involves the assessment of relationships among a specified set of enablers $E = \{E_1, E_2, \ldots, E_n\}$ (listed in Table 1 for this case). The financial sustainability experts in higher education institutions (HEIs), as shown in Table A1 in Appendix A, are represented as $FSE = \{FSE_1, FSE_2, \ldots, FSE_l\}$. These experts evaluated the extent of influence among the enablers being examined. The evaluation involves assessing the specific impact of enabler E_i on another enabler E_j pairing, using the integer scale for pairwise comparison outlined in Table 2.

Table 2. Integer scale for pairwise comparison of the DEMATEL method.

Integer Scale	Definition
0	No influence
1	Low influence
2	Medium influence
3	High influence
4	Very high influence

The matrix $G_k = \left[G_{ij}^k\right]_{n\times n}$ serves as a representation of the viewpoints expressed by financial sustainability experts FSE_k to FSE_l on the direct influence between pairs of enablers E_i and E_j. Following this, the various assessments of influence provided by each expert are combined to create a Group Direct-Influence Matrix $G = \left[g_{ij}\right]_{n\times n}$, as defined by Equation (1).

$$g_{ij} = \frac{1}{l}\sum_{k=1}^{l} g_{ij}^k. \qquad i.\, j = 1.,2.\ldots,\ n \tag{1}$$

Next, the Normalized Direct-Influence Matrix X is obtained by using the previously computed Group Direct-Influence Matrix G. The Normalized Direct-Influence Matrix X is represented as $X = \left[x_{ij}\right]_{n\times n}$, and is derived using Equations (2) and (3). Components of the matrix X conform to the requirement conditions that $0 \le x_{ij} \le 1$, $0 \le \sum_{j=1}^{n} x_{ij} \le 1$, and the existence of at least one i, such that $\sum_{j=1}^{n} g_{ij} \le s$.

$$X = \frac{G}{s} \tag{2}$$

$$s = \max\left(\max_{1\le i\le n}\sum_{j=1}^{n} g_{ij}, \max_{1\le i\le n}\sum_{i=1}^{n} g_{ij}\right) \tag{3}$$

The computation of the Total-Influence Matrix T is performed next, using the Normalized Direct-Influence Matrix X that was generated previously. The calculation of the Total-Influence Matrix T, represented as $T = \left[t_{ij}\right]_{n\times n}$, is executed using Equation (4).

$$T = X + X^2 + X^3 + \cdots + X^h = X(I - X)^{-1} \quad \text{when, } h \to \infty \tag{4}$$

where I is the Identity Matrix of size $n \times n$.

Subsequently, the sums of the rows and columns of the Total-Influence Matrix T are calculated. The procedure entails the identification of the vectors R and C, which correspond to the summation of the rows and columns in the matrix T, respectively. Equations (5) and (6) are used to identify the vectors.

$$R = [r_i]_{n\times 1} = \left[\sum_{j=1}^{n} t_{ij}\right]_{n\times 1}^{T} \tag{5}$$

$$C = \left[c_j\right]_{1\times n} = \left[\sum_{i=1}^{n} t_{ij}\right]_{1\times n}^{T} \tag{6}$$

where

r_i refers to the sum of the values in the ith row of the matrix T, indicating the dispatched influence from enabler E_i to other enablers in the system;
c_j refers to the sum of the jth column in matrix T, indicating the received effects that enabler E_i is obtaining from other enablers in the system.

After finding the vectors R and C, let $i = j$, where i and j are components of the set $\{1, \ldots, n\}$. The vector representing the prominence of enablers, designated as $(R + C)$, is calculated on the horizontal X-axis of a chart. Similarly, the vector representing the relation of enablers, denoted as $(R - C)$, is computed on the vertical Y-axis of the chart.

On the one hand, the vector $(R + C)$ represents the magnitude of the relevance of the enablers inside the system. A higher $(r_i + c_i)$ value of an enabler E_i signifies a more substantial connection of that enabler with other enablers. In contrast, a lower $(r_i + c_i)$ value of an enabler implies a weaker relationship of that enabler with other enablers.

On the other hand, the vector $(R - C)$ offers insights into the connection between enablers and their respective contributing influences. If the $(r_i - c_i)$ value of an enabler E_i is positive, then it indicates that the identity of the enabler E_i is that of a dispatcher enabler. Subsequently, it is classified under the cause category of enablers due to its influence on other enablers within the system. Conversely, in an event where the $(r_i - c_i)$ value of an enabler E_i is found to be negative, this indicates that the identity of the enabler E_i is that of a recipient enabler, and it is classified under the effect category of enablers since it is influenced by other enablers present in the system.

The relative importance of each enabler to other enablers in the system is then determined by calculating its weight ω_j using Equation (7) based on its associated values in the $(R + C)$ and $(R - C)$ vectors, representing its prominence and relation levels, respectively. Following this, the normalized weight of each enabler is calculated using Equation (8). The enablers are then ranked according to the normalized weights in descending order.

$$\omega_j = \sqrt{\left(r_j + c_j\right)^2 + \left(r_j - c_j\right)^2} \tag{7}$$

$$\acute{\omega}_j = \frac{\omega_j}{\sum_{j=1}^{n}\omega_j} \tag{8}$$

The normalized relative importance weights of the enablers' dimensions are also calculated by finding the sum of the individual normalized weights of the enablers forming the dimension. Also, the $(R + C)$ and $(R - C)$ vectors of the dimensions are calculated by finding the average of the values associated with the enablers forming the dimension.

Determination of the threshold value α, which differentiates between negligible and significant relationships among the enablers within the matrix T, is carried out. Values in matrix T below the threshold α are considered unimportant, whereas values equal to or more than α are deemed to have substantial influences. A Cause-and-Effect Identity Classification Chart (CEICC) and a DEMATEL Causal Relations Digraph (CRD) are constructed considering only influential relationships among enablers. The estimation of α could rely on expert opinion in identifying connections between the enablers. Also, the threshold value α could be readjusted iteratively until all experts reach a consensus and satisfaction level regarding the produced CEICC and the CRD. However, in the current investigation, the threshold value α is calculated using Equation (9), which entails calculating the mean of all values in the calculated matrix T based on Equation (4).

$$\alpha = \frac{\sum_{i=1}^{n} \sum_{j=1}^{n} \left[t_{ij} \right]}{n^2} \tag{9}$$

The CEICC is graphed using the revealed cause-and-effect identities of the studied enablers established by analyzing the Total-Influence Matrix T. The found $(R + C)$ and $(R - C)$ vectors are used as axes, and the calculated values for each enabler are used $(R + C, R - C)$ as coordinates to plot the chart. A similar graph is also produced for the enablers' dimensions.

The CRD is generated using the CEICC and the predetermined threshold value α. The developed CRD provides a visual representation of the interconnected cause-and-effect relationships among the enablers, providing insights into the strategic factors contributing to financial sustainability in HEIs and their dimensions in this case. The aim of this is to achieve the study's first objective by analyzing the influential relationships among the ten enablers and their associated dimensions, revealing their cause-and-effect identities, relative importance weights, and rankings as strategic enablers of financial sustainability in HEIs.

2.2. The ISM Method

Instead of the ISM's traditional way of collecting data from the experts to construct the Structural Self-Interaction Matrix (SSIM) to indicate the directions of relationships among the enablers in direction codes, the directions of strong influences (i.e., $t_{ij} \geq \alpha$) among the enablers are found by converting the found DEMATEL's T Matrix to $D = \left[d_{ij} \right]_{n \times n}$ based on Equation (10) to be in the form of Equation (11).

$$d_{ij} = \begin{cases} \pi_{ij} = 0, & t_{ij} < \alpha \\ \pi_{ij} = 1, & t_{ij} \geq \alpha \end{cases} \tag{10}$$

$$D = \begin{array}{c} \\ E_1 \\ E_2 \\ \vdots \\ E_i \end{array} \begin{array}{c} \begin{array}{cccc} E_1 & E_2 & \cdots & E_j \end{array} \\ \begin{bmatrix} 0 & \pi_{12} & \cdots & \pi_{1j} \\ \pi_{21} & 0 & \cdots & \pi_{2j} \\ \vdots & \vdots & \ddots & \vdots \\ \pi_{i1} & \pi_{i2} & \cdots & 0 \end{bmatrix} \end{array} \tag{11}$$

where D denotes the converted T matrix, E_i represents the ith enabler in a row, E_j represents the jth enabler in a column, and π_{ij} in 1 or 0 entry codes indicates the existence of a strong influence or no influence, respectively, to be considered between each pair of ith and jth enablers in a row and a column. The directions of the relationship between pairs of enablers can be extracted from the resulting 1 and 0 code combinations between a pair of enablers

(E_i, E_j) and (E_j, E_i) under consideration in the D matrix. Table 3 presents four possible relationship direction scenarios that can be found between pairs of enablers.

Table 3. Scenarios of relationship directions between pairs of enablers and their associated entry codes in the converted T matrix to D matrix and the IRM.

Scenario	Direction of Relationship	*D* Matrix and IRM Entries	
	(E_i, E_j)	**(E_i, E_j)**	**(E_j, E_i)**
1	$E_i \rightarrow E_j$	1	0
2	$E_i \leftarrow E_j$	0	1
3	$E_i \leftrightarrow E_j$	1	1
4	$E_i \times E_j$	0	0

Then, the found D matrix is used to form the Initial Reachability Matrix (IRM) and the Final Reachability Matrix (FRM) using matrices M and M^* denoted in Equations (12) and (13), respectively.

$$M = D + I, \tag{12}$$

$$M^* = M^k = M^{k+1},\ k > 1 \tag{13}$$

This is carried out under Boolean mathematics' multiplication and addition operators, where I is an identity matrix of size $n \times n$, and k denotes the powers. The IRM will retain the same 1 and 0 entry codes and indicated directions as in Table 3 of the D matrix, with the addition of the relationships of each enabler with itself resulting from adding the entry codes of ones to the diagonal of the IRM from adding the I to the D matrix in Equation (12). Based on the IRM, the FRM accounts for further existing higher-order transitive relationships between the enablers found based on Warshall's algorithm [70] and is denoted by a (1 *) symbol to indicate the existence of a transitive relationship between a pair of enablers.

Then, the dependence and driving powers of the enablers are found by computing the sum of rows and columns of the FRM. According to the calculated powers, the studied enablers are classified by performing a Cross-Impact Matrix Multiplication Applied to Classification (MICMAC) analysis. The aim of this is to chart the enablers based on their dependence and driving power scores on the X-axis and Y-axis, respectively, of a quadrant chart that classifies them into four categories. These categories are independent drivers, linkage, autonomous, and dependent enablers.

Then, to determine the levels of the enablers, a Partitioning Matrix (PM) is formed using the found FRM. For each enabler E_i in the system, the reachability $R(E_i)$, antecedent $A(E_i)$, and interaction $I(E_i)$ sets are found using Equations (14)–(16), respectively, until all enablers in the system are exhausted.

$$R(E_i) = \left\{ E_i \middle| m^*_{ji} = 1 \right\}, \tag{14}$$

$$A(E_i) = \left\{ E_i \middle| m^*_{ij} = 1 \right\}, \tag{15}$$

$$I(E_i) = R(E_i) \cap\ A(E_i) \tag{16}$$

where m_{ij} denotes the value of the ith row and the jth column of the FRM.

Subsequently, an ISM digraph is built based on the directions of relationships between the studied enablers, their classifications, and their determined levels. The developed model helps achieve the study's second objective by revealing the interpretive structure of the studied strategic enablers, their levels, and their classifications based on their driving and dependence powers as autonomous, dependent, linkage, and independent enablers of financial sustainability in HEIs.

Finally, based on the obtained results from achieving the first and second objectives of the study, an integrated DEMATEL-ISM model of strategic enablers of financial sustain-

ability in HEIs is built. The results of applying the DEMATEL and ISM methods and their integration are presented in the following section.

3. Results

Using the materials and methods described above, this study's first objective is achieved using the DEMATEL method, and the second is achieved using the ISM method. Based on the results of both methods, an integrated DEMATEL-ISM model is developed. The results of applying each technique and their integration are presented in the following subsections.

3.1. Application and Results of the DEMATEL Method

As mentioned earlier, 16 experts with specialist knowledge and hands-on experience in financial sustainability in HEIs were engaged to evaluate the direct influence of each enabler on other enablers listed in Table 1 using the integer scale for pairwise comparison defined in Table 2. The data were collected using a designed questionnaire, resulting in 16 direct-influence matrices, one matrix from each expert. Then, using Equation (1), the 16 collected matrices were combined into the Group Direct-Influence Matrix *G*, as given in Table 4.

Table 4. The Group Direct-Influence Matrix *G* of strategic enablers of financial sustainability HEIs.

Enablers	E1	E2	E3	E4	E5	E6	E7	E8	E9	E10	Sum
E1	0	4	4	2	3	1	0	0	0	0	14
E2	1	0	2	1	2	4	0	0	0	0	10
E3	2	4	0	0	4	1	0	0	0	0	11
E4	0	0	0	0	0	0	0	0	0	0	0
E5	2	4	3	0	0	1	0	0	0	0	10
E6	0	0	0	4	0	0	0	0	0	0	4
E7	4	4	4	4	4	4	0	4	1	4	33
E8	4	4	4	4	4	4	4	0	0	4	32
E9	4	4	4	4	4	4	1	1	0	1	27
E10	4	4	4	4	4	4	0	1	4	0	29
Sum	21	28	25	23	25	23	5	6	5	9	

Note: all averaged rating values are approximated to the nearest integer scale value (Table 2).

The Normalized Direct-Influence Matrix *X* of the Group Direct-Influence Matrix *G* was calculated using Equations (2) and (3). According to Equation (3), the total of the rows and columns yields a maximum value of 33. This maximum value normalized Matrix *G* (Table 4) using Equation (2). Table 5 displays the obtained Normalized Direct-Influence Matrix *X*.

Table 5. The Normalized Direct-Influence Matrix *X* of strategic enablers of financial sustainability in HEIs.

Enablers	E1	E2	E3	E4	E5	E6	E7	E8	E9	E10
E1	0.000	0.121	0.121	0.061	0.091	0.030	0.000	0.000	0.000	0.000
E2	0.030	0.000	0.061	0.030	0.061	0.121	0.000	0.000	0.000	0.000
E3	0.061	0.121	0.000	0.000	0.121	0.030	0.000	0.000	0.000	0.000
E4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
E5	0.061	0.121	0.091	0.000	0.000	0.030	0.000	0.000	0.000	0.000
E6	0.000	0.000	0.000	0.121	0.000	0.000	0.000	0.000	0.000	0.000
E7	0.121	0.121	0.121	0.121	0.121	0.121	0.000	0.121	0.030	0.121
E8	0.121	0.121	0.121	0.121	0.121	0.121	0.121	0.000	0.000	0.121
E9	0.121	0.121	0.121	0.121	0.121	0.121	0.030	0.030	0.000	0.030
E10	0.121	0.121	0.121	0.121	0.121	0.121	0.000	0.030	0.121	0.000

The Total-Influence Matrix T presented in Table 6 was computed based on the Normalized Direct-Influence Matrix X (Table 5) using Equation (4) and a 10 × 10 Identity Matrix I.

Table 6. The Total-Influence Matrix T of strategic enablers of financial sustainability in HEIs.

Enablers	E1	E2	E3	E4	E5	E6	E7	E8	E9	E10	*R*
E1	0.021	0.155	0.144	0.074	0.120	0.057	0.000	0.000	0.000	0.000	0.571
E2	0.040	0.023	0.074	0.049	0.075	0.129	0.000	0.000	0.000	0.000	0.390
E3	0.076	0.151	0.031	0.016	0.141	0.056	0.000	0.000	0.000	0.000	0.471
E4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
E5	0.074	0.147	0.112	0.015	0.029	0.054	0.000	0.000	0.000	0.000	0.431
E6	0.000	0.000	0.000	0.121	0.000	0.000	0.000	0.000	0.000	0.000	0.121
E7	0.195	0.238	0.220	0.206	0.220	0.209	0.017	0.129	0.047	0.140	1.621
E8	0.191	0.233	0.215	0.201	0.215	0.205	0.124	0.020	0.021	0.139	1.563
E9	0.163	0.199	0.183	0.172	0.184	0.175	0.034	0.036	0.006	0.039	1.191
E10	0.172	0.210	0.193	0.181	0.194	0.184	0.008	0.035	0.122	0.009	1.308
C	0.932	1.356	1.172	1.035	1.178	1.069	0.183	0.219	0.196	0.327	

Note: Shaded cells represent values greater than or equal to the threshold value α of 0.077.

The Total-Influence Matrix T (Table 6) was used to determine the sums of the rows and columns represented by the vectors R and C, respectively. This calculation was performed using Equations (5) and (6). Subsequently, the vectors $R + C$ and $R - C$ were computed to determine the significance and nature of the relationships among the enablers. Afterward, each enabler's relative relevance and the normalized relative importance weights were calculated using Equations (7) and (8), respectively. Consequently, we ordered the enablers accordingly. The outcomes of the calculations are shown in Table 7. The findings presented in Table 7 indicate that of the ten enablers examined, six of them, labeled E1–E6, fall within the category of the receiver set of enablers. These particular enablers are identified as effects of other strategic enablers that contribute to the financial sustainability of HEIs. However, the four remaining enablers, namely E7–E10, are categorized as the dispatcher set of enablers and are considered causal strategic enablers for achieving financial sustainability in HEIs. The ranking of the strategic enablers of financial sustainability in HEIs based on their normalized relative relevance weights is also shown in Table 7. The presented ranking illustrates the prioritization of strategic enablers for achieving financial sustainability in HEIs, with enabler E7 being assigned the highest rank position of 1, indicating its utmost importance, and enabler E4 being given the lowest rank position of 10, showing its relatively minor importance.

Table 7. Relative importance weights, ranks, and identities of strategic enablers of financial sustainability in HEIs based on prominence and relation calculations.

Enabler	*R*	*C*	*R* + *C*	*R* − *C*	ω	$\acute{\omega}$	Rank	Identity
E1	0.571	0.932	1.503	−0.361	1.5457	0.085	8	Effect
E2	0.390	1.356	1.746	−0.966	1.9953	0.109	3	Effect
E3	0.471	1.172	1.642	−0.701	1.7857	0.098	5	Effect
E4	0.000	1.035	1.035	−1.035	1.4635	0.080	10	Effect
E5	0.431	1.178	1.610	−0.747	1.7744	0.097	6	Effect
E6	0.121	1.069	1.190	−0.948	1.5220	0.083	9	Effect
E7	1.621	0.183	1.805	1.438	2.3073	0.127	1	Cause
E8	1.563	0.219	1.781	1.344	2.2313	0.122	2	Cause
E9	1.191	0.196	1.387	0.995	1.7068	0.094	7	Cause
E10	1.308	0.327	1.635	0.982	1.9066	0.105	4	Cause

The calculation of the threshold value α is determined by using Equation (9) on the Total-Influence Matrix T, as shown in Table 6. The outcome yields a threshold value α of 0.077. Consequently, the values in the Total-Influence Matrix T (Table 6) that are larger than

or equal to α are shaded, indicating only the significant impacts of enabler connections that should be taken into account. Notably, none of the diagonal elements in matrix T were observed to be greater than or equal to α, suggesting the absence of any significant influence between any enabler and itself to be considered.

Subsequently, the CEICC is generated and shown in Figure 1 using the enablers' cause-and-effect identity classification and $(R + C, R - C)$ as coordinate values, as listed in Table 7. The chart serves as a visual aid for understanding the cause-and-effect grouping of the enablers of financial sustainability in HEIs. Four enablers (E7–E10) are charted above the X-axis, indicating their belongness to the cause group. Conversely, the other six enablers (E1–E6) are charted below the X-axis, showing their belongness to the effect group.

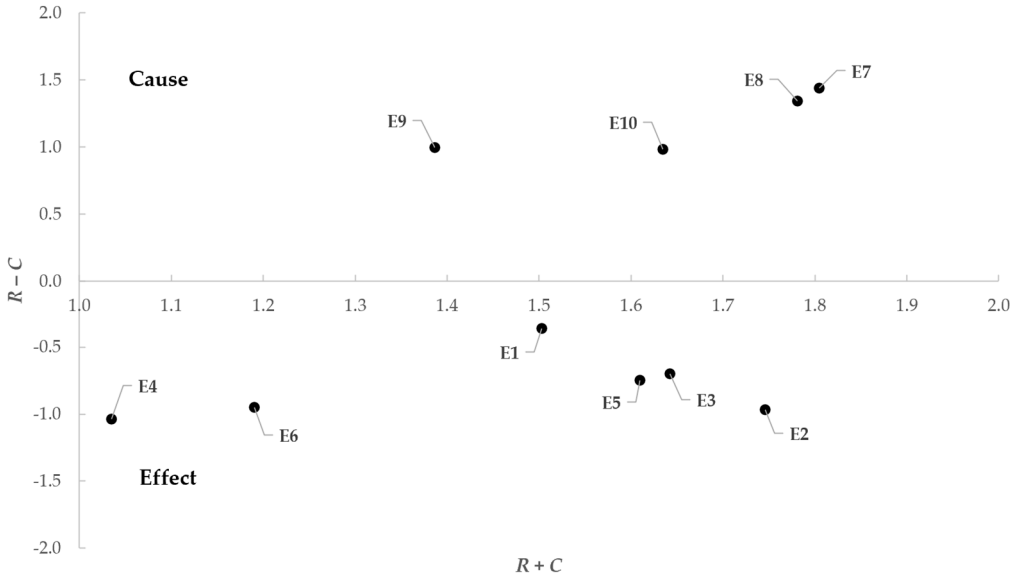

Figure 1. CEICC of strategic enablers of financial sustainability in HEIs.

Next, a DEMATEL cause-and-effect relationships digraph was generated and is illustrated in Figure 2, using the CEICC (Figure 1) and the strong relations between the enablers in matrix T (Table 6) based on the predetermined threshold value α of 0.077.

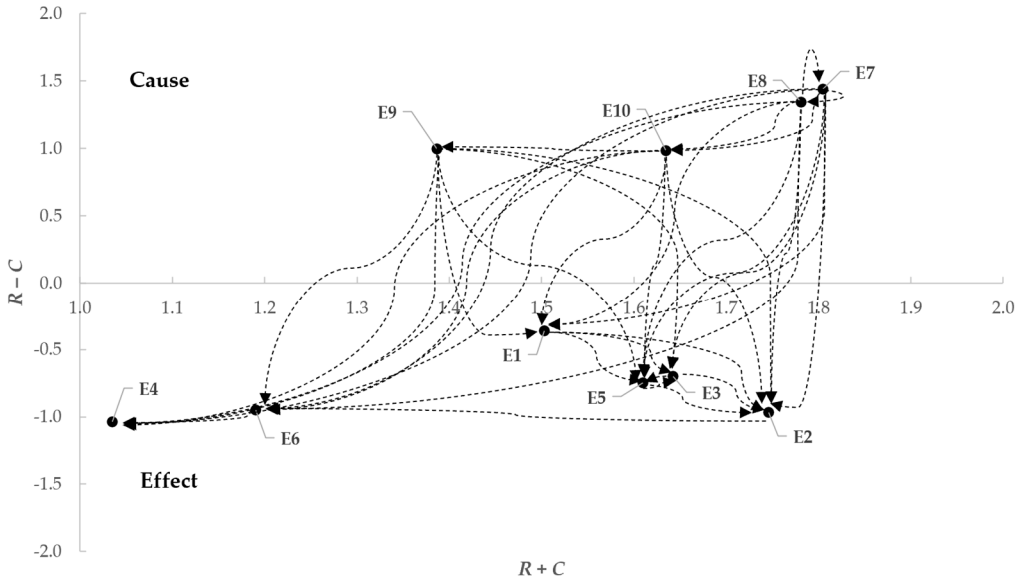

Figure 2. CRD of strategic enablers of financial sustainability in HEIs.

Based on the prominence and relation calculations presented in Table 7 for each of the ten strategic enablers, the normalized relative importance weights of the enablers' dimensions D1 and D2 were also calculated and are shown in Table 8. This was achieved by finding the sum of the individual normalized weights of the enablers forming each dimension (Table 7). Also, the $(R + C)$ and $(R - C)$ vectors of the dimensions were calculated by finding the average of the values associated with the enablers forming the dimension (Table 7). The results in Table 8 show that the effect dimension D1 has a higher sum of normalized relative importance weights than the effect dimension D2, indicating their rankings as first and second, respectively.

Table 8. Relative normalized importance weights, ranks, and identities of dimensions of strategic enablers of financial sustainability in HEIs based on prominence and relation calculations.

Dimension	Enabler	Average $R + C$	Average $R - C$	Sum $\acute{\omega}$	Rank	Identity
D1	E1 E2 E3 E4 E5 E6	1.454	−0.793	0.553	1	Effect
D2	E7 E8 E9 E10	1.652	1.189	0.447	2	Cause

Note: average and sum values are based on calculations obtained in Table 7.

Accordingly, the CRD of the strategic enablers' dimensions is illustrated in Figure 3 based on the results obtained in Table 8. Figure 3 provides a visual aid for understanding the cause-and-effect of the enablers' dimensions of financial sustainability in HEIs. The digraph shows that the cause dimension D2 above the X-axis influences the effect dimension D1 below the X-axis.

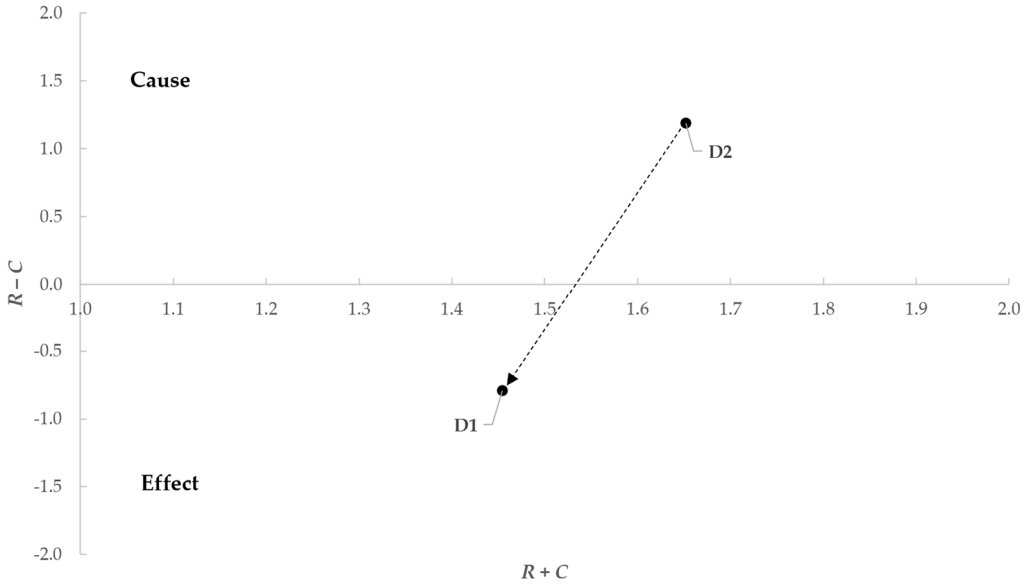

Figure 3. CRD of dimensions of strategic enablers of financial sustainability in HEIs.

Here, the study's first objective is achieved by analyzing the influential relationships among the enablers E1–E10 and their associated dimensions D1 and D2, revealing their cause-and-effect identities, relative importance weights, and rankings as strategic enablers

of financial sustainability in HEIs. The following subsection provides the obtained DEMATAL results used as inputs in the ISM, along with its application to achieve the study's second objective and its outcomes.

3.2. Application and Results of the ISM Method

To find the directions of strong relationships among the enablers, the DEMATEL *T* matrix (Table 6) was converted to the *D* matrix presented in Table 9 based on Equations (10) and (11). The resulting *D* matrix represents four possible relationship direction scenarios (Table 3) that were found between pairs of the studied enablers.

Table 9. Converted Total-Influence Matrix *D* of strategic enablers of financial sustainability in HEIs.

Enablers	E1	E2	E3	E4	E5	E6	E7	E8	E9	E10
E1	0	1	1	0	1	0	0	0	0	0
E2	0	0	0	0	0	1	0	0	0	0
E3	0	1	0	0	1	0	0	0	0	0
E4	0	0	0	0	0	0	0	0	0	0
E5	0	1	1	0	0	0	0	0	0	0
E6	0	0	0	1	0	0	0	0	0	0
E7	1	1	1	1	1	1	0	1	0	1
E8	1	1	1	1	1	1	1	0	0	1
E9	1	1	1	1	1	1	0	0	0	0
E10	1	1	1	1	1	1	0	0	1	0

Subsequently, the found *D* matrix (Table 9) was used to form the IRM and FRM using Equations (12) and (13), respectively. The resulting IRM and FRM are presented in Tables 10 and 11, respectively. The FRM shown in Table 11 includes higher-order transitive relationships between the studied enablers, indicated by the (1 *) symbol. The driving and dependence powers were calculated before and after the inclusion of higher-order transitive relationships between the studied enablers, as presented in Tables 10 and 11, respectively.

Table 10. IRM of strategic enablers of financial sustainability in HEIs.

Enablers	E1	E2	E3	E4	E5	E6	E7	E8	E9	E10	Driving Power
E1	1	1	1	0	1	0	0	0	0	0	4
E2	0	1	0	0	0	1	0	0	0	0	2
E3	0	1	1	0	1	0	0	0	0	0	3
E4	0	0	0	1	0	0	0	0	0	0	1
E5	0	1	1	0	1	0	0	0	0	0	3
E6	0	0	0	1	0	1	0	0	0	0	2
E7	1	1	1	1	1	1	1	1	0	1	9
E8	1	1	1	1	1	1	1	1	0	1	9
E9	1	1	1	1	1	1	0	0	1	0	7
E10	1	1	1	1	1	1	0	0	1	1	8
Dependence Power	5	8	7	6	7	6	2	2	2	3	

The driving and dependency powers derived from the FRM (Table 11) were used to categorize the examined enablers via the implementation of a MICMAC analysis. The classification of strategic enablers of financial sustainability in HEIs is shown in Figure 4 via the use of a MICMAC chart. This chart categorizes the enablers into three groups: independent, linkage, and dependent enablers. Notably, there are no enablers designated as autonomous enablers, indicating the relevance of the studied enablers to the subject matter.

Table 11. FRM of strategic enablers of financial sustainability in HEIs.

Enablers	E1	E2	E3	E4	E5	E6	E7	E8	E9	E10	Driving Power
E1	1	1	1	1 *	1	1 *	0	0	0	0	6
E2	0	1	0	1 *	0	1	0	0	0	0	3
E3	0	1	1	1 *	1	1 *	0	0	0	0	5
E4	0	0	0	1	0	0	0	0	0	0	1
E5	0	1	1	1 *	1	1 *	0	0	0	0	5
E6	0	0	0	1	0	1	0	0	0	0	2
E7	1	1	1	1	1	1	1	1	1 *	1	10
E8	1	1	1	1	1	1	1	1	1 *	1	10
E9	1	1	1	1	1	1	0	0	1	0	7
E10	1	1	1	1	1	1	0	0	1	1	8
Dependence Power	5	8	7	10	7	9	2	2	4	3	

Note: 1 * represents higher-order transitive relationships based on Warshall's algorithm [70].

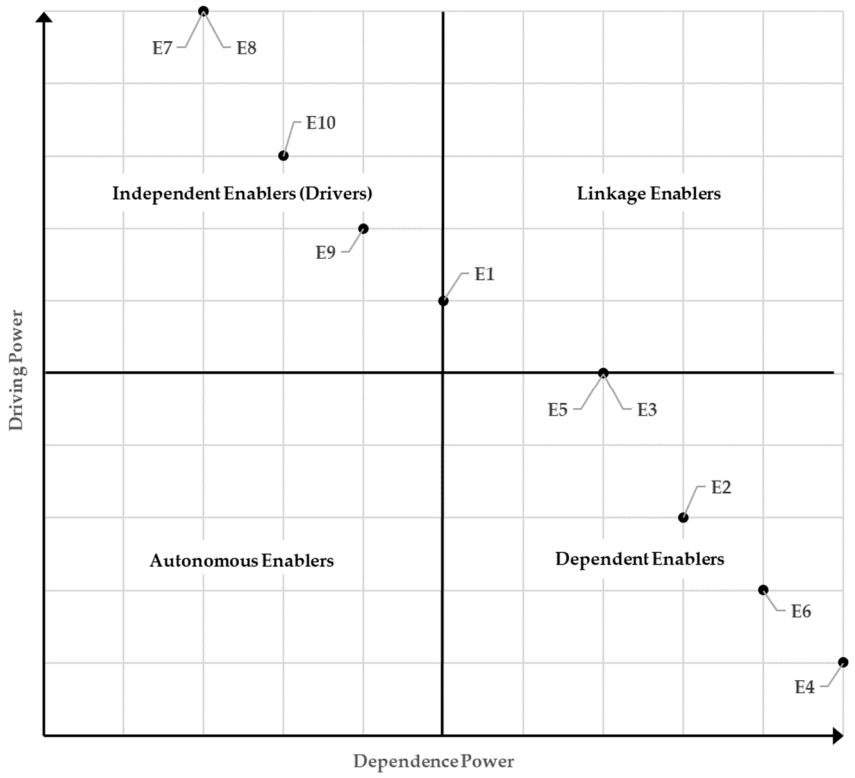

Figure 4. MICMAC of strategic enablers of financial sustainability in HEIs.

The findings indicate that enablers E7–E10 are grouped together as independent strategic enablers for achieving financial sustainability in HEIs. Nevertheless, the enabler E1 is positioned as an intermediary between the independent and linking regions. Additionally, the enablers E3 and E5 are also positioned as intermediaries between the regions of the linkage and dependent clusters. On the other hand, the enablers E2, E4, and E6 are categorized as dependent strategic enablers of the achievement of financial sustainability in HEIs.

Notably, the categorization outcomes obtained from the MICMAC technique align with the cause-and-effect classification derived from the DEMATEL method. The MICMAC analysis categorizes the cause group of the DEMATEL method as independent enablers E7–E10. These enablers are connected by the in-between linkage enabler E1, which

is closer to the independent group, and E3 and E5, which are closer to the dependent group. Finally, the effect group of enablers E2, E4, and E6 are classified as dependent enablers.

Subsequently, the FRM (Table 11) is used to construct the PM. The PM segregated the studied enablers into eight tiers resulting from eight successive iterations. This classification is based on the enablers' reachability, antecedent, and interaction sets, which are found using Equations (14)–(16), respectively. Table 12 provides a summary of the resulting PM.

Table 12. PM of strategic enablers of financial sustainability in HEIs.

Enabler	Reachability Set	Antecedent Set	Intersection Set	Level
E1	E1	E1, E7, E8, E9, E10	E1	5
E2	E2	E1, E2, E3, E5, E7, E8, E9, E10	E2	3
E3	E3, E5	E1, E3, E5, E7, E8, E9, E10	E3, E5	4
E4	E4	E1, E2, E3, E4, E5, E6, E7, E8, E9, E10	E4	1
E5	E3, E5	E1, E3, E5, E7, E8, E9, E10	E3, E5	4
E6	E6	E1, E2, E3, E5, E6, E7, E8, E9, E10	E6	2
E7	E7, E8	E7, E8	E7, E8	8
E8	E7, E8	E7, E8	E7, E8	8
E9	E9	E7, E8, E9, E10	E9	6
E10	E10	E7, E8, E10	E10	7

The construction of the ISM digraph, as seen in Figure 5, is informed by the disclosed directions of relationships among the enablers and their driving and dependence powers in the FRM (Table 11), their respective classifications derived from the MICMAC analysis (Figure 4), and their partition into eight distinct levels (Table 12). Here, the study's second objective is achieved by developing the interpretive structure of the studied strategic enablers of financial sustainability in HEIs.

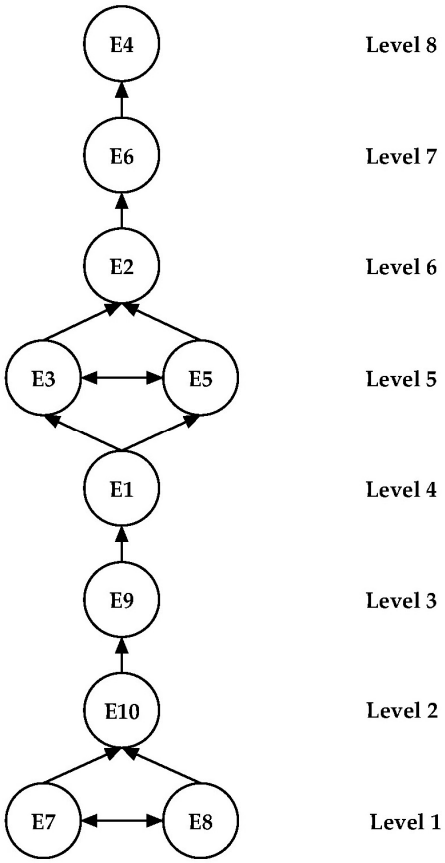

Figure 5. ISM Digraph of strategic enablers of financial sustainability in HEIs.

Finally, the construction of an integrated DEMATEL-ISM model of the studied strategic enablers of financial sustainability in HEIs, E1–E10, and their associated dimensions, D1 and D2, is undertaken in light of the outcomes from achieving the study's first and second objectives. This model is visually illustrated in Figure 6. The following section discusses the results obtained by applying the DEMATEL and ISM methods and their integration.

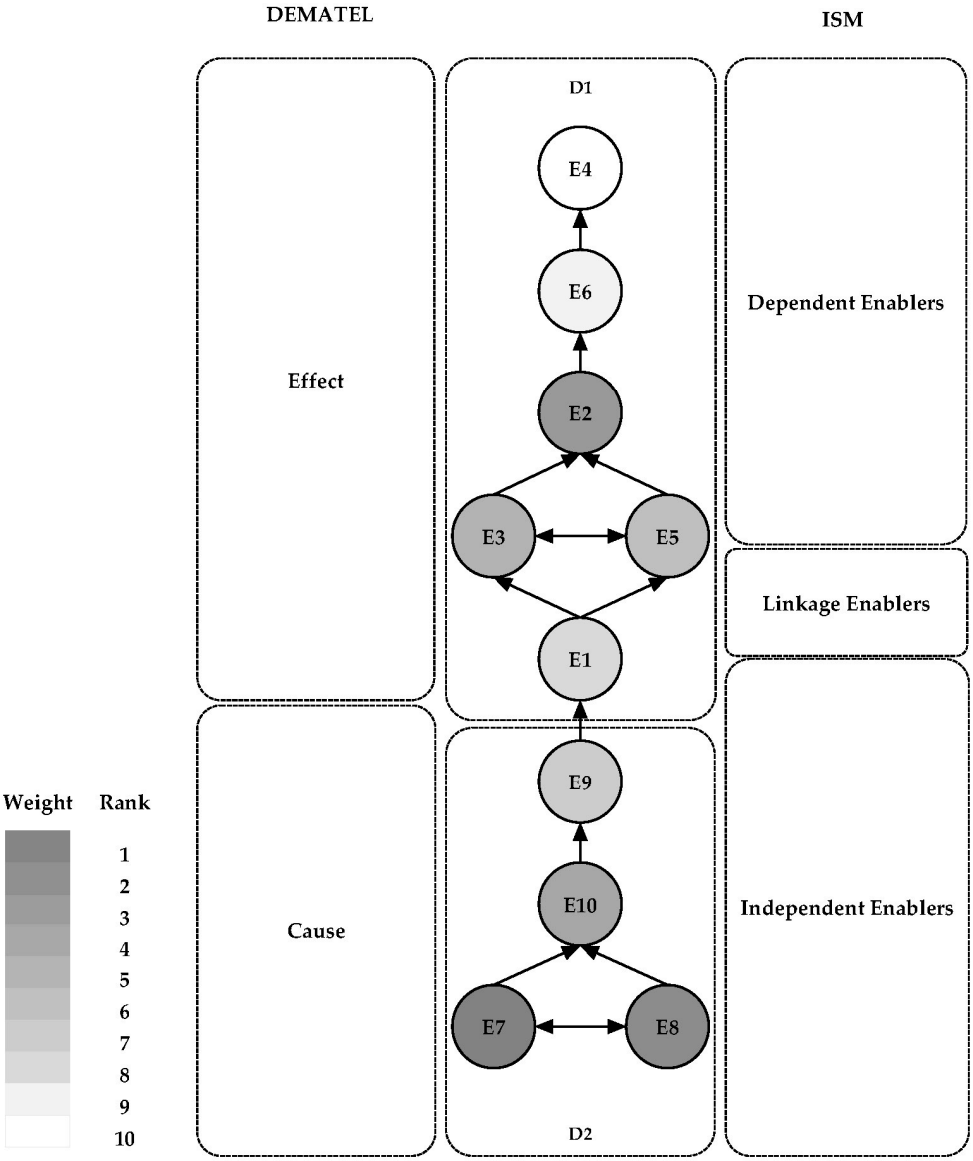

Figure 6. Integrated DEMATEL-ISM digraph of strategic enablers of financial sustainability HEIs.

4. Discussion

A discussion of the findings and observations derived from following the integrated DEMATEL-ISM approach is provided in this section. This is in light of the primary purpose of this research study, which is to model and analyze the intricate connections and interdependencies among the ten identified and examined strategic enablers of financial sustainability in HEIs and their associated dimensions (Table 1). These intricate connections and interdependencies, which were formed based on the collective opinions of the engaged experts, were used as inputs to the modeling and analysis process. Our aim was attained by achieving the two main objectives of this study. Therefore, the following subsections are categorized based on the two objectives of this study. The first subsection provides a discussion of the results obtained from the application of the DEMATEL technique. The

second subsection provides a discussion of the results obtained from the application of the ISM technique and the MICMAC analysis. Finally, a discussion of the integrated DEMATEL-ISM model is given, providing a complete view of the strategic enablers and practical insights for decision-makers to achieve financial sustainability in HEIs.

4.1. Cause-and-Effect Relationship Classifications, Relative Importance, and Ranks of Strategic Enablers of Financial Sustainability in HEIs

The first objective of this study was achieved using the DEMATEL method. This was achieved by analyzing the influential relationships among the enablers E1–E10 and their associated dimensions D1 and D2, revealing their cause-and-effect identities, relative importance weights, and rankings as strategic enablers of financial sustainability in HEIs.

The obtained results from the analysis show that the enablers E7–E10 falling under dimension D2 are all classified as cause enablers. This classification indicates that for HEIs to be able to achieve financial sustainability, regulations and legislation should be put in place as the starting point. These regulations and legislation include developing systems that stimulate the external and internal environments, improve change management, and boost environmental sustainability. The aim of this is to transform HEIs into attractive and stimulating environments for investment, enabling them to implement their financial sustainability initiatives. This includes formulating systems, enablers, and executive rules that stimulate the investment environment externally. Furthermore, to ensure that all internal sectors of HIEs and their personnel are in harmony with the objectives and initiatives of financial sustainability. HEIs must formulate systems and executive rules that enable the investment environment to operate internally.

Additionally, HEIs need to ensure the commitment of all their financial sustainability initiative owners to environmental sustainability controls. This includes implementing procedural guidelines and indicators of environmental sustainability to be applied to all financial sustainability initiatives and ensuring their conformance. Moreover, HEIs need to apply the specifications of financial sustainability to all sectors and personnel of the HEI and adhere to them. This includes establishing rules and regulations, adopting change-management strategies that increase employees' awareness of financial sustainability objectives, and linking material and moral incentives to achieving them.

The analysis results also classified the enablers E1–E6 as effect enablers, falling under dimension D1. This classification indicates that HEIs will be able to satisfy their governance requirements due to having the necessary regulations and legislation-related systems in place. These governance requirements include the integration of planned financial sustainability initiatives into the HEIs' organizational structures, which allows for establishing new or developing existing units. This also includes integrating such initiatives into the HEIs' financial structures and ensuring the alignment of this integration with their plan objectives. Another governance requirement is for HEIs to define tasks and authorities for all administrative units emerging from their financial sustainability plans and ensure commitment.

Moreover, HEIs also need to ensure the legal integrity of their procedures by putting in place guidelines for monitoring and control procedures for administrative units emerging from their financial sustainability plans, and ensuring that their initiatives are well connected to their administrative structures. Also, HEIs need to adopt an integrated financial system, which includes creating a unified job grade structure for all their personnel. Furthermore, HEIs must verify quality control of the governance components in all their sectors and ensure their commitment, including issuing regulations to govern performance in achieving financial sustainability.

The analysis and modeling process also revealed the rankings of the strategic enablers and their related dimensions of financial sustainability in HEIs. These rankings were found based on their normalized weights of relative importance to each other. The analysis revealed that the most critical strategic enabler of achieving financial sustainability in HEIs is the development of systems that stimulate the external environment—followed by the

development of systems that stimulate the internal environment; financial restructuring; developing systems that stimulate change management; defining tasks, authorities, and job descriptions; restructuring job grades; developing systems that boost environmental sustainability; administrative restructuring; updating governance systems and quality standards; and lastly, monitoring and control, which is the least critical. In terms of dimensions, the analysis revealed that good governance is marginally more critical than regulations and legislation as a dimension of financial sustainability in HEIs. This finding indicates that despite the regulations and legislation that should be in place as a starting point, satisfying governance requirements is a critical phase in achieving financial sustainability in HEIs.

This analysis also determined the vital cause-and-effect relationships among the studied enablers, revealing a complex network of interconnections that illustrates the dynamics of the system components. The developed model (Figure 2) shows the general flow of cause-and-effect between the enablers, starting from developing systems that stimulate the external environment and reaching the monitoring and control stage. In terms of dimensions, the developed model (Figure 3) also shows that the general flow begins from the regulations and legislation, ending with good governance for achieving financial sustainability in HEIs.

4.2. Dependence and Driving Power Classifications, Relationship Directions, and Interpretive Structure of Strategic Enablers of Financial Sustainability in HEIs

This study's second objective was achieved using the ISM method and MICMAC analysis. This was achieved by developing an interpretive structure of the studied strategic enablers, revealing their levels and classifications based on their driving and dependence powers as autonomous, dependent, linkage, and independent enablers of financial sustainability in HEIs. The vital cause-and-effect relationships between the enablers determined using the DEMATEL method were used as inputs to the ISM process.

The findings from the MICMAC analysis revealed the classifications of the enablers. The developed model shows that E7–E10 are grouped as independent enablers. This result suggests that these enablers, namely, the development of systems that stimulate the external and internal environments, change management, and boost environmental sustainability, which fall under the regulations and legislation dimension, are all independent. This result indicates the vital role of these enablers as the cornerstone of achieving financial sustainability in HEIs, which is consistent with their classification as cause enablers by the DEMATEL method. It also indicates that the development of regulations and legislation systems might be independent of the HEIs and could be the responsibility of an external higher regulatory body to ensure their alignment with higher goals and other institutions, as well as their enforcement in a top-down direction.

Our findings also showed that administrative restructuring in HEIs is classified as an intermediary between the independent and linkage groups of enablers. Also, defining tasks, authorities, job descriptions, and restructuring job grades are intermediaries between the linkage and dependent groups of enablers. This result indicates that after having regulations and legislation in place, administrative restructuring should first be conducted in conjunction with defining tasks, authorities, and job descriptions and restructuring job grades, which all will act as linkages to the dependent group of enablers. These dependent enablers were found to be financial restructuring, updating governance systems and quality standards, and lastly, monitoring and control.

The developed interpretive structure model of the studied strategic enablers of financial sustainability in HEIs (Figure 5) partitions them into eight separate tiers, guiding the direction and order of their attainment. The model places the development of systems that stimulate external and internal environments for investments on the first level. The second level involves the development of systems that stimulate change management in HEIs. On the third level of the model comes the development of systems that boost environmental sustainability. The model places administrative restructuring on the fourth level. This is followed by defining tasks, authorities, and job descriptions and restructuring job grades

on the fifth level, and enabling financial restructuring on the sixth level. Then, updating governance systems and quality standards is categorized into the seventh level. Lastly, the monitoring and control enabler is on the eighth level.

4.3. Integrated Model of Strategic Enablers of Financial Sustainability in HEIs

Finally, based on the obtained results from achieving the first and second objectives of this study, an integrated DEMATEL-ISM model of strategic enablers of financial sustainability in HEIs was built (Figure 6). The developed model synthesizes the achieved results from both methods. The developed model illustrates the cause-and-effect relationship classifications, ranks based on relative importance weights, dependence and driving powers classifications, relationship directions, and the interpretive structure of the enablers and their dimensions. It provides an overarching view of the interconnected network of strategic enablers and their dimensions, which act as a roadmap to achieving financial sustainability in HEIs.

5. Conclusions

The primary purpose of this research study was to model and analyze the strategic enablers of financial sustainability in HEIs and their corresponding dimensions. This aim was attained by achieving two objectives. The first objective of the modeling process was to analyze the influential relationships among the ten enablers and their associated dimensions, revealing their cause-and-effect identities, relative importance weights, and rankings as strategic enablers of financial sustainability in HEIs. The second objective was to develop an interpretive structure of the studied strategic enablers, revealing their levels and classifications based on their driving and dependence powers as autonomous, dependent, linkage, and independent enablers of financial sustainability in HEIs. The aim of this was to build an integrated model that assists in achieving financial sustainability in HEIs. The DEMATEL and ISM methods were used to create an integrated model of the ten enablers, which were found to fall into two dimensions. This helped us reach both goals. Input data collected from experts with specialist experience in financial sustainability in HEIs were used in the modeling process.

The results indicate that for HEIs to achieve financial sustainability, regulations and legislation should be in place as the starting point. These regulations and legislation include developing systems that stimulate the external and internal environments, change management, and boost environmental sustainability. Additionally, HEIs will be enabled to work on their governance requirements due to having the necessary regulations and legislation-related systems in place. The analysis and modeling process also revealed the rankings of the strategic enablers and their related dimensions of financial sustainability in HEIs. It revealed that the most critical strategic enabler of achieving financial sustainability in HEIs is the development of systems that stimulate the external environment, followed by the development of systems that stimulate the internal environment; financial restructuring; developing systems that stimulate change management; defining tasks, authorities, and job descriptions; restructuring job grades; developing systems that boost environmental sustainability; administrative restructuring; updating governance systems and quality standards; and lastly, monitoring and control, which is the least critical. The findings also indicated that despite the regulations and legislation that should be in place as a starting point, satisfying governance requirements is also critical to achieving financial sustainability in HEIs. The developed model shows the general cause-and-effect flow between the enablers, starting from developing systems that stimulate the external environment and reaching the monitoring and control stage.

Moreover, in terms of dimensions, the developed model also shows that the general flow begins with regulations and legislation, ending with good governance for achieving financial sustainability in HEIs. It also indicates that the development of regulations and legislation systems might be independent of the HEIs and could be the responsibility of an external higher regulatory body to ensure their alignment with higher goals and other

institutions, as well as their enforcement in a top-down direction. These results indicate that after having regulations and legislation in place, administrative restructuring should first be conducted in conjunction with defining tasks, authorities, and job descriptions and restructuring job grades, which all will act as linkages to the dependent group of enablers. Those dependent enablers were found to be financial restructuring, updating governance systems and quality standards, and lastly, monitoring and control.

The developed model unpacks the complex relationships among the enablers and their dimensions. It provides an overarching view of the interconnected network that acts as a roadmap to achieving financial sustainability in Saudi HEIs. The results of this study can facilitate the execution of current Saudi HEIs' strategic plans for financial sustainability, such as the strategy in [9,10] and its investment initiatives [11].

However, the results obtained in this study are specific to Saudi HEIs. Therefore, this study might be replicated using input data from another group of experts from HEIs in different spatial and temporal contexts following the same integrated modeling approach to ensure the further validity of the developed model. Moreover, other HEI-specific models could be developed, providing institution-specific insights into enabling the achievement of their financial sustainability. Also, using a fuzzy extension of the methods used in this study is a future research direction that could further enhance the developed model by accounting for the ambiguity in experts' input data. Lastly, to further validate the model and its results, a cross-sectional or longitudinal study design with more extensive data samples might be used in future studies to statistically confirm the established cause-and-effect relationships in this study.

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Appendix A

Table A1. Higher education financial sustainability experts' profiles.

Expert	Qualification	Specialty	Position	Years of Experience
FSE_1	Ph.D.	Pharmacology	Former University Rector and Consultant	+30
FSE_2	Ph.D.	Nuclear Engineering	University President	+30
FSE_3	Ph.D.	Industrial Engineering	Former University President	+30
FSE_4	Ph.D.	Electrical Engineering	Former University Vice President	+30
FSE_5	Ph.D.	Industrial Engineering	University Professor and Consultant	+30

Table A1. *Cont.*

Expert	Qualification	Specialty	Position	Years of Experience
FSE_6	Ph.D.	Economics	Industry Representative (Banking)	+30
FSE_7	Ph.D.	Computer Information Systems	University President Assignee	+25
FSE_8	Ph.D.	Nuclear Engineering	Industry Representative (Technology)	+25
FSE_9	Ph.D.	Accounting	University Vice President	+20
FSE_{10}	Ph.D.	Management and Planning	Consultant, Ministry of Economy and Planning	+20
FSE_{11}	Ph.D.	Computer Information Systems	University Rector	+20
FSE_{12}	Ph.D.	Administration	Industry Representative (Technology Transfer)	+20
FSE_{13}	Ph.D.	Business	Former Dean of a University	+20
FSE_{14}	B.Sc.	Business	Industry Representative (Investment)	+20
FSE_{15}	B.Sc.	Business Administration	Industry Representative (Investment)	+20
FSE_{16}	Ph.D.	Management	Planning Consultant	+15

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