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# Identifying and prioritizing effective factors on measuring the success of business and information and communication technology alignment

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### ABSTRACT

The purpose of the current research was to identify and prioritize the effective factors on measuring the success of the alignment of business and information and communication technology. During this research, the factors were obtained according to internal and external studies and in four dimensions of common understanding between information technology and business. and work, the capability of information technology department, information technology architecture and information technology governance were categorized. In this research, the proposed method called Fuzzy DEMATEL was implemented in order to identify and prioritize factors affecting the success of business alignment and information and communication technology. The findings showed that in the dimension of common understanding between information technology and business, the factor of senior management's knowledge of information technology is the most effective and the factor of communication between information technology managers and managers of other departments is the most impressive factor. In the dimension of the capability of the information technology department, the information technology efficiency factor is the most effective and the information technology responsiveness factor is the most impressive factor. In the dimension of information technology architecture understanding, the presence of integrated macro architecture in the organization is the most effective factor and the information technology infrastructure flexibility factor is the most impressive factor, and finally in In terms of information technology governance, the existence of information technology strategic planning has been the most effective factor and the budget control factor has been the most impressive factor.

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## **Introduction**

Strategic alignment of information technology and business is always the most important concern of information technology and business managers. Because strategic alignment improves the allocation of information technology resources and leads to operational benefits, financial incomes and competitive advantages and ensures the survival of the organization in the competitive environment (SalimKhawan,2019). Information and communication technology (ICT) is a powerful tool that helps organisations identify customer needs, innovate products and services, improve customer relationships, and improve organisational processes and activities. Technological advances have increased the ability of companies to collect customer data and the role of senior business managers and managers. Advances in technology have increased the ability of companies to collect customer data and have enhanced the role of senior business managers and senior IT and IT executives, as well as their interdependence (Sleep & Hulland, 2018). Strategic alignment has been the first concern of executives for more than two decades, and it has made senior executives interested in taking measures in the field of information technology. CIOs have been called not only to formulate IT strategy, but also to formulate business strategy They should know how to align the IT strategy with the business strategy. (Ali Mechman Slim, 2020)

Given the high rate of investment in the information technology sector, the lack of alignment between business and information technology will be significant Therefore, understanding strategic alignment between the two functional units is a challenge for senior managers, which unfortunately has been achieved less frequently so far. Researchers have found that the lack of close communication between business and information technology senior managers will result in the organization's inability to understand the benefits of investments in the business technology field (Whitler et al, 2017). Strategic alignment between IT strategy and business strategy is a top priority for executive managers This is because strategic alignment improves the effective deployment of IT resources, leading to operational benefits, financial gains, and competitive advantages (Jamipour, Mona et al, 1399)

## **Statement of the problem**

The lack of strategic alignment, on the other hand, diminishes the strategic role of IT within the organization and also results in various drawbacks such as reduced efficiency of information systems, lack of information integration, lack of support for business processes during IT implementation, and failure to align IT decisions with organizational goals.

Such costs, as well as the economic pressures caused by them, necessitate the support of information technology and the use of an approach to integrate business with information technology (Bidayi and Jam Full May, 2016) Outside the scope of standard duties and goals of the organization, it makes the IT department ambiguous to provide correct and reliable information, as a result, the IT unit cannot properly support the business and its strategies (Abbasi, 2017) In order to identify the factors of measuring the alignment and the factors affecting the alignment, how can the factors affecting the measurement of the alignment of ICT and business be prioritized?

## **Necessity of research:**

Overall, it can be stated that the failure to achieve alignment between information technology and business will lead to the following drawbacks:

1. Inability to make innovative IT investments and establish mechanisms for such investments.
2. Inability to gain credibility for the business and provide proactive services instead of reactive ones.
3. Inability to attract, retain, and source appropriate talent.
4. Inability to assess the role of information technology in the business.
5. Inability to link strategy to employees and connect it to the budget (Jami Pour et al., 2020).

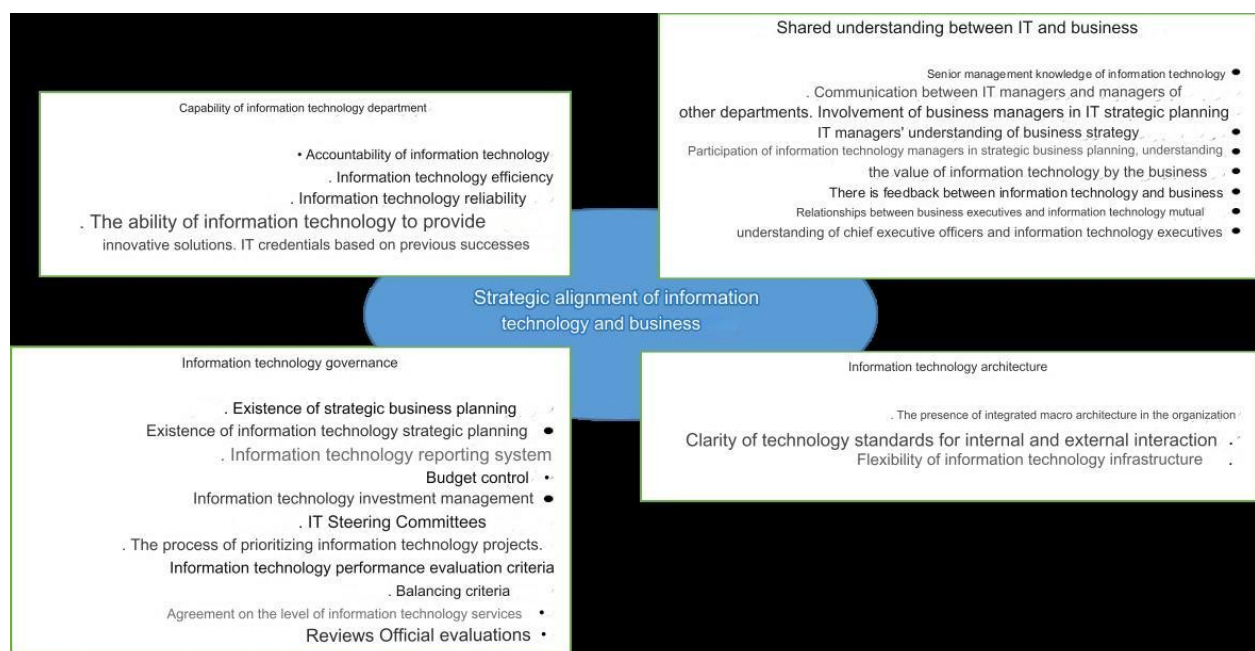
### **An overview of the research:**

In relation to the factors affecting the success measurement of business alignment and information and communication technology, various studies have been conducted, which are mentioned below Avison et al (2014) have shown the use of the strategic alignment model in a financial services company. This research showed that the strategic alignment model has conceptual and practical value. Technology management allows us to determine the current level of alignment and control and the changes that will be needed in the future for alignment (Avison, Jones Powell, & Wilson, 2014) Talon (2016). In one study, he advanced the issue of alignment beyond the dominant paradigm at the company level and did so by using a value-based perspective to conceptualise process level alignment. They found that managers need to revisit the steps taken to align their IT and business strategy, ie, instead of looking at how IT can support an overall strategy, they should take a closer look at how IT supports each of the processes The results showed that there is a positive relationship between the levels of strategic alignment and the performance of small and medium-sized enterprises operating in Saudi Arabia, and organisational culture has a positive effect on the relationship between the alignment of IT strategy and business strategy and organisational performance in small and medium-sized enterprises active in Saudi Arabia Saudi Arabia has (AlyahyaSuhaimi, 2016 & Kekoaltsui & Mtbola, 2017). In an interpretive study and adopting an interpretive approach presented by Bonteco (1996), they presented a conceptual framework to improve the alignment of IT strategy with business strategy in South African banks. The results of this study show that the alignment of IT strategy with business strategy is influenced by external factors such as government laws, market competition, etc. The IT strategy must also change accordingly in line with the business strategy in order to support business opportunities (Kekwaletswe & Mathebula, 2017). Queiroz (2017) states that despite a lot of research, the impact of strategic alignment on organisational performance is unclear Data from a survey of 120 companies show that company-level IT alignment and process-level IT alignment lead to different results when testing a theory under the same conditions (Queiroz, 2017) Javier Sanchez and Suzi Bayona (2020) provide a systematic review to determine the critical factors affecting the strategic alignment between business and IT. The results show that the organisational structure of information technology, the understanding of IT goals, functions, and operations by business managers, and the common knowledge between business and IT are the ones that have the highest frequency. (Xavier Sanchez, Sussy Bayona, 2020). Dishonesty and May 2016 investigated the relationship between organisational architecture maturity and strategic alignment maturity model in companies in which organisational architecture project has been implemented to determine whether organisational architecture maturity can act as an enabler of strategic alignment maturity model and there is a positive and significant relationship between the maturity of organizational architecture and the maturity of the strategic alignment of information technology and business (Dishonesty and the Cup of May, 2016) and Manian et al (2017) (An article entitled Evaluation of Organizational Maturity for the Strategic Alignment of Information Technology and Business) The results showed that these companies

are in a good situation in terms of participation and communication, but in terms of how to manage affairs, the situation is not very good Manian et al, 2017 Jamipour et al, (2020) The main purpose of this study was to identify the factors affecting the strategic alignment of marketing with information technology in organizations to improve the return on IT investments in the field of marketing The findings of the research include 7 factors of support and support of the chief marketing manager, IT capabilities, participation/communication, governance, marketing competencies, skills/human resources, and competitive factors, among which participation/communication has the most weight and importance and competitive/environmental factors with the least weight were the least important factors (Jamipour et al, 2020) Studies show that the alignment of IT strategies and business strategies is the most important issue for IT and business managers in current organizations The strategic alignment of IT and business creates a competitive advantage and gains value from IT investments. Managers of organizations are faced with the problem of how to understand and measure alignment and what actions need to be taken to improve and control it. Most of the researches conducted in this field have investigated the factors affecting strategic alignment and have often presented models and frameworks for measuring strategic alignment based on the widely used and well-known models of Luftman's maturity level and the strategic alignment model of Henderson and Venkatraman. Another group of studies has investigated the impact of strategic alignment of information technology and business on organizational performance in this study, by studying past models and researches and using the opinions of experts, indicators for measuring strategic alignment in domestic organizations were identified and categorized into four factors. After that, the prioritization of these indicators is supposed to be investigated using the group decision-making method of DEMATAL In this study, after reviewing the existing literature and valid and reliable researches, the indicators of measuring the alignment of information technology and business were extracted and collected. After identifying the indicators, using the experts' opinions, those duplicate indicators that were expressed in different articles with the same concepts but with different literature were identified and merged, and finally their number was reduced to 13 indicators Information.

**Table (1) Effective Indicators for Measuring IT and Business Alignment**  
**The source of the operator code measurement index**  
**Row measurement**

Source	Measurement index	Code
(Teo & Ang, 1999)	Senior management knowledge of information technology	B1
(Henderson & Venkatraman, 1999)	Communication between IT managers and managers of other departments	B2
(Luftman, 2004)	The participation of business managers in the strategic planning of information technology	B3
(Luftman, 2004)	Information technology managers' understanding of business strategy	B4
(Luftman, 2004)	Participation of IT managers in strategic business planning	B5
(Luftman, 2004)	Understanding the value of information technology by business	B6
(Weiss & Anderson, 2004)	existence of feedback between information technology and business	B7
(Campbell, 2005)	Relationships between business executives and information technology	B8
(A. Johnson & Lederer, 2006; A. M. Johnson & Lederer, 2010)	Mutual understanding of CEOs and CIOs	B9
(Teo & Ang, 1999)	Information Technology Accountability	C1
(Teo & Ang, 1999)	Information technology efficiency	C2
(Teo & Ang, 1999)	Information technology reliability	C3
(Luftman, 2004)	Information technology capability in providing innovative solutions	C4
(Chan, Sabherwal, & Thatcher, 2006)	Validity of information technology based on previous successes	C5
(Luftman, 2004)	Existence of integrated macro-architecture in organization	E1
(Luftman, 2004)	Clarity of technology standards for internal and external interaction	E2
(Luftman, 2004)	Information technology infrastructure flexibility	E3
(Luftman, 2004)	Existence of strategic business planning	F1
(Luftman, 2004)	Existence of strategic information technology planning	F2
(Luftman, 2004)	Information technology reporting system	F3
(Luftman, 2004)	Budget control	F4
(Luftman, 2004)	Information Technology Investment Management	F5
(Luftman, 2004)	Information Technology Steering Committees	F6
(Luftman, 2004)	The process of prioritizing information technology projects	F7
(Luftman, 2004)	Information Technology Performance Evaluation Criteria	F8
(Luftman, 2004)	Balancing criteria	F9
(Luftman, 2004)	Agreement on the level of information technology services	F10
(Luftman, 2004)	official reviews/evaluations	F11



## Figure (1) Factors for measuring the alignment of information technology and business

### Research goal:

1. Identifying factors influencing the assessment of the success of business and information and communication technology alignment
2. Prioritizing factors influencing the assessment of the success of business and information and communication technology alignment

### Research hypothesis:

Due to the exploratory nature of this research, no hypothesis has been proposed.

### Research questions:

1. What are the factors influencing the assessment of the success of business and information and communication technology alignment?
2. How are the factors influencing the assessment of the success of business and information and communication technology alignment prioritized?

### Research Methods:

The present study is a library in terms of data collection method The present study is applied in terms of purpose and in terms of method, it is considered as a descriptive-analytical research of the type of case study, because it identifies and ranks the factors affecting the success measurement of business alignment and information and communication technology using DEMATEL method In this method, a decision matrix is first formed and each option is assigned a score based on each criterion The first step in all multi-criteria decision-making techniques that aim at ranking is the formation of a decision matrix In the Marcus technique, using n criteria, m options are evaluated Therefore, each option is given a score based on each criterion These scores can be based on quantitative and real values, or they can be qualitative and theoretical In any case, an M\*N decision matrix must be formed

The steps of the fuzzy DEMATEL method are as follows (Ozmirchi et al, 2023):

Step 1: Forming a group of experts in order to gather their collective knowledge to solve the problem

Step 2: Determining the criteria to be evaluated and also designing linguistic scales In this step, using the opinions of experts, the factors and indicators of the research are identified

The evaluated criteria will be selected according to the studied areas The linguistic scales used in this method and their corresponding values are shown in Table (2) The fuzzy numbers used in this study are triangular fuzzy as can be seen, this spectrum is similar to the spectrum of the DEMATEL method, except that fuzzy numbers have been used (Ozmirchi et al, 2023)

**Table (2) of the linguistic phrases used and the corresponding fuzzy numbers (Ozmirchi et al, 2023)**

Triangular Fuzzy Numbers	Linguistic Expressions
(025, 0, 0)	No Effect (No)
(05, 025, 0)	Very Low Impact (VL)
(075, 05, 025)	Low impact (L)
(1, 075, 05)	High impact (H)

(1, 1, 075)	Very High Impact (VH)
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Step Three: Creating a Fuzzy Matrix of Primary Direct Communication by Collecting Expert Opinions.

To measure the relationships between metrics, we need to put them in a square matrix and ask experts to compare them in pairs based on how much they affect each other. In this survey, the experts will express their opinions based on Table (2). Assuming that we have an expert number of n criteria and p, we have a fuzzy matrix, each of which corresponds to the opinions of an expert along with triangular fuzzy numbers as its elements (Özmirchi et al., 2023).

Step 4: Normalization of the Direct Correlation Fuzzy Matrix.

For this purpose, linear scale conversion is used as a normalization formula to convert the scales of criteria into comparable criteria.

$$(1) \quad \tilde{a}_{ij} = \sum_{j=1}^n \tilde{Z}_{ij} = (\sum_{j=1}^n l_{ij}, \sum_{j=1}^n m_{ij}, \sum_{j=1}^n r_{ij}) \text{ and } r = \max_{1 \leq i \leq n} (\sum_{j=1}^n r_{ij})$$

$$(2) \quad \tilde{X} = \begin{bmatrix} \tilde{X}_{11} & \dots & \tilde{X}_{1n} \\ \vdots & \ddots & \vdots \\ \tilde{X}_{m1} & \dots & \tilde{X}_{mm} \end{bmatrix} \text{ and } \tilde{X}_{ij} = \frac{\tilde{Z}_{ij}}{r} = \left( \frac{l_{ij}}{r}, \frac{m_{ij}}{r}, \frac{r_{ij}}{r} \right)$$

Step 5: Calculate the total correlation fuzzy matrix In this step, we first calculate the inverse of the normal matrix, then subtract it from matrix I, and finally multiply the normal matrix by the resulting matrix.

$$(3) \quad [lij''] = Xl \times (I - Xl)^{-1}$$

$$(4) \quad [mij''] = Xm \times (I - Xm)^{-1}$$

$$(5) \quad [rij''] = Xr \times (I - Xr)^{-1}$$

Step Six: Create and analyse the causal graph For this purpose, we first calculate the sum of the elements of each row (Di) and the sum of the elements of each column (Ri) of the fuzzy matrix The sum of the elements of each row (D) for each factor indicates the extent to which that factor affects the other elements of the system The sum of the elements of the column (R) for each factor indicates the extent to which that factor is influenced by other factors of the system (Ozmirchi et al, 2023)

**Risk number calculation (rpn):**

Step 1: Forming a Direct Communication Matrix In this section, we will implement the DEMATEL method for all criteria. For this purpose, first, using the opinions of experts obtained based on Table (3), the DEMATEL Effects Matrix has been formed

**Table (3) Verbal Expressions and Corresponding Numbers of DEMATEL Method**

Value in Phase Name State
(0, 0, 025) No effect
(05, 025, 025) Low impact

(0,25, 0,5, 0,75) Moderate impact
(1,0,75,0,5) High impact
(1,1,0,75) Very high impact

Then, using the arithmetic mean method, the opinions of all experts are integrated and a direct communication matrix is formed, which is shown in Table (4) its fuzzy state

**Table (4) Direct Correlation Matrix**

B9	B8	B7	B6	B5	B4	B3	B2	B1	X
0,75,1, 1	0, 0,25, 0,5	0,25, 0,5, 0,75	0, 0,25, 0,5	0,5, 0,75, 1	0,25, 0,5, 0,75	0,25, 0,5, 0,75	0,25, 0,5, 0,75	0, 0, 0,25	B1
0, 0, 0,25	0,5, 0,75, 1	0, 0,25, 0,5	0,75,1, 1	0,5, 0,75, 1	0,5, 0,75, 1	0,75,1, 1	0, 0, 0,25	0,25, 0,5, 0,75	B2
0,5, 0,75, 1	0,25, 0,5, 0,75	0,25, 0,5, 0,75	0,75,1, 1	0,25, 0,5, 0,75	0,5, 0,75, 1	0, 0, 0,25	0,5, 0,75, 1	0,5, 0,75, 1	B3
0,5, 0,75, 1	0, 0,25, 0,5	0,5, 0,75, 1	0,5, 0,75, 1	0,75,1, 1	0, 0, 0,25	0,25, 0,5, 0,75	0,75,1, 1	0,5, 0,75, 1	B4
0,75,1, 1	0,25, 0,5, 0,75	0,75,1, 1	0,5, 0,75, 1	0, 0, 0,25	0,75,1, 1	0,5, 0,75, 1	0,5, 0,75, 1	0,25, 0,5, 0,75	B5
0,25, 0,5, 0,75	0,5, 0,75, 1	0,25, 0,5, 0,75	0, 0, 0,25	0,5, 0,75, 1	0,5, 0,75, 1	0,5, 0,75, 1	0,75,1, 1	0,25, 0,5, 0,75	B6
0,75,1, 1	0,75,1, 1	0, 0, 0,25	0, 0,25, 0,5	0,25, 0,5, 0,75	0,75,1, 1	0,25, 0,5, 0,75	0,5, 0,75, 1	0,25, 0,5, 0,75	B7
0,25, 0,5, 0,75	0, 0, 0,25	0, 0,25, 0,5	0, 0,25, 0,5	0,5, 0,75, 1	0, 0,25, 0,5	0,25, 0,5, 0,75	0,75,1, 1	0, 0,25, 0,5	B8
0, 0, 0,25	0,5, 0,75, 1	0, 0, 0,25	0,75,1, 1	0,25, 0,5, 0,75	0,75,1, 1	0, 0,25, 0,5	0, 0,25, 0,5	0,25, 0,5, 0,75	B9

**Step Two: Normalizing the Direct Communication Matrix**

In this step, the matrix of direct communication is normalized using the relevant relationships. For normalization, first, the sum of the rows and columns of the matrix of the above tables is determined and all the numbers in this table are divided by the maximum value of this set. Normalization of the Direct Communication Matrix:

**Table (5) Normalized Matrix**

B9	B8	B7	B6	B5	B4	B3	B2	B1	X
0,75 1 0,75	0 0,25 0,25	0,25 0,5 0,5	0 0,25 0,25	0,5 0,75 0,75	0,25 0,5 0,5	0,25 0,5 0,5	0,25 0,5 0,5	0 0 0	B1
0 0 0	0,5 0,75 0,75	0 0,25 0,25	0,75 1 0,75	0,5 0,75 0,75	0,5 0,75 0,75	0,75 1 0,75	0 0 0	0,25 0,5 0,5	B2
0,5 0,75 0,75	0,25 0,5 0,5	0,25 0,5 0,5	0,75 1 0,75	0,25 0,5 0,5	0,5 0,75 0,75	0 0 0	0,5 0,75 0,75	0,5 0,75 0,75	B3
0,5 0,75 0,75	0 0,25 0,25	0,5 0,75 0,75	0,5 0,75 0,75	0,75 1 0,75	0 0 0	0,25 0,5 0,5	0,75 1 0,75	0,5 0,75 0,75	B4
0,75 1 0,75	0,25 0,5 0,5	0,75 1 0,75	0,5 0,75 0,75	0 0 0	0,75 1 0,75	0,5 0,75 0,75	0,5 0,75 0,75	0,25 0,5 0,5	B5
0,25 0,5 0,5	0,5 0,75 0,75	0,25 0,5 0,5	0 0 0	0,5 0,75 0,75	0,5 0,75 0,75	0,5 0,75 0,75	0,75 1 0,75	0,25 0,5 0,5	B6
0,75 1 0,75	0,75 1 0,75	0 0 0	0 0,25 0,25	0,25 0,5 0,5	0,75 1 0,75	0,25 0,5 0,5	0,5 0,75 0,75	0,25 0,5 0,5	B7
0,25 0,5 0,5	0 0 0	0 0,25 0,25	0 0,25 0,25	0,5 0,75 0,75	0 0,25 0,25	0,25 0,5 0,5	0,75 1 0,75	0 0,25 0,25	B8

0	0	0	0.5	0.75	0	0	0	0.75	1	0.25	0.5	0.75	1	0	0.25	0	0.25	0.25	0.5	B9
			0.75					0.75		0.5		0.75		0.25		0.25		0.5		

**Step 3: Calculating the Total Communication Matrix (T)**

In this step, using the relation of this part, the total communication matrix is formed, ie, first the normal matrix is subtracted from the matrix of unit I, then it is reversed, and then the normal matrix is multiplied by the inverted matrix, which is the result of the total correlation matrix (T)

In order to obtain the T matrix in the fuzzy DEMATEL method, it is first necessary to investigate the direct correlation matrix (N)

**Table (6) Matrix of Direct Relation of Non-Fuzzy Numbers**

A9	A8	A7	A6	A5	A4	A3	A2	A1	
0.917	0.250	0.500	0.250	0.750	0.500	0.500	0.500	0.083	A1
0.083	0.750	0.250	0.917	0.750	0.750	0.917	0.083	0.500	A2
0.750	0.500	0.500	0.917	0.500	0.750	0.083	0.750	0.750	A3
0.750	0.250	0.750	0.750	0.917	0.083	0.500	0.917	0.750	A4
0.917	0.500	0.917	0.750	0.083	0.917	0.750	0.750	0.500	A5
0.500	0.750	0.500	0.083	0.750	0.750	0.750	0.917	0.500	A6
0.917	0.917	0.083	0.250	0.500	0.917	0.500	0.750	0.500	A7
0.500	0.083	0.250	0.250	0.750	0.250	0.500	0.917	0.250	A8
0.083	0.750	0.083	0.917	0.500	0.917	0.250	0.250	0.500	A9

**Table (7) Generalized Non-Fuzzy Direct Relation Matrix G**

A9	A8	A7	A6	A5	A4	A3	A2	A1	
0.092	0.025	0.050	0.025	0.075	0.050	0.050	0.050	0.008	A1
0.008	0.075	0.025	0.092	0.075	0.075	0.092	0.008	0.050	A2
0.075	0.050	0.050	0.092	0.050	0.075	0.008	0.075	0.075	A3
0.075	0.025	0.075	0.075	0.092	0.008	0.050	0.092	0.075	A4
0.092	0.050	0.092	0.075	0.008	0.092	0.075	0.075	0.050	A5
0.050	0.075	0.050	0.008	0.075	0.075	0.075	0.092	0.050	A6
0.092	0.092	0.008	0.025	0.050	0.092	0.050	0.075	0.050	A7
0.050	0.008	0.025	0.025	0.075	0.025	0.050	0.092	0.025	A8
0.008	0.075	0.008	0.092	0.050	0.092	0.025	0.025	0.050	A9

**Table (8) Step Four: Forming a Causal Diagram**

A9	A8	A7	A6	A5	A4	A3	A2	A1	
0.313	0.226	0.254	0.273	0.342	0.287	0.230	0.298	0.237	A1
0.248	0.277	0.243	0.342	0.358	0.316	0.280	0.278	0.290	A2
0.300	0.251	0.249	0.330	0.326	0.312	0.196	0.331	0.304	A3
0.292	0.221	0.267	0.308	0.349	0.240	0.229	0.330	0.291	A4
0.374	0.301	0.343	0.381	0.351	0.387	0.303	0.389	0.337	A5
0.307	0.300	0.281	0.288	0.385	0.343	0.285	0.382	0.312	A6
0.339	0.304	0.234	0.302	0.356	0.355	0.254	0.358	0.308	A7
0.241	0.179	0.198	0.237	0.309	0.230	0.209	0.309	0.226	A8
0.248	0.278	0.224	0.343	0.341	0.337	0.216	0.297	0.295	A9

In this step, the sum of the row (D) and the sum of the column (R) of the total communication matrix are obtained, and then we create the values of D+R and D-R, and then we create the coordinate axis with the values of (D+R, D-R)

**Table (9) Matrix of the whole relation S**

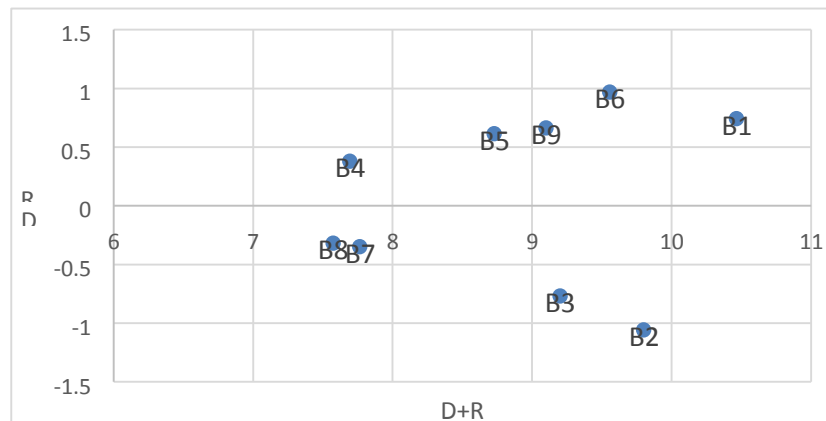
Volume 1, 2020 ISSN: xxx  
DOI: 10.31058/j.ad.2019.xxxxxx

A9	A8	A7	A6	A5	A4	A3	A2	A1	
0.313	0.226	0.254	0.273	0.342	0.287	0.230	0.298	0.237	A1
0.248	0.277	0.243	0.342	0.358	0.316	0.280	0.278	0.290	A2
0.300	0.251	0.249	0.330	0.326	0.312	0.196	0.331	0.304	A3
0.292	0.221	0.267	0.308	0.349	0.240	0.229	0.330	0.291	A4
0.374	0.301	0.343	0.381	0.351	0.387	0.303	0.389	0.337	A5
0.307	0.300	0.281	0.288	0.385	0.343	0.285	0.382	0.312	A6
0.339	0.304	0.234	0.302	0.356	0.355	0.254	0.358	0.308	A7
0.241	0.179	0.198	0.237	0.309	0.230	0.209	0.309	0.226	A8
0.248	0.278	0.224	0.343	0.341	0.337	0.216	0.297	0.295	A9

**Table (10) Formation of the Impact and Effectiveness of Common Perception Factors between Information Technology and Business**

Shared understanding between IT and business	D-R	D+R	R	D	
Senior Management Knowledge of Information Technology	0.742	10.466	4.862	5.604	B1
Relationship between IT managers and managers of other departments	-1.058	9.8	5.429	4.371	B2
Business Managers' Participation in IT Strategic Planning	-0.768	9.2	4.984	4.216	B3
IT Managers' Understanding of Business Strategy	0.379	7.695	3.658	4.037	B4
Participation of IT Managers in Strategic Business Planning	0.613	8.729	4.058	4.671	B5
Understanding the value of IT by business	0.969	9.557	4.294	5.263	B6
Existence of feedback between IT and business	-0.348	7.766	4.057	3.709	B7
Relationships between Business and IT Executives	-0.317	7.575	3.946	3.629	B8

According to Table (10), the criterion of "senior management knowledge of information technology" has the highest value of D, so it is considered the most influential factor. The criterion of "relationship between IT managers and managers of other departments" has the highest value of R, so it is the most influential factor. Also, the factor of "senior management knowledge of information technology" has the highest value of D+R, so it has the most relationship with other factors of the system. The criteria are as B1> B2> B6> B3> B9> B5> B7> B4> B8 are rated. The ranking of the criteria is based on the values of  $D_i + R_i$ . Finally, a Cartesian coordinate system is drawn. In this machine, the longitudinal axis is D+R and the transverse axis is based on D-R. The position of each agent is determined by a point in the coordinates (D + R, D - R) in the device.



**Figure (2) Cartesian Coordinate Diagram of DEMATEL Method for Common Understanding Factors between Information Technology and Business**

The criteria evaluated in the chart are: senior management's knowledge of information technology (B1), the relationship between IT managers and managers of other departments (B2), the participation of business managers in IT strategic planning (B3), the understanding of IT managers of business strategy (B4), the participation of IT managers in strategic business planning (B5), the understanding of the value of IT by the business (B6), and the existence of feedback between technology perspectives Information and Business (B7), the relationship between business and IT executives (B8), and the mutual understanding of senior executives and CIOs (B9).

The horizontal axis shows the importance of each criterion, whilst the vertical axis divides the criteria into cause and effect groups. Additionally, by visualizing the causal diagram, we can make decisions by knowing the causal criteria. Criteria B6, B5, B4, B1, and B9 are grouped as cause criteria, which are called pure causes, whilst the group of impact criteria includes B7, B3, B2, and B8. These latter criteria are also known as pure receptors. The causal graph shows that B1 receives the highest significance score among the criteria.

In the following, the fuzzy DEMATEL method is used to investigate the other identified factors, such as the previous ones. In order to summarize the tables, the final tables and charts are used in this section.

**Table (11) Matrix of the total relationship S**

A5	A4	A3	A2	A1	
0.237	0.230	0.312	0.258	0.207	A1
0.225	0.193	0.189	0.174	0.226	A2
0.210	0.151	0.186	0.262	0.311	A3
0.255	0.145	0.215	0.309	0.214	A4
0.207	0.195	0.346	0.294	0.347	A5

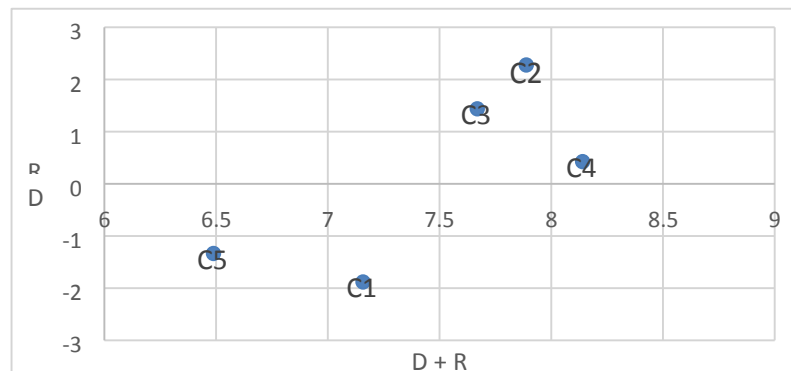
**Table (12) Formation of the Effectiveness and Effectiveness of the Information Technology Sector**

IT Department Capability	D-R	D+R	R	D	
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IT Responsiveness	-1.88	7.158	4.519	2.639	C1
IT Efficiency	2.274	7.888	2.807	5.081	C2
IT Reliability	1.438	7.67	3.116	4.554	C3
IT capability to provide innovative solutions	0.425	8.141	3.858	4.283	C4
IT credibility based on previous successes	-1.333	6.489	3.911	2.578	C5

According to Table (12), the criterion of IT efficiency has the highest value of D, so it is considered the most influential factor. The criterion of IT responsiveness also has the highest value of R, so it is the most influential factor. Also, the factor of IT capability in providing innovative solutions has the highest value of D+R, so it has the most relationship with other system factors. The criteria are ranked as C4 > C2 > C3 > C1 > C5. It is based on Di + Ri values. Finally, a Cartesian coordinate system is drawn. In this machine, the longitudinal axis is D+R and the transverse axis is based on D-R. The position of each agent is determined by a point in coordinates (D + R, D - R) in the device.

In this way, a graphical diagram will also be obtained.



**Figure (3) Cartesian Coordinate Diagram of DEMATEL Method for IT Sector Capability**

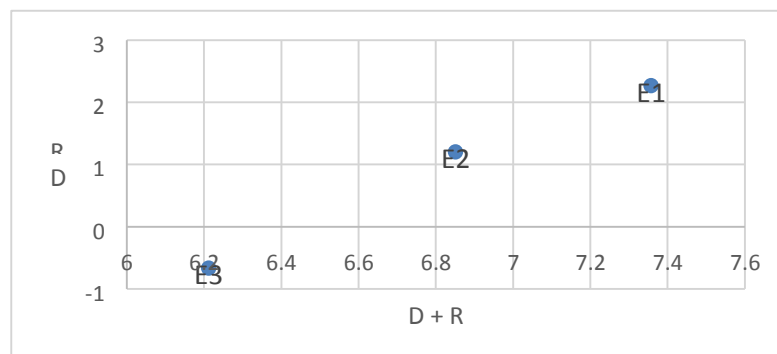
The criteria evaluated in the graph are: IT responsiveness (C1), IT efficiency (C2), IT reliability (C3), IT capability to provide innovative solutions (C4), IT credibility based on previous successes (C5). The horizontal axis shows the importance of each metric, whilst the vertical axis divides the metrics into cause and effect groups. This aids in a visible structural model. Additionally, by visualising the causal diagram, we can make decisions by knowing the causal criteria. Criteria C3, C2, and C4 are grouped as cause criteria, which are referred to as pure causes, whilst the group of impact criteria includes C1 and C5. These latter criteria are also known as pure receptors. The causal graph shows that C4 receives the highest significance score among the criteria. Table (12) The Matrix of the Total Relation S

A3	A2	A1	
0.243	0.246	0.191	A1
0.301	0.217	0.300	A2
0.233	0.426	0.340	A3

**Table (13) Formation of the Impact and Effectiveness of Information Technology Architecture**

IT Architecture	D-R	D+R	R	D	
The existence of an integrated macro architecture in the organisation	2.267	7.357	2.545	4.812	E1
Clarity of technology standards for intra- and extra-organisational interaction	1.203	6.851	2.824	4.027	E2
Flexibility of IT infrastructure	-0.666	6.212	3.439	2.773	E3

According to Table (13), the criterion of existence of integrated macro architecture in the organization has the highest value of D, so it is considered the most influential factor The criterion of Flexibility of IT infrastructure has the highest value of R, so it is the most effective factor Also, the factor of existence of integrated macro architecture in the organization has the highest value of D+R, so it has the most relationship with other factors of the system The criteria are ranked as  $E_1 > E_2 > E_3$  It is based on  $D_i + R_i$  values Finally, a Cartesian coordinate system is drawn In this machine, the longitudinal axis is D+R and the transverse axis is based on D-R The position of each agent is determined by a point in the coordinates (D + R, D – R) in the device.



**Figure (4) Cartesian Coordinate Diagram of DEMATEL Method for IT Architecture**

The criteria evaluated in the diagram are: the existence of an integrated macro-architecture in the organization (E1), the clarity of technology standards for intra- and external interaction (E2), and the flexibility of the IT infrastructure (E3) The horizontal axis shows the importance of each metric, whilst the vertical axis divides the criteria into cause and effect groups These types of causal diagrams can help visualize the complex causal relationships of the criteria in a visible structural model By visualizing the causal graph, we can make decisions by knowing the causal criteria The E1 and E2 criteria are grouped as cause criteria, which are called pure cause, whilst the group of impact criteria includes E3 These latter criteria are also known as pure receptors The causal graph shows that E1 receives the highest significance score among the criteria

**Table (14) The Matrix of the Total Relation S**

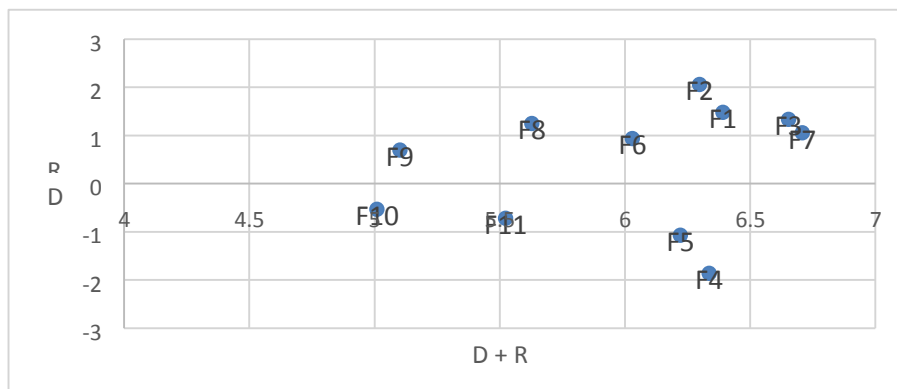
A11	A10	A9	A8	A7	A6	A5	A4	A3	A2	A1	
0.256	0.598	0.460	0.586	0.605	0.588	0.559	0.425	0.585	0.605	0.420	A1
0.145	0.470	0.373	0.392	0.495	0.408	0.498	0.388	0.447	0.421	0.361	A2
0.190	0.415	0.417	0.512	0.549	0.534	0.564	0.423	0.429	0.541	0.401	A3
0.290	0.476	0.382	0.569	0.644	0.561	0.538	0.373	0.526	0.608	0.462	A4

0.215	0.464	0.368	0.475	0.580	0.451	0.435	0.479	0.525	0.529	0.390	A5
0.292	0.504	0.395	0.410	0.513	0.402	0.414	0.396	0.427	0.581	0.462	A6
0.210	0.458	0.437	0.452	0.451	0.477	0.516	0.364	0.474	0.480	0.425	A7
0.310	0.438	0.388	0.363	0.534	0.454	0.466	0.322	0.490	0.493	0.366	A8
0.272	0.443	0.345	0.426	0.528	0.554	0.451	0.370	0.482	0.571	0.502	A9
0.294	0.324	0.271	0.348	0.439	0.356	0.411	0.345	0.361	0.471	0.352	A10
0.451	0.161	0.228	0.256	0.234	0.184	0.256	0.172	0.254	0.273	0.220	A11

**Table (15) Formation of the Effectiveness and Effectiveness of Information Technology Governance Factors**

IT Governance	D-R	D+R	R	D	
Existence of Strategic Business Planning	1.487	6.391	2.452	3.939	F1
Existence of Strategic IT Planning	2.062	6.298	2.118	4.18	F2
IT Reporting System	1.335	6.653	2.659	3.994	F3
Budget Control	-1.86	6.336	4.098	2.238	F4
IT Investment Management	-1.066	6.222	3.644	2.578	F5
IT Steering Committees	0.94	6.03	2.545	3.485	F6
The Process of Prioritizing IT Projects	1.06	6.708	2.824	3.884	F7
IT Performance Evaluation Criteria	1.25	5.628	2.189	3.439	F8
Balancing Criteria	0.703	5.101	2.199	2.902	F9
Agreeing on the level of IT services	-0.532	5.01	2.771	2.239	F10
Official reviews/assessments	-0.713	5.523	3.118	2.405	F11

According to Table (15), the criterion of existence of strategic IT planning has the highest value of D, so it is considered the most influential factor. The criterion of budget control also has the highest value of R, so it is the most influential factor. Also, the factor of process of prioritising IT projects has the highest value of D+R, so it has the most relationship with other system factors. The criteria are as  $F7 > F3 > F1 > F4 > F2 > F5 > F6 > F8 > F11 > F9 > F10$ . They are ranked. The ranking of the criteria is based on the values of  $D_i + R_i$ . Finally, a Cartesian coordinate system is drawn. In this machine, the longitudinal axis is D+R and the transverse axis is based on D-R. The position of each agent is determined by a point in the coordinates (D + R, D - R) in the device. In this way, a graphical diagram will also be obtained.



**Figure (5) Cartesian Coordinate Diagram of DEMATEL's Method for Information Technology Governance**

The criteria evaluated in the chart are: Strategic Business Planning (F1), Strategic IT Planning (F2), IT Reporting System (F3), Budget Control (F4), IT Investment Management

(F5), IT Steering Committees (F6), IT Project Prioritization Process (F7), IT Performance Evaluation Criteria (F8), Balancing Criteria (F9), Agreeing on the Level of IT Services The horizontal axis shows the importance of each criterion, while the vertical axis divides the criteria into cause and effect groups.

These types of causal diagrams can help visualize the complex causal relationships of criteria in an observable structural model In addition, by visualizing the causal diagram, we can make decisions by recognizing the causal criteria The criteria F8, F7, F6, F3, F2, F1, and F9 are grouped as cause criteria, which are called pure causes, whilst the group of impact criteria includes F10, F5, F4, and F11

These latter criteria are also known as pure receptors the causal graph shows that F7 receives the highest significance score among the criteria.

**Table (16) Matrix of the total relation S**

A4	A3	A2	A1	
0.290	0.220	0.248	0.242	A1
0.273	0.300	0.224	0.331	A2
0.253	0.158	0.169	0.241	A3
0.210	0.243	0.208	0.222	A4

**Table (17) Formation of the Effect Value and Effectiveness of the Main Factors of Measurement**

IT Governance	D-R	D+R	R	D
Shared understanding between IT and business	0.646	9.322	4.338	4.984
IT Department Capability	-0.122	8.51	4.316	4.194
IT Architecture	0.353	9.455	4.551	4.904
IT Governance	-0.15	8.194	4.172	4.022
IT Governance	D-R	D+R	R	D

According to Table (17), the criterion of common understanding between IT and business has the highest value of D, so it is considered the most influential factor The criterion of IT architecture also has the highest value of R, so it is the most influential factor Also, the IT architecture factor has the highest value of D+R, so it has the most relationship with other elements of the system The criteria are ranked as  $R_3 > R_1 > R_2 > R_3$   $D_i + R_i$  Finally, a Cartesian coordinate system is drawn In this machine, the longitudinal axis is D+R and the transverse axis is based on D-R The position of each agent is determined by a point in the coordinates (D + R, D – R) in the device. In this way, a graphical diagram will also be obtained.

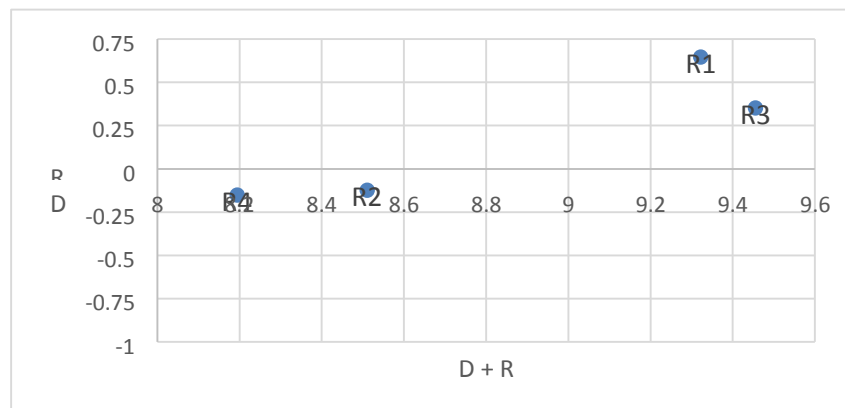


Figure 6 Cartesian coordinate diagram of DEMATEL method for the main factors of measurement. The metrics evaluated in the diagram are: common understanding between IT and business (R1), IT sector capability (R2), IT architecture (R3), and IT governance (R4). The horizontal axis shows the importance of each metric, whilst the vertical axis divides the metrics into cause and effect groups. These types of causal graphs can help visualize the complex causal relationships of the criteria in a visible structural model. Therefore, by visualizing the causal diagram, we can make decisions by knowing the causal criteria. The R1 and R3 criteria are grouped as the cause criteria, which are called pure cause, whilst the group of impact measures includes R2 and R4. These latter criteria are also known as pure receptors. The causal graph shows that R3 receives the highest significance score among the criteria.

### Prioritization of units to make corrective suggestions:

In this study, a proposed method called fuzzy DEMATEL has been implemented in order to identify and prioritize the factors affecting the success measurement of business alignment and information and communication technology. According to the results of the fuzzy DEMATEL method in investigating the common perception between IT and business, the criteria B6, B5, B4, B1 and B9 are grouped as the cause criteria, which are called pure causes, while the group of impact criteria includes B7, B3, B2 and B8. They are grouped as cause criteria, which are called pure cause, while the group of impact measures includes C1 and C5. These latter criteria are also known as pure receptors.

It is further found that in the study of IT architecture, E1 and E2 criteria are grouped as cause criteria, which are called net causes, whilst the group of impact criteria includes E3. These latter criteria are also known as pure receptors.

It is also found that in the study of IT architecture, the criteria of F8, F7, F6, F3, F2, F1 and F9 are grouped as cause criteria, which are called pure causes, whilst the group of impact criteria includes F10, F5, F4 and F11. These latter criteria are also known as pure receptors.

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