A Fuzzy TOPSIS Based Analysis to Prioritize Enabling Factors for Strategic Information Technology Management

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Abstract

Strategic management of information technology (IT) requires the attention provided to internal and external organizational factors. This paper discusses different enabling factors that allow strategic management of IT, making advances not only for using the approaches independently as well as in using them in a corresponding and adaptive way. A questionnaire-based survey and in-depth discussions were performed with 40 primary stakeholders to assess the relevance of enabling factors. Using available resources-based analysis, enabling factors were defined in four different categories: organizational, business, technological, and operational assessment. Subsequently, these four enabling factors were prioritized using the fuzzy Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS) multi-criteria decision analysis method. Finally, technological assessments were given high priority on the basis of the findings to allow more successful strategic IT management.

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1. Introduction

In current digital world, markets, business, and industry entirely depend on their technical capabilities to be more agile in evolving market priorities, increased competition, and investments. We are less worried with what technology IT companies are using, and more focused in how the IT department can affect or promote a business strategy transition. Security quality assurance of information technology systems is also a necessary consideration for IT stakeholders [1, 2]. In general, public agencies have far more knowledge about individuals, properties and organizational procedures than likely exist anywhere else in the globe. Public organizations actually have an abundance of a tool that does not show any indication of diminishing in the near future. Making successful use of the digital tool

through strategy, power, and vision is a different matter entirely. It is important how corporate organizations manage, operate, and disseminate facts and also in what manner they achieve the relevant technology as the digital / technological era progresses. Strategic IT management is an active and dynamic undertaking, and with every new invention this becomes more important. It's no longer sufficient merely to simplify administrative activities or pass data reams to a computational device.

Information technology addresses possible collection, storage, and communication of data or information in electronic format to all technological innovation procedures. For this determination, the physical infrastructure used involves digital devices, computers, networking systems and networks, as well as electronic compact planners. Information technology based applications incorporate formalized information collection and/or communication

activities. Knowledge is usually considered as a tangible or intangible factor which significantly reduces indecisiveness about certain condition or occurrence. Information or data may be collected from the company's internal activities and from outside sources, such as vendors or consumers. Data often derives from peripheral systems and services; such as the acquisition by administrations of an enormous amount of advertisement and productive data. Several organizations provide clients with a variety of analysis on various businesses. An IT driven solution also processes these facts in certain manner and provides users with the findings. Given the simple usability of personal computers, users frequently processes the performance of a structured program in an ad hoc way themselves. Human perception of knowledge is essential in determining how an entity responds to a system's performance. Different approaches for two managers could mean something different. An investment banker can check trends or sales problems using arithmetical software and graphs. Despite the very same sales results, a financial analyst can see an issue with profitability.

Today's new advanced and powerful commercial enterprise should make use of automated information management, that can not only enable them to manage data as well as conduct clerical activities however also offer facilities in a more secure and customer-friendly manner. Cumulative publicly available information systems may compromise better ways of providing government supervision and programs, but receiving there is no simple process. Public officials have learned in recent decades that they need to handle the information technology in consideration of its effect on the workers using the technology as well as the company itself. Digital technology is therefore no longer seen simply as a means of increasing productivity but also as a way of bringing about corporate transformation. IT has evolved from a method of data collection and analysis to a way of handling organizational procedures and results systematically. At the one side, the world in which public authorities work is a complicated one transformed by technology, and thus vulnerable to rapidly changing. The public officials, at the other side, works within a national background in an organizational setting that is not particularly susceptible to dramatic change. Throughout the public sector, therefore, strategic IT management is at the convergence of opposing interests and principles about transition. IT and its strategic management address three strategic issues among public administrators. First, the rapid speed at which information technology is developing in this field requires executives in the public sector to keeping up-to-date with the developments and determines which, if there are any, must be integrated into their organisation. Second, information administration is in itself a significant transformation agent and has adverse effects on management arrangement, human resource managing as well as economic controlling. Third, with the growing use of a governance system as compared to a legislative structure, public officials are in the centre of a big transition.

This research work comprises of six sections. The second section deliberates the strategic use of Information Technology in the setting of business organization. The third section designates the different recent related works. The fourth section describes fuzzy TOPSIS MCDM approach to prioritize the different enabling factors of strategic information technology management. The fifth section discusses data analysis and results. Lastly the work concludes in the sixth section.

2. Strategic Use of Information Technology

The Strategic use of information technology is essential for effective control of information technology with certain policy and procedure. Gorry and Scott-Morton were one of the first writers who recognized variations between systems based on information technology [3]. We organized them through administrative activity and included forms of assumptions suggesting that most aspects of management anxiety were unorganized decisions. They concluded that the largest payment to corporate entities happens at a strategic level wherein the issues are rich in complexity as well as confusion. Managerial decisions are heavily indebted at this level; innovations may have a strong payoff for issues that are important. However, the focus of Gorry and ScottMorton was on leveraging computer technology to enhance supervisory decision-making with the help of a model construct as well as learning cycle. In 1982, Hank Lucas and Jon Turner found that information technology could be used in three radically different ways to accomplish strategic administrative ends [4]. First, this can be used to achieve better qualifications in current systems, for instance, through minimizing variable costs by automation of routine operations, or through increasing the usage of information through optimizing services to customers. Furthermore, this can be used to enhance the mechanism of strategic planning by creating support mechanisms for policy analysis. Ultimately, technology could be used to open up new markets by creating new products or services which depend directly on or integrate technology. While many of the underlying factors in the implementation of these techniques were established by the authors, the emphasis was still on technology, emphasizing the way it has been used.

A year later, Greg Parsons observed that if information technology were to become a feasible strategic tool, top management would need to consider how its use affected a firm's business environment and strategy [5]. He described three interaction-levels. At the industrial level, IT is possible to modify the goods and services sold the industries and the manufacturing environment by fundamental process changes. At the firm stage, IT affects buyer-supplier relationships, drives substitution, serves as an obstacle to new competitors, and is an environment where challenges can be fought. Lastly, a company may use IT to develop a low-cost lead at the strategic level, to distinguish its goods from those in the market. The value of Parsons' research was that it moved the theoretical focus from technology to the

strategy of an organization and integrated the strategic arrangement terminology. Warren McFarlan elaborated on this concept by noting that information technology would contribute quality to the goods and be utilized to bring off track rivals [6]. Through his viewpoint the problem is the quest for chances. IT may be utilized to construct entry authentication. Information technology will transform distributor organizations stability and create new goods. Digital technology should be used to create savings of substitution and to shift the foundation of the struggle. McFarlan explicitly links technology to Porter's three different business strategic planning groups, as Parsons has done: cost-based, product differentiation, as well as market niche. Several of these challenges are clarified in Porter's article on how to use information technology to gain a competitive advantage. Cost-based, product differentiation, and market niche [7].

Porter's main focus on knowledge as well as how it could be utilised to advantage is a major contribution.

This not only shifts the emphasis away from social media in general, but it also ties the push return to the initial decision concepts. Of course, it is the information supplied by technology instead of the technology itself which is significant. Williamson indicates two simple ways to organize organizational operation exist [8]. Internal hierarchies for a particular product could be used to begin price, power, importance and purpose. In this case sellers are not chosen from a pool of possible choices; management guides them. To achieve alignment with hierarchies, relatively little knowledge is required, since choices are restricted and pre-planned. In this situation, cost of production tends to be higher to push them lower, without competitiveness. Considerable details must be converged and shared with external companies to recognize (and control) appropriate suppliers. Nonetheless, production prices should be reduced because of the dynamic business process. Thus, an exchange-off occurs for a firm among communication costs, which are mainly information processing and development costs [9]. To sum up, the focus has shifted beyond classifying information technology activities to analyzing all facets of an organization in search of ways to use information to achieve a reasonable edge.

Rezende et al. [10] described the municipal information preparation and IT management used for a project undertaken in the municipality of Vinhedo, São Paulo / Brazil. They used a case study as research technique, using an action-analysis. The findings identify the different phases, sub-phases and endpoints of project authorization via a strategic urban city project approach. They also showed the items provided and should illustrate the obstacles and complications. The contributions relate to the functional viability of this municipal information as well as information technology management initiative and the specifics of its approach execution. Farnia et al. [11] conducted an empirical study to assess the impact of IT on strategic controlling at one of Iranian auto manufacturers on after-sales facilities in the Iranian automotive business. The findings suggested that information technology had an

impact on the implementation and management policies of the strategy.

Chen [12] experimentally explored the efficiency consequences of Knowledge Management (KM) fitting between KM approach and its Strategic IT Management (SITM). Based on a covariation point of view of fit, the findings of this study demonstrate that KM performance is mainly the result of the well-fitting strategy among KM and strategic IT management. Khosravian & Radfar [13] observed analysis in which they collected information in retirement fund oil using population questionnaires and evaluated using descriptive statistics by SPSS software. The conclusions drawn through test hypotheses revealed important association between IT strategic management and organizational performance. They also investigated that the index and investment in IT integration are in important association towards organizational performance.

Al Wazzan [14] investigated strategic and IT factors which must be regarded as a profitable factor for IT strategic analysis, and recommended a Strategic Technology Management (STM) framework. The findings of the study demonstrated that strategic management of information technology is a continual process of analysis and improvement and that convergence between factors like competitive marketplace, profitable strategies, competitive result, and competitive factors is gaining competitive edge for businesses. Alzaabi et al. [15] performed inspections and intended to conceptualize strategic IT project risk management to adequately describe the role of top management. The research population involved all IT practitioners and institutional top management representatives with a dedicated IT department at UAE. Upon thorough review of the findings, the results showed important and optimistic statistical effects on the IT project setting from both strategic planning processes and strategic risk incorporation.

While this is a significant change in perspective, considering the current understanding of how organizations work, it enhances some troublesome considerations. The following Figure 1 shows the implementation method for the strategic management of information technology.
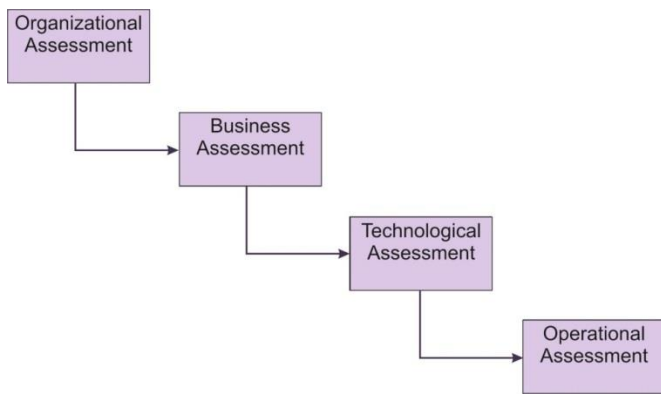
Figure 1. Strategic Information Technology Management Implementation Process

2.1. Organizational assessment

There are many ways in which the organisations differentiate [16]. Organizations may include law-making bodies, political organizations, administrative agencies, the courts, private businesses, labour unions, NGOs, colleges, and parent-teacher associations. An association consists of individuals who are working in a coordinated way towards a common objective. Organizational priorities differentiate organisations from other groups in society, including families. Moreover, even though organizations have objectives, their members may appear uncooperative towards the objectives, or be excluded from them. Since organisations are comprised of individuals, all of their operations are structured inside the constraints of members of the organization. Trade organizational assessments use a process science methodology to evaluate a proposed renovation, track the renovation effects on the organization, evaluate the readiness of the organizational artifacts for the construction, and determine the workplace and institutional risks involved with the construction.

2.2. Business assessment

A business assessment helps the organization's manager in achieving the business's goals, developing and delivering the enterprise in a wise and proactive manner with IT resources being involved. Administrator of the organization has to be aware of the firm's weaknesses and strengths. The business assessment performance helps define the risky capacities of the strategic development plan. It is a critical step and will place the managerial staff on a track to more actively run the company.

2.3. Technological assessment

In the 1960s, technology assessment was carried out by business organizations, particularly in the United States, concentrating on problems which including supersonic

transport charges, environmental detritus as well as the concepts of genetic analysis. The word has been utilized in the House Science and Astronautics Committee's Subcommittee on Science, Research and Development of US Congress headed by Emilio Daddario, its chairman. Technology assessment is a very comprehensive field. Technology assessment is not the only supported or approved operation. These topics, such as technology dissemination and the delivery of technology, aspects that are vital for the fast approval of fresh technology as well as the position of technology as well as society, appear to be part of the technology evaluation field [17].

2.4. Operational assessment

Operational assessment in a corporate enterprise is a vital mechanism and it requisite evaluate client competency-evaluating, at a smallest, product as well as service technology, process design, process management procedures, system capabilities and deliverables. This assessment concerns how every part of the company is structured to provide strategic direction as well as practical objectives at the organizational and company unit level. Operational assessment is also based on process problems, human & financial infrastructure, etc. [18]. This process comprises an operational assessment involving workers with comprehensive, sophisticated product and design engineering expertise as well as specific process management methodologies, accompanied by several others able to make significant organizational and productive judgments.

3. Related Works

Several existing research studies of fuzzy-TOPSIS multi-criteria decision-making (MCDM) procedures have been published by different authors to solve decision-making issues. Moreover, none of them evaluate and prioritize the enabling factors for strategic information technology management with the usage of Fuzzy-based decision-making method.

Sawant and Mohite [19] designed a selection model of the effective automated guided vehicle (AGV) for a vehicle production company by attempting to measure the degree of profit given by using the multi-attribute decision making (MADM) methods of fuzzy numbers system. They used TOPSIS as the MADM method to rank the AGV. From the findings of this study they observed that as the ambiguity and inaccuracy increase, it is better to use fuzzy values instead of crisp values. But on the other side, this can be inferred that the use of crisp numbers would be more than sufficient in cases where there may be a low degree of fuzziness, or even the average value of a fuzzy number.

Jafarian et al. [20] proposed a structure for decision-making, selection as well as assignment to development teams of the six sigma projects. Firstly, the most relevant criteria are selected in the Six Sigma Project Selection

(SSPS) process. Consequently, the fuzzy TOPSIS approach is used to prioritize them, after defining six sigma possible projects in the company. They also presented a   case study in the automotive sector, as well as the methodology is addressed to demonstrate the designed application. Liu et al. [21] presented a new hybrid Failure Mode and Effect Analysis (FMEA) design focused on cloud system concept as well as hierarchical TOPSIS approach to determine as well as rank the probability of modes of failure. Further they took two empirical observations which provided along with a comparison with some current approaches to demonstrate the viability and efficacy of the suggested FMEA.

 Rafi et al. [22] described the essential factors which could adversely affect the DevOps process of evaluating the quality of the data. They used the method for Systematic Literature Review (SLR) as well as identified a total of 13 important difficulty factors. Further they also validated the SLR result is by questionnaire survey with industry experts. Subsequently, they used the Fuzzy TOPSIS method to prioritize the daunting variables under investigation with reference to the DevOps data quality evaluation method significance. Rani et al. [23] planned a report on a novel divergence measurement to rank as well as pick alternative energy foundations within multi-criteria decision-making issues focused on fuzzy TOPSIS, and contrasted with a few previous methods.

Lei et al. [24] proposed a method in which the linguistic term sets (LTSs) are translated into probabilistic linguistic term sets (PLTSs) in this process. To extract the attribute weight information, an aggregation method is constructed on the base of the basic idea of the traditional TOPSIS process, through which the weights of the attribute determined. Further they also executed the case study for the selection of green suppliers which demonstrate the merits of the developed methodology. They showed uncomplicated, accurate, and easy to measure methodology.

Ansari et al. [25] designed and carried out in order to determine the most suitable SRE technique for efficiency and trustable software development depends on the security analyst's skill and understanding. With the help of the fuzzy TOPSIS model, the hierarchical model was evaluated. SRE selection criteria that were effective in pairs were compared. The pairwise criteria comparison form was distributed to 25 security experts.

Lima-Junior et al. [26] developed a novel strategy for evaluating suppliers in terms of cost as well as delivery effectiveness, based on the efficiency measures of the SCORs (Supply Chain Operations Reference) framework. It integrates different fuzzy TOPSIS methods to assess and categorise suppliers into four groups based on their effectiveness. Guidelines for development strategies were also proposed based on their classification scheme. Depending on the manufacturing setting, they developed an indicative application.

Ansari et al. [27] demonstrated the fuzzy TOPSIS centred approach to assess the physiological consequence for durable security inside the perspective of the Digital India strategy. They also proposed new DURASec blueprints for

developing trustable and high-quality healthcare applications.

4. Materials and Methods

4.1. Prioritize enabling factors to IT management

A questionnaire based survey as well as in-depth discussions were performed with 40 primary stakeholders to assess the relevance of factors. Among all these forty stakeholders, 15 are drawn from academic institutions and have 30 years of experience, 15 are researchers with 10 years of experience, and 10 are IT managers with 20 years of experience. Using available resources-based analysis, enabling factors were defined in four different categories: organizational, business, technological, and operational assessment and represented by A1, A2, A3 and A4 respectively. The evaluation of the potential primary stakeholders in each criterion was made based on linguistic judgments given by the decision makers. The criteria were defined through the literature review are discussed in the following Table 1.

Table 1. Different criterion to prioritize the enabling factors for IT management

	Criteria	Description
C1	Sustainability	Chardine-Baumann & Botta-Genoulaz [38] defined sustainability performance as "the combination of its economic, social and environmental performance". Multiple researches explored how the quality management standards and procedures can tackle sustainability challenges.
C2	Survivability	As shown by Knight et al. [39], the survivability of system services is characterized as the capacity of system services in the existence of targeted attacks, security breaches or crashes to accomplish the plan objectives.
C3	Sociability	Sociability encompasses a physiological dimension, and has a growing presence on the purposes of using technology. Socializing with each other through technology is a factor that has emerged over the last few years and has evolved with the creation of service providers, applications and services that enable these experiences [28].
C4	Effectiveness	Assistance for effectiveness is derived from the organizational structures that contribute to an IT professional's ability to interact through operational bunkers and recognize the unit's priorities, challenges and requirements [29].

C5	Efficiency	Efficiency is a significant concern for regulation of resources. The goal of the management efficiency strategies is to produce high impedance from lower input levels [30].

The following Figure 2 illustrates the hierarchical arrangement of the decision model for prioritizing IT management enabling factors with the four alternatives and five criteria. The problem of decision comprises of three levels: the purpose of the concern is positioned at the highest level while the criteria are recorded at the second level and the alternatives are listed at the third level.
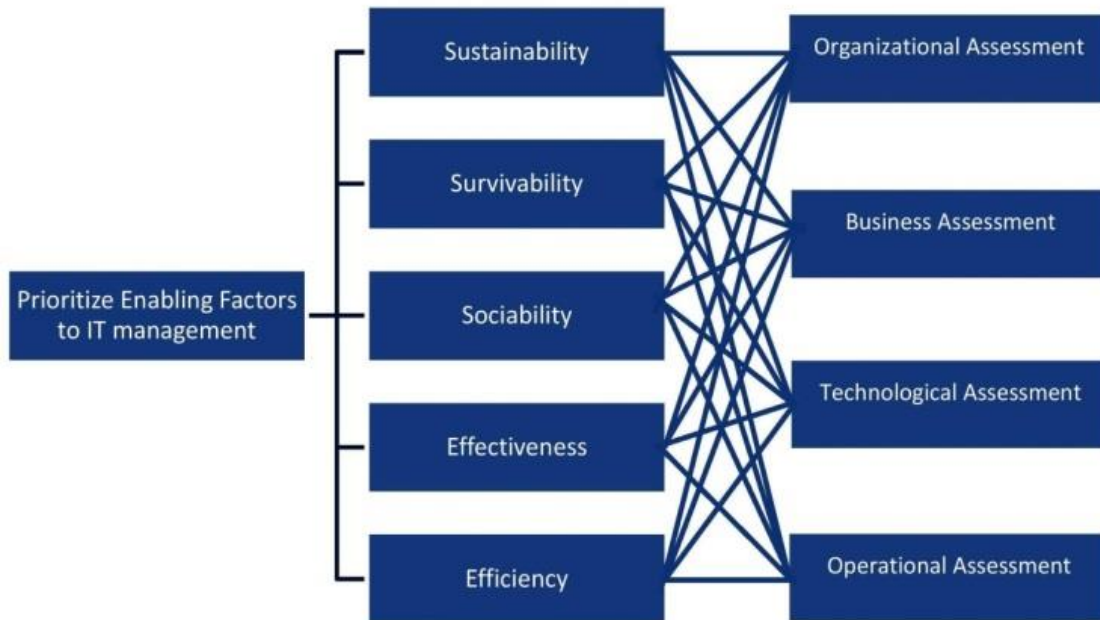

Figure 2. The hierarchical structure for prioritizing the enabling factors for IT management

4.2. Fuzzy-TOPSIS method

The MCDM process for selecting staff must be capable of integrating both qualitative and quantitative data. The fuzzy set concept serves as a significant technique for offering a context for decision making which integrates inaccurate decisions implicit in the procedure of personnel evaluation [37]. Fuzzy Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS) was presented by Hwang and Yoon in 1981 is a common and extensively utilized method of multi-criteria decision-making (MCDM) utilized to rank the alternative in a fuzzy context. TOPSIS can classify resolutions from a finite set of alternatives [31]. As shown by Hwang and Yoon [32], the principle of fuzzy TOPSIS is in determining the positive ideal solution and the negative ideal solution. The positive ideal solution is the one that increases the profit metrics and reduces cost metrics, while the negative ideal solution is the one that increases cost metrics and reduces profit metrics. Fuzzy TOPSIS can be sufficient when evaluations are used with numerical as well as linguistic variables. The best alternative is something that has the quickest range from the ideal positive solution as well as farthest range from the ideal negative. However a decision-maker also finds it hard to give a specific ranking to an alternative for the attributes being considered. Then the advantage of utilizing a fuzzy TOPSIS method is to use fuzzy numbers to assign specific metric values. Let A1=(a1,a2,a3) and B1=(b1,b2,b3) be two triangular fuzzy numbers, then you can measure the range among both two triangular fuzzy numbers from the following equation 1 [33].

$$d_v(A_1, \widetilde{B}_1) =$$

$$\sqrt{\frac{1}{3}[(a_1 - b_1)^2 + (a_2 - b_2)^2 + (a_3 - b_3)^2]} \quad (1)$$

MCDM issues are generally broken down into two different kinds [34]. The first is traditional MCDM issues where measures are calculated by flat numbers, and the other is the problem of fuzzy multi-criteria set decision-making (FMCGDM) where linguistic words are used, and afterwards fuzzy numbers. Sun [35] designed an assessment model founded on the Fuzzy analytical hierarchy method as well as the order efficiency methodology focused on an ideal solution similarity, Fuzzy TOPSIS, to assist manufacturing professionals in performance review in a fuzzy setting where ambiguity and rationality are treated with linguistic numbers parameterized by triangular fuzzy figures. Their recommended approach assisted decision experts recognize the entire assessment process better and offered a more reliable, efficient, and comprehensive mechanism to support decision making. Chen et al. [36] and Önüt et al. [33] used the Fuzzy TOPSIS approach to choosing and assessing suppliers. The following Figure 3 illustrates the flowchart of fuzzy TOPSIS method.
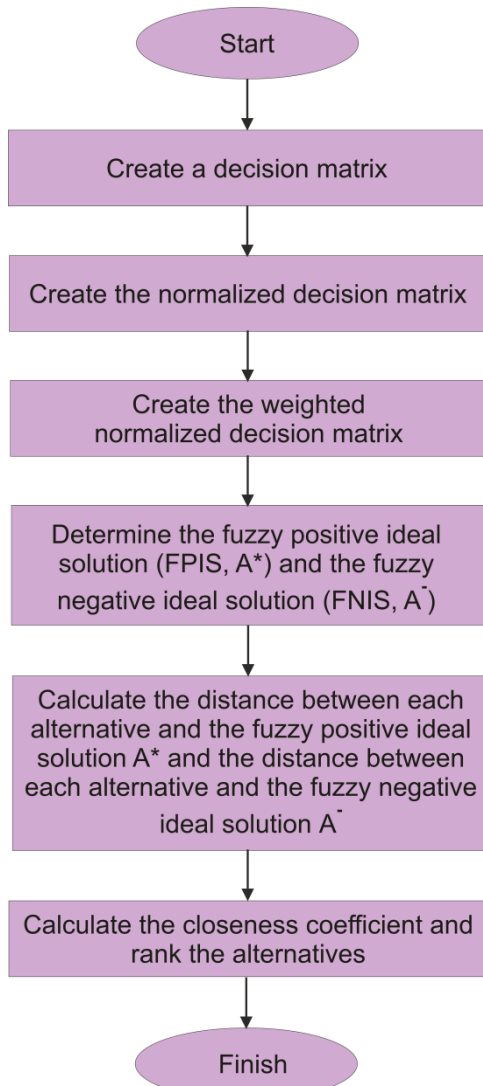
Figure 3. Flowchart of fuzzy TOPSIS method

The step-by-step procedure for weighting determination and priority ranking with the support of Fuzzy ANP-TOPSIS is described as follows according to Figure 3:

(i) Step 1: Create a decision matrix

In this research, 5 criteria as well as 4 alternatives are consistently rated using the Fuzzy TOPSIS modelling approach. Table 2 represents the type of criterion as well as the weight designated to every criterion.

Table 2. Characteristics of Criteria

	Name	Type	Weight
1	C1	+	**(0.200,0.200,0.200)**
2	C2	+	**(0.200,0.200,0.200)**
3	C3	+	**(0.200,0.200,0.200)**
4	C4	+	**(0.200,0.200,0.200)**
5	C5	+	**(0.200,0.200,0.200)**

The following Table 3 demonstrates the fuzzy scale used in the model.

Table 3. Linguistic term and the corresponding triangular fuzzy numbers

Code	Linguistic terms	L	M	U
1	Very low	1	1	3
2	Low	1	3	5
3	Medium	3	5	7
4	High	5	7	9
5	Very high	7	9	9

(ii) Step 2: Generate the normalized decision matrix

A normalised decision vector can be determined utilizing relation depending on the positive as well as negative ideal solutions:

$$\tilde{r}_{ij} = \left(\frac{a_{ij}}{c_j^*}, \frac{b_{ij}}{c_j^*}, \frac{c_{ij}}{c_j^*}\right) \quad ; \quad c_j^* = \max_i c_{ij} \; ; \; \text{Positive ideal solution} \tag{2}$$

$$\tilde{r}_{ij} = \left(\frac{a_j^-}{c_{ij}}, \frac{a_j^-}{b_{ij}}, \frac{a_j^-}{a_{ij}}\right) \quad ; \quad a_j^- = \min_i a_{ij} \; ; \; \text{Negative ideal solution} \tag{3}$$

(iii) Step 3: Create the weighted normalized decision matrix

The weighted normalised decision matrix could be determined by calculating the weight of every criterion in the normalised fuzzy decision matrix through the following formula, taking into account the various weights of every criterion.

$$\tilde{v}_{ij} = \tilde{r}_{ij} . \tilde{w}_{ij} \tag{4}$$

Where $\tilde{w}_{ij}$ signifies weight of criterion c_j

(iv) Step 4: Determine the fuzzy positive ideal solution (FPIS, A*) and the fuzzy negative ideal solution (FNIS, A^-)

The FPIS as well as FNIS of the alternatives can be defined as follows:

$$A^* = \{\tilde{v}_1^*, \tilde{v}_2^*, ..., \tilde{v}_n^*\} = \left\{\left(\max_j v_{ij} \,|i \in B\right), \left(\min_j v_{ij} \,|i \in C\right)\right\} \tag{5}$$

$$A^- = \{\tilde{v}_1^-, \tilde{v}_2^-, ..., \tilde{v}_n^-\} = \left\{\left(\min_j v_{ij} \,|i \in B\right), \left(\max_j v_{ij} \,|i \in C\right)\right\} \tag{6}$$

Where $\tilde{v}_i^*$ is the max significance of i for entire alternatives as well as $\tilde{v}_1^-$ is the min significance of i for

all the alternatives. B and C characterize the positive as well as negative ideal solutions, correspondingly.

(v) Step 5: Compute the range among each alternative and the fuzzy positive ideal solution A* and the distance between each alternative and the fuzzy negative ideal solution A⁻

The range amongst each alternative as well as FPIS and the distance among each alternative and FNIS are correspondingly estimated as follows:

$$S_i^* = \sum_{j=1}^{n} d(\tilde{v}_{ij}, \tilde{v}_j^*) \quad i=1,2,\ldots,m \quad (7)$$

$$S_i^- = \sum_{j=1}^{n} d(\tilde{v}_{ij}, \tilde{v}_j^-) \quad i=1,2,\ldots,m \quad (8)$$

d is the range between two different fuzzy numbers , when assumed two triangular fuzzy numbers (a_1, b_1, c_1) as well as (a_2, b_2, c_2), e distance among the two may be estimated as follows:

$$d_v(\tilde{M}_1, \tilde{M}_2) = \sqrt{\frac{1}{3}[(a_1 - a_2)^2 + (b_1 - b_2)^2 + (c_1 - c_2)^2]} \quad (9)$$

Note that $d(\tilde{v}_{ij}, \tilde{v}_j^*)$ and $d(\tilde{v}_{ij}, \tilde{v}_j^-)$ are crisp numbers.

(vi) Step 6: Compute the closeness coefficient as well as order the alternatives

The closeness coefficient of every alternative may be estimated as follows:

$$CC_i = \frac{S_i^-}{S_i^+ + S_i^-} \quad (10)$$

5. Results

Effective IT management strategies should recognise not only the traditional notions related to strategic preparation, but also a profound comprehension of how organisational, governmental, and technological powers all stem from a distinct set of attributes, perspectives, and operations. A productive manager needs to be fully cognizant that technological transformation takes place not only at an exceedingly furious speed, but also in a widespread manner. Organizational transformation, on the other hand, is slow as well as progressive, and governmental adjustment is also slow however it takes place more repetitively or sequentially due to funding confirmation cycles, voting, and revitalization operations.

This paper ranks enabling factors that allow strategic management of IT, making advances not only for using the approaches independently as well as in using them in a corresponding and adaptive way. Through the help of uniform fuzzy scale as shown in Table 3 and using Equations (1)–(10), the researchers has generated the results. The alternative solutions are assessed in contexts

of different criteria, as well as the decision matrix outcomes are demonstrated below. The following Table 4 displays the decision matrix which represents the arithmetic mean of all 40 expert's feedback.

Table 4. Decision Matrix

	C1	C2	C3	C4	C5
A1	4.650,6.650,8.500	4.350,6.350,8.100	3.950,5.950,7.800	3.900,5.900,7.800	4.300,6.300,8.150
A2	4.250,6.250,8.050	4.150,6.150,8.100	4.400,6.400,8.200	3.850,5.850,7.750	4.000,6.000,7.750
A3	4.500,6.500,8.150	4.800,6.800,8.500	4.250,6.250,8.150	4.350,6.350,8.150	4.200,6.200,8.100
A4	4.100,6.100,7.900	4.650,6.650,8.350	4.200,6.200,8.000	4.450,6.450,8.350	4.000,6.000,7.850

The normalized decision matrix is presented in the Table 5 below.

Table 5. A normalized decision matrix

	C1	C2	C3	C4	C5
A1	0.547,0.782,1.000	0.512,0.747,0.953	0.482,0.726,0.951	0.467,0.707,0.934	0.528,0.773,1.000
A2	0.500,0.735,0.947	0.488,0.724,0.953	0.537,0.780,1.000	0.461,0.701,0.928	0.491,0.736,0.951
A3	0.529,0.765,0.959	0.565,0.800,1.000	0.518,0.762,0.994	0.521,0.760,0.976	0.515,0.761,0.994
A4	0.482,0.718,0.929	0.547,0.782,0.982	0.512,0.756,0.976	0.533,0.772,1.000	0.491,0.736,0.963

The following Table 6 presented the weighted normalized decision matrix

Table 6. Weighted normalized decision matrix

	C1	C2	C3	C4	C5
A1	0.109,0.156,0.200	0.102,0.149,0.191	0.096,0.145,0.190	0.093,0.141,0.187	0.106,0.155,0.200
A2	0.100,0.147,0.189	0.098,0.145,0.191	0.107,0.156,0.200	0.092,0.140,0.186	0.098,0.147,0.190
A3	0.106,0.153,0.192	0.113,0.160,0.200	0.104,0.152,0.199	0.104,0.152,0.195	0.103,0.152,0.199
A4	0.096,0.144,0.186	0.109,0.156,0.196	0.102,0.151,0.195	0.107,0.154,0.200	0.098,0.147,0.193

The positive as well as negative ideal solutions are presented in the Table 7 below.

Table 7. The positive and negative ideal solutions

	Positive ideal	Negative ideal
C1	0.109,0.156,0.200	0.096,0.144,0.186
C2	0.113,0.160,0.200	0.098,0.145,0.191
C3	0.107,0.156,0.200	0.096,0.145,0.190
C4	0.107,0.154,0.200	0.092,0.140,0.186
C5	0.106,0.155,0.200	0.098,0.147,0.190

The following Table 8 shows distance from positive and negative ideal solutions.

Table 8. Distance from positive and negative ideal solutions

	Distance from positive ideal	Distance from negative ideal
A1	0.034	0.027
A2	0.046	0.014
A3	0.014	0.047
A4	0.029	0.032

The best alternative is closest to the FPIS and farthest to the FNIS. The closeness coefficients of each alternative as well as the place order of it are presented in the Table 9 below.

Table 9. Closeness coefficient

	Ci	rank
A1	**0.44**	**3**
A2	**0.235**	**4**
A3	**0.77**	**1**
A4	**0.521**	**2**

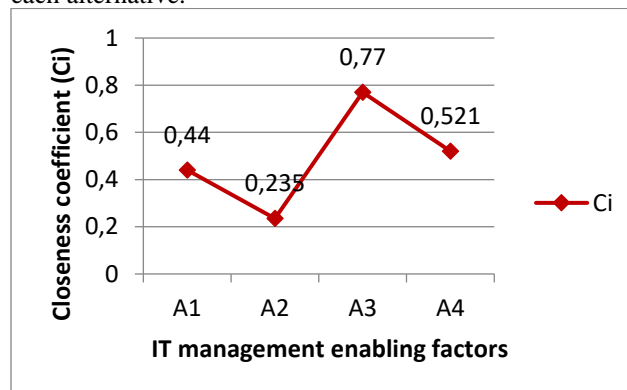The following Figure 4 shows the closeness coefficient of each alternative.

Figure 4. Closeness coefficient graph

Finally we make a decision based on the results of this study. Figure 4 shows the closeness coefficient measure for each of the enabling factors for strategic IT management. It shows that technological assessment (A3) has a higher priority than other enabling factors for the successful implementation of strategic information technology management within business organizations.

6. Conclusion

The traditional TOPSIS system, however, is not adequate to solve complex problems of multidimensional as well as problematic decision making. Consequently, the hierarchical TOPSIS was designed to deal more efficiently with these kinds of problems. Therefore we use fuzzy-TOPSIS MCDM approach. Enabling factors for strategic IT management were identified in four separate categories with the help of the appropriate resource-based analysis: organizational, business, technological, and operational assessment. Those four factors were prioritised with the multi-criteria approach of decision support Fuzzy Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS). Finally, based on the results, high priority was given to technical assessments to allow for more effective strategic IT management. This paper makes the point there are two significant contributions that the concept of the systems may bring to IT strategic management. The first is to provide instructions on which strategic preparation approaches to utilize when and how to interpret them as a

balance collection that can be flexibly used to tackle all features of the planned management mission. The second is to provide a selection of procedures that can be put in information technology management strategic planning project facility. The second is to provide a priority wise selection of enabling factors for successful strategic IT management within a business organization. This can be put in information technology management strategic planning project facility. Additional research is strategic that will help build consistent management about how to monitor which strategic planning strategy to use when and when to determine the impact of changing program procedures for strategic purposes of managing information technology. This study contributes to the strategic IT management research by clarifying the weightage relationships in a comprehensive context for organizational, business, technological, and operational assessment.

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