



Evaluation of Criteria Affecting the Outsourcing Decision in E-Government: A case Study

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Abstract: Background: Outsourcing in the context of e-government represents a critical strategy for engaging the private sector in the development of governmental systems. A wide range of factors influence the decision to outsource within e-government initiatives. **Aim:** The present study seeks to identify and assess the principal determinants that shape outsourcing decisions in this domain. **Methodology:** To this end, an integrated methodological framework was adopted. Initially, a PESTEL analysis was conducted to delineate the critical factors informing the decision-making process in E-government outsourcing. Subsequently, the DEMATEL method was employed to explore the interdependencies among these identified criteria. Finally, the Analytic Network Process (ANP) was applied to determine the relative importance, or weight, of each factor. **Results:** The findings reveal that privacy emerges as the most decisive factor in outsourcing decisions, accounting for a relative weight of 30.21%. This is followed by outsourcing cost (20.39%) and the technical competence of government personnel (16.70%). **Conclusion:** By clarifying these priorities and key considerations, the study provides valuable insights for policymakers and decision-makers in the field of E-government, thereby facilitating more effective and strategically informed outsourcing practices. **Keywords:** E-government, Outsourcing, MCDM, PESTEL, ANP, DEMATEL.

تقييم العوامل المؤثرة على قرار الاستعانة بمصادر خارجية في الحكومة الإلكترونية: دراسة حالة

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الملخص: خلفية البحث: يُعدّ التعاقد الخارجي في الحكومة الإلكترونية استراتيجية مهمة لإشراك القطاع الخاص في عملية تطوير الأنظمة الحكومية، تؤثر العديد من العوامل في قرار التعاقد الخارجي في الحكومة الإلكترونية. **الهدف:** تهدف الدراسة لتحديد وتقييم العوامل الرئيسية المؤثرة في قرارات التعاقد الخارجي في سياق الحكومة الإلكترونية. **المنهجية:** تم اعتماد منهجية متكاملة، حيث تُجرى الدراسة أولاً تحليل باستخدام نموذج PESTEL، لتحديد العوامل الحاسمة التي تُشكل عملية صنع القرار في تعاقد الحكومة الإلكترونية. ثم تستخدم نموذج DEMATEL، لدراسة العلاقات المتبادلة بين هذه المعايير المحددة. وأخيراً، تُطبق طريقة ANP لتحديد الأهمية النسبية أو الوزن النسبي للعوامل. **النتائج:** أظهرت النتائج أن الخصوصية تبرز العامل الأكثر تأثيراً في قرار الاستعانة بمصادر خارجية بوزن أهمية (30.21%)، تليها تكلفة الاستعانة بمصادر خارجية (20.39%) والكفاءة الفنية لموظفي الحكومة بنسبة (16.70%). **الخلاصة:** تساعد الدراسة متخذي قرار التعاقد الخارجي في الحكومة الإلكترونية من خلال تسليط الضوء على الأولويات والاعتبارات الأساسية اللازمة للاستعانة بمصادر خارجية فعالة.

الكلمات المفتاحية: الحكومة الإلكترونية، التعاقد الخارجي، MCDM، PESTEL، ANP، DEMATEL

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Introduction

E-government refers to the digital transformation of government processes, services, communication by utilizing Information and Communication Technologies (ICT) to enhance efficiency, accessibility, and transparency in operations. E-government systems facilitate various transactions among citizens, government entities, businesses, and civil society organizations with ease and speed, thereby reducing effort, time, and costs (Yin *et al.*, 2009). E-Government initiatives have emerged as powerful catalysts in reshaping and enhancing government services globally (Chatfield & Al-Hujran, 2009; Al-Soud *et al.* 2014; United Nations, 2012). Despite its demonstrated advantages, constructing e-government systems is a complex process that demands expertise in both ICT and government affairs (Hu *et al.*, 2009). In this context, outsourcing becomes indispensable, offering expertise in both technological and bureaucratic domains. According to (Dahleez, 2017), it has been shown that senior management in Palestinian ministries is aware of the e-government project and its importance.

E-government outsourcing is a management and operational approach in which expert IT outsourcing service providers handle all the work or a portion. This work is related to government affairs projects, daily maintenance and operation, and associated services (Han & Li, 2009). Outsourcing has become a global trend in private and public sectors as it enables the faster, more efficient, and cost-effective development of services. The primary aim of outsourcing is to enhance efficiency by fostering a competitive environment for service provision.

the absence of an effective ecosystem, and operating in a complex environment surrounded by numerous political, economic, and social challenges, have negatively affected the growth and development of startups and the local

economy in Palestine, which will increase the need to outsource (Morrar & Tawil, 2024).

IT outsourcing in the public sector is considered significantly more complex than the private sector because of the stringent regulations governing organizational processes. Besides, the highly sensitive political context involves many stakeholders who have divergent and conflicting opinions (Lin *et al.*, 2007). Corporate practices from the private sector do not translate seamlessly to the public sector and require adaptation to meet the unique demands of the public environment (Gantman & Fedorowicz, 2020). According to Vilovsky (2008) complexity is further compounded by the increasing interdependence of government agencies and the wide range of stakeholders, each with distinct vested interests. So, decision making in e-government is a pivotal aspect that leverages efficiency of public administration (UN e-Government Survey, 2016).

Multi-Criteria Decision-Making (MCDM) methods are well-suited for analyzing complex issues such as E-government outsourcing strategies, as they systematically integrate qualitative and quantitative criteria into a structured framework. These methods enable decision-makers to navigate complexities arising from multiple objectives, conflicting criteria, and diverse stakeholder interests (Hasan *et al.*, 2022). By facilitating the evaluation of trade-offs and preferences, MCDM helps identify optimal resolutions, leading to more robust and widely accepted decisions. Moreover, MCDM provides a transparent and adaptable approach for addressing uncertainty in decision-making processes (Sahoo & Goswami, 2023).

The range of E-government outsourcing strategies includes full outsourcing, in-house development, or co-outsourcing. Understanding the key influencing criteria is essential for optimizing these decisions. This study aims to support decision-makers by identifying critical

outsourcing criteria, evaluating their interactions, and assessing their relative weights. To achieve this, we adopt a three-phase MCDM approach:

- **PESTEL Analysis** (Political, Economic, Social, Technological, Environmental, and Legal) to identify macro-environmental criteria affecting outsourcing decisions.
- **DEMATEL** (Decision-Making Trial and Evaluation Laboratory) to analyze interdependencies among the identified criteria.
- **ANP** (Analytic Network Process) to determine the prioritized weights of each criterion.

By combining these methods, the study provides a comprehensive framework to enhance strategic decision-making in E-government outsourcing.

The rest of this paper is organized as follows: Section 2 presents a comprehensive literature review and synthesizes relevant works in the field. Section 3 offers the combination of Multi-criteria decision-making (MCDM) methodology. Section 4 shows application process and results derived from each phase and the insights garnered throughout the study. Section 5 encapsulates the study's conclusions, summarizing key insights, future thoughts and implications.

Literature Review

In this section, a literature review on outsourcing is presented.

From different points of view, many studies focus on the outsourcing process in e-government. (Demircan, 2024), see that the most sensitive criteria for the selection decision are cost and information security. This result shows that institutions attach importance to information security in their outsourcing processes and cost.

Akhtar (2023), did a literature review analysis, it is observed that multi criteria decision making (MCDM) methods have been adopted by majority of researchers wherein Analytic Hierarchy Process

(AHP), Technique for order of preference by similarity to ideal solution (TOPSIS) and their fuzzy variant are highly applied.

In the research presented by (Sarvari *et al.*, 2023), the results show that the categories of criteria that can enhance suppliers' capacity in outsourcing processes at Water and Wastewater Company (WWC) are the following, in order of importance: financial, judicial-legal, contracts, and management. The findings help to focus on the shortcomings and deficiencies of current outsourcing processes.

The study by Gantman & Fedorowicz (2020) aims to identify the extent to which public sector IT practices align with those on the private sector. It focuses on the outcomes and components of IT outsourcing decision-making process identified as challenging for public sector IT. The findings show that trail gaps and cost considerations are the primary drivers of IT adoption and the availability of capital funding influences ITO (Information Technology Outsourcing) decisions.

Marco-Simó & Pastor-Collado (2020) analyzed IT outsourcing (ITO) in the public sector and compared it to ITO on the private sector. The extent differences in ITO process between the public and private are clear and impact upon the implementation of the ITO. The study concludes the discussion and highlights aspects that appear exclusive to ITO in the PS. The negative effects of outsourcing were emphasized by Svärd (2019), he emphasized the absence of clarity reading information management in the contracts for outsourcing government. Mkude & Wimmer (2016) also discussed of e-government challenges to help decision-makers understand the outsourcing process. Fatih *et al.* (2015) suggested a formula for helping government institutions in choosing the appropriate could deployment model. The framework was developed by combining benefits, costs, opportunities and risk analysis.

Moon *et al.* (2014) found that organization size has no impact on outsourcing success in the public sector. Thus, the role of IT plays a key role for IT outsourcing success in the public sector. The issues to e-government service outsourcing along with back sourcing and insourcing policies were discussed by Samsudin *et al.* (2013). The impairments of e-government applications are related to politics and economics criteria according to literature. They are affecting the achievement of online services and the agency or department.

Girth *et al.* (2012) has done a study about holding the advantage of competition as a key argument for outsourcing public services. Results show that the deals costs related to running noncompetitive markets need to be considered when governments decide how to best deliver services to citizens. Cordella & Willcocks (2012) test government IT outsourcing policies by criticizing the idea of ‘the Contract State’, and

suppose how more disciplined uses of outsourcing can assist the creation of strong public worth.

Souqia (2011) aimed to estimate the likelihood of Open Source Software (OSS) adoption in the Palestinian e-government program, recognizing the opportunities. Based on that, to develop the decision-making process and solve the issue of outsourcing in e-government. It aspires to provide a comprehensive understanding of the criteria that directly affect outsourcing decisions within the realm of E-government through a multi-criteria decision making (MCDM) encompassing PESTEL analysis, DEMATEL, and ANP, the study will identify and prioritize these criteria. It will analyze how these criteria interrelate and influence one another, offering a nuanced perspective on the decision-making process. Table (1) summarizes the studies using the MCDM approach.

Table (1): Previous Studies.

Year	Author (s)	Method	Topic	Application
2024	Demircan	Interval-Valued Spherical Fuzzy AHP	IT Outsourcing Vendor Selection for Digital Transformation Projects in Public Sector	✓
2023	Sarvari, Dehkordi, Chan, Cristofaro & Banaitienè	Delphi survey, one-sample t-test and the Friedman test	the major criteria able to increase the capacity of suppliers in outsourcing processes	✓
2023	Akhtar	literature review and analysis	literature review and research agenda Logistics services outsourcing decision making	×
2022	Mansour A.	Survey and SPSS	Study of the readiness of Palestinian ICT institutions for digital transformation	✓
2020	Gantman & Fedorowicz	Qualitative Comparative Analysis	Success Criteria of IT Outsource	✓
2019	Svärd	Interviews	Contract and Security of outsourcing	×
2018	Duhamel Gutiérrez-Martínez, Picazo-Vela, & Luna-Reyes	Case selection, interviews	Manage public-private IT outsourcing relations	✓
2016	Mkude, & Wimmer, .	PESTELMO, DEMATEL, ANP	E-Government Challenges	✓
2015	Fatih, Alfina, & Purwandari	BCOR, Entropy and TOPSIS approach	Selecting Model	✓
2014	Moon, Choe, Chung, Jung & Swar	Questionnaire	IT outsourcing in public sector	✓
2013	Samsudin Hashim & Fuzi	Cross-sectional research design through surveys	Assessing the feasibility of outsourcing	×
2012	Cordella & Willcocks	Questionnaire and interviews	Government policy, public value and IT outsourcing	×
2012	Girth, Hefetz, Johnston & Warne	Surveys and qualitative data from inter views with government	-	✓

Year	Author (s)	Method	Topic	Application
		managers.		
2011	Souqia, F	Surveys and qualitative data from e-government team members and heads of IT departments	Opportunities and Challenges of Open-source Initiatives in the Palestinian e-Government Program	✓

Research Problem

The Palestinian government efforts in the field of E-services date back several years, evidenced by the accomplishments of the Ministry of Telecommunications and Information Technology (MTIT), along with other government ministries and institutions. These efforts have been evident in the development of infrastructure, integration with the government network, provision of an electronic services environment, and hosting government websites. The collaborative work among government departments in information technology is exemplified by the Data Integration Committee, resulting in the establishment of a centralized government database. This database has played a crucial role in advancing various essential e-services for Palestinian citizens.

The Palestinian government, which has partially implemented e-government applications, seeks to broaden services offerings and improve user satisfaction. However, achieving this goal requires additional resources and processes. Furthermore, there is a strong interest in engaging private sector institutions in the development of E-government MTIT initiatives, with outsourcing being a viable solution to address these needs (MTIT, 2022). However, the entry of public-private cooperation to date has proven barbed. Some previous experiments highlight both tangible and experiential challenges such as “challenges with cost coverage for both set-up and maintenance costs, unclear service designs and technical specifications and the lack of a comprehensive architecture strategy” (USAID,

2015). At present, outstanding granter attempt try to change the state of relations: the USAID-funded Enterprise Development for Global Competitiveness Project (“Compete”) or the KOICA-funded PASS program (inclusive of the IT training center within MTIT) to include the ICT sector (as one of the seven target sectors) in cooperating with the government as part of further e-Government development in Palestine (Boski, 2017).

Methods

Outsourcing E-government service is a significant aspect of governmental privatization initiatives. Governments perceive it as a complex process, beyond simply procuring services (Yin *et al.*, 2009). Decision-makers must understand that outsourcing decisions in E-government extend beyond purely technological considerations. Political, economic, and legal criteria also play essential roles and influence one another. In order to attain such comprehension, we suggest a combination Multi-criteria decision-making (MCDM) methodology that consists of PESTEL (Political, Economic, Social, Technological, Environmental, Legal) analysis method, DEMATEL (Decision Making Trial and Evaluation Laboratory), and ANP (Analytic Network Process).

To gain a comprehensive understanding of the research methodology employed in this study, it is essential to explore each step-in detail, examining the specific objectives, processes, and outcomes associated with PESTEL analysis, DEMATEL, and ANP. The following subsections provide an in-depth look at each stage.

PESTEL Analysis: To identify criteria which affect the adoption of the E-government outsourcing in a systematic way, the PESTEL analysis method is proposed. PESTEL analysis is a strategic framework used to analyze the external criteria that can impact an organization or decision-making process. The acronym PESTEL stands for Political, Economic, Social, Technological, Environmental, and Legal criteria. Each of these dimensions is explored to understand the broader context in which an organization operates.

Using the PESTEL technique, companies and decision-makers analyze both their internal and external environments and determine the context in which the E-government plan will be implemented. The steps of PESTEL analysis method are as follows:

1. Identifying Criteria Affecting E-government outsourcing:
2. Categorizing Criteria
3. Filtering Criteria
4. Forming A Hierarchical Model of Criteria

DEMATEL Method: DEMATEL, which stands for Decision Making Trial and Evaluation Laboratory, is a method used for analyzing complex systems and identifying interdependencies among components among various criteria within the system through a causal diagram (Tzeng *et al.*, 2007). In this study, we suggest employing the DEMATEL technique by following a PESTEL analysis to thoroughly evaluate the interdependencies, interrelations, and causal relations among criteria which affect outsourcing decision making in E-government. This approach aims to determine the extent of influence each criterion hold. The steps for using DEMATEL are as follows (Yüksel, 2012):

Calculating the Initial Average Matrix

This step requires evaluation of the degree of direct influence between the identified criteria affecting outsourcing decision making

in E-government by experts on a scale 0–4, where the higher value indicates greater influence. The results from each respondent then produces an $n \times n$ non-negative matrix stated as $X^k = [X_{i,j}^k]$ where n is the number of criteria and $X_{i,j}$ is the degree to which the respondent thinks that factor i influences factor j ; k represents the number of respondent where $1 \leq k \leq H$. Thus $X^1, X^2, X^3, \dots, X^H$ are the matrices from H respondents.

The average matrix $A = [a_{i,j}]$ that covers all respondent experts is given in formula (1):

$$a_{i,j} = \frac{\sum_{k=1}^H x_{i,j}^k}{H} \quad (1)$$

Calculating the Normalized Initial Direct-Relation Matrix

The normalized initial direct-relation matrix D is given by formula (2) as follows:

$$D = A \times S \text{ and } S = \frac{1}{\max_{1 \leq i \leq n} \sum_{j=1}^n a_{i,j}} \quad (2)$$

Where n is the total number of criteria identified and each element in matrix D falls between 0 and 1.

Calculating the Total Relation Matrix

The total relation matrix T is given by formula (3) as follows, where I is an $n \times n$ identity matrix:

$$T = D (I - D)^{-1} \quad (3)$$

Vectors r and c , respectively, define the total rows and columns in T . r_i denotes the row sum of the i^{th} row of matrix T and shows the sum of direct and indirect effects of criteria i on the other criteria.

Similarly, to this c_j represents the total of the direct and indirect impacts that criteria j acquired from the other criteria, as well as the total of the j^{th} column of matrix T .

When $i = j$, $r_i + c_i$ gives a measure of the magnitude of influences supplied and received, in other words $r_i + c_i$ indicates the extent to

which the major role is emphasized criteria i plays in the problem such that:

- If $r_i + c_i$ is positive, then criteria i is affecting other criteria.
- If $r_i + c_i$ is negative, then criteria i is being influenced by other criteria (Mkude & Peter, 2024).

Obtaining the Digraph

Matrix T shows the relationships among the criteria. Therefore, in order to weed out insignificant impacts, a threshold value needs to be determined. In the digraph, effects that surpass the threshold value are selected and displayed. The dataset of $(r + c, r - c)$ can be mapped to obtain the digraph.

After completion of step 4, a comprehensive visual representation of the connections and interdependencies between the criteria will be created using a digraph. The digraph demonstrates the independence of one category from the others as well as the dependencies and connections between the issues both within and between categories.

Analytic Network Process (ANP)

Method: The Analytic Network Process (ANP) is the most comprehensive framework available for analyzing decisions made by businesses, and governments. It enables the decision-maker to take into account all the elements and concrete or intangible standards that significantly impact choosing the optimal course of action ANP (Tuzkaya & Önut, 2008). This action takes into account the relationships between criteria and sub-criteria and thus eliminates the need of modeling based on a single direction and produces more sensitive and consistent results for decision-makers (Yıldız, 2014). Building upon the insights which are gained by PESTEL and DEMATEL, this study utilizes the ANP method for further

quantitative analysis. ANP calculates weights and rankings for PESTEL criteria, it offers a more nuanced perspective on the significance of each factor. This method is widely recognized for its application in Multiple Criteria Decision Making (MCDM) (Ordoobadi, 2012). The following steps are for utilizing ANP (Yüksel, 2012):

Step-1: Decision problem, which includes the goal, criteria, and sub-criteria, the decision-makers are identified. The dimensions and sub-dimensions are revealed in the previous chapter.

Step-2 and 3: The network structure which demonstrates the inter-dependencies among criteria are identified by appropriate methods such as brainstorming, literature search, expert reviews, etc., (Büyüközkan & Güleriyüz, 2016; Büyüközkan & Öztürkcan, 2010).

Therefore, the interdependencies that constitute the network structure are determined by experts using the DEMATEL method, and the corresponding influence matrix is created.

Step-4: The pair-wise comparisons are created according to the influence matrix using Saaty's (1994) "1-9 scale".

Step-5: The priority weights are determined by using Analytical Hierarchy Process calculation procedures given by Cetin and Önder (2015).

Step-6: The subjectivity originated from the participants may result in inconsistency. Therefore, AHP requires to check the consistency ratio.

In order to calculate Consistency Ratio (C.R.), the random consistency index (R.I) given in Table (2) is introduced by Saaty (1994).

Table (2): Random Consistency Index (R.I.)

n	1	2	3	4	5	6	7	8	9	10
R.I.	0	0	0.52	0.89	1.11	1.25	1.35	1.40	1.45	1.49

Step-7: Once all the relative priority weights are obtained, the supermatrix is constructed.

Step-8: The supermatrix includes the relative priority weights of the sub-dimensions. Besides, pair-wise comparisons are made for dimensions, and relative priority weights of the dimensions are calculated. Hence, the weighted supermatrix is obtained by multiplying the dimension weight by its corresponding value in the supermatrix. Then, the weighted supermatrix is normalized, that each element in a column is divided by the sum of its column. Hence, in the resulting normalized weighted super-matrix, the sum of each column equals one.

Step-9: Limit supermatrix, which shows the global priority weights of the sub-dimensions are calculated.

Decision-makers receive a thorough quantitative evaluation and measurement of the identified criteria step 9. They are provided

Table (3): Research Questions and Objective of Study

Research Question	Objective of the Study
Q1: What are the criteria affecting the adoption of the outsourcing in Palestinian E-government?	Identifying and analyzing the key criteria that influence the decision to adopt IT outsourcing in the context of Palestinian e-government.
Q2: What is the interrelationship between these criteria?	Exploring how different criteria interact and influence each other, contributing to a holistic understanding of the outsourcing decision-making process.
Q3: What are the most important criteria influencing the outsourcing of E-Government in Palestine?	Discover the importance of each element influencing a decision E-Government in Palestine to help the decision-maker.

By addressing these research questions, the study aims to provide a detailed analysis of the criteria influencing outsourcing decisions in Palestinian E-government. It aims to offer practical recommendations for policymakers and stakeholders to navigate the complexities and make informed decisions that enhance the effectiveness and efficiency of E-government services.

Research Population: The study population includes all Supreme Committee for Digital Transformation in Palestine. This committee, which consists of ten representatives from various ministries within the government, supervises the E-government

with insights into the interdependent local and global weights of the categories, which highlight the extent of the interdependencies among these criteria. This information empowers decision-makers to develop strategies and find solutions that are more informed and well-grounded, considering the relationships between different criteria.

Application

Research Questions: This study aims to address the multifaceted nature of IT outsourcing by formulating specific research questions and corresponding objectives. The research questions are designed to explore the criteria influencing outsourcing decisions, their interrelationships, and the identification of the most appropriate alternatives for outsourcing in Palestinian E-government. The research questions along with the objectives of the study presented in table (3).

project and is responsible for decision-making in the outsourcing process. A meeting with ten different IT professionals, who possessed varying roles, responsibilities, and the levels of experience.

The study sample size was consistent with previous studies that used the same technique, like Kumar (2023). In his study to see the reasons behind outsourcing choices of European organizations, which include the level of cyber security know-how of Operational activities of the coal mining organization in India. The sample consists of 11 IT professionals. Modak *et al.* (2019) proposed an integrated method for choosing the best

outsourcing strategy (insourcing, outsourcing, and strategic alliance), a group of five experts were selected in the context of the study. In Dubai, an approach is used to make a comparison between various cleaning ways and find the best cleaning way. A multi-criteria decision-making approach Technique for Order of Preference by Similarity to Ideal Solution is used for this. An online survey that was distributed among seven solar PV experts (Al Mallahi *et al.*, 2022). Modak *et al.* (2017) chose ten experts, whose experience is of ten years minimum, from the Indian coal mining organization as panel members. The experimental study aimed to balance short-term financial measures with long-term strategic objectives by reducing inefficiencies. Mahalik (2010) presented an attempt to discover a best

Table (4): Correlations for survey.

Correlations				
		TOTAL	ODD	EVEN
TOTAL	Pearson Correlation	1	.931	.960
	Sig. (2-tailed)		.001	.000
	N	10	10	10
ODD	Pearson Correlation	.931	1	.793
	Sig. (2-tailed)	.001		.019
	N	8	8	8

The correlation results presented in Table (4) provide strong evidence of the internal consistency and reliability of the collected data. Both subgroups (ODD and EVEN) demonstrated very high and statistically significant correlations with the TOTAL scores ($r = 0.931$ and $r = 0.960$, respectively). This confirms that the subgroup analyses are closely aligned with the overall outcomes, reinforcing the stability of the results. Moreover, the significant positive correlation between the ODD and EVEN groups ($r = 0.793$) further indicates that the findings are consistent across different participant divisions. Taken together,

level of outsourcing utilizing the AHP. He proposed a balance strategy between internal and external agency in order to lessen inability average in e-governance projects. For analysis, the study prepares a questionnaire and interacted with three experts.

The data were collected through a survey that was distributed to experts (10 officials representing decision making process in e-government in Palestine). These 10 experts were officially responsible for decisions related to use the outsourcing process in this sector. All ten experts have filled the survey, a short meeting was held to understand their perspective. Table (4) show correlations analysis:

these results validate the robustness and repeatability of the methodology, ensuring that the conclusions drawn from the analysis are well-supported and not dependent on the specific composition of the subgroups.

Identified Criteria: In this study, a structured multi-criteria research methodology is employed. The first step is PESTEL analysis. The second step is DEMATEL. Finally, ANP (Analytic Network Process) method is used in the last step. The flowchart of the suggested research process is shown in Figure (1):

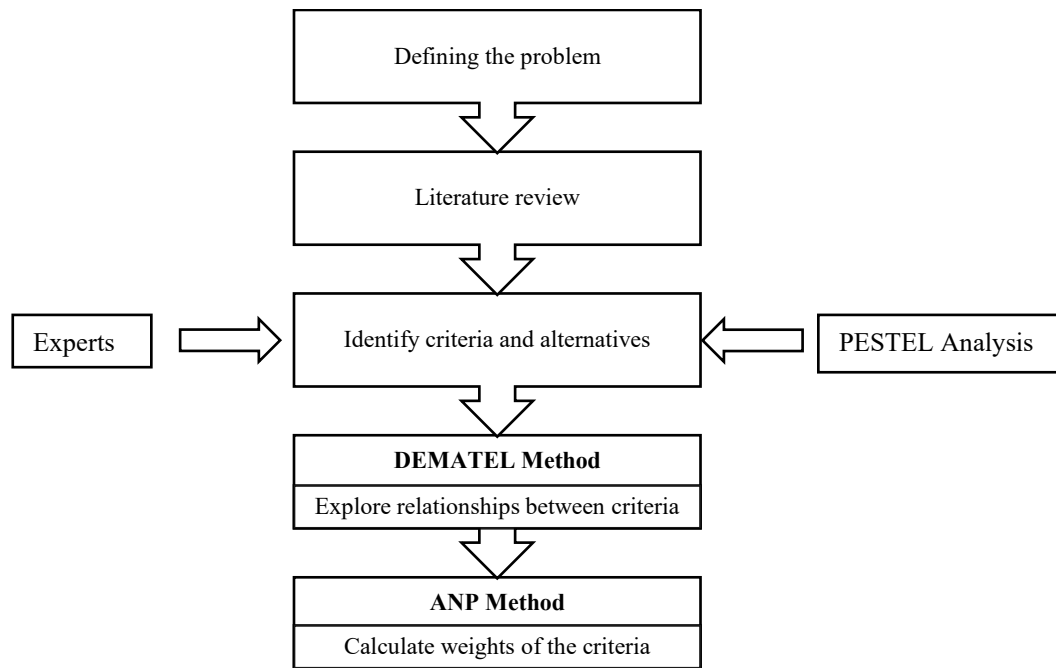


Figure (1): Research Process Flowchart.

Based on the application of PESTEL analysis to determine the criteria that affect the outsourcing decision in E-government, the analysis initiates with a PESTEL analysis, a strategic management tool examining the Political, Economic, Socio-cultural, Technological, Environmental, Legal, Managerial, and Organizational criteria. by discussing the results with decision-maker in the Palestinian E-government, the criteria that directly affect the outsourcing decision-making process are in Figure (2). The analysis was conducted in collaboration with the Supreme Committee for Digital Transformation in Palestine. This committee, which consists of ten representatives all representing different ministries within the government, oversees the transformation process in outsourcing.

The political dimension revealed a significant influence of the ongoing occupation on the outsourcing decisions. The occupation, acting as a major impediment, hinders the development of Palestinian infrastructure by restricting the import of equipment and technologies. Consequently, outsourcing decisions become a viable option to address these challenges and bridge the gaps caused by such restrictions. The Palestinian government

actively supports outsourcing initiatives, particularly in aiding local technology companies and providing opportunities for their engagement. The economic landscape plays a crucial role in fostering an outsourcing culture. The parallel development of private companies in the information technology sector, coupled with the overall economic growth in Palestine, contributes to the support of outsourcing. Private companies in this sector are pivotal in attracting and managing technology-related projects. The legal aspect is a dynamic component evolving in alignment with the government's new directions in outsourcing and E-outsourcing. A recent development is the introduction of the E-Outsourcing Legal System, it is a legal framework that regulates the relationship between private companies and the government. This system ensures the rights of various stakeholders in the outsourcing process. Technological criteria emerge as a primary driver influencing the shift towards outsourcing. The availability of a skilled workforce is a key technological factor, indicating the presence of capabilities and skills within the public and private sectors. The environmental dimension, while not explicitly

addressed, remains relevant for sustainable practices. However, it is crucial to consider environmental criteria as they may have implications for sustainable and eco-friendly

outsourcing practices. The result of the analysis and opinions of experts in e-government were that the criteria directly affecting the decision of the outsourcing process.

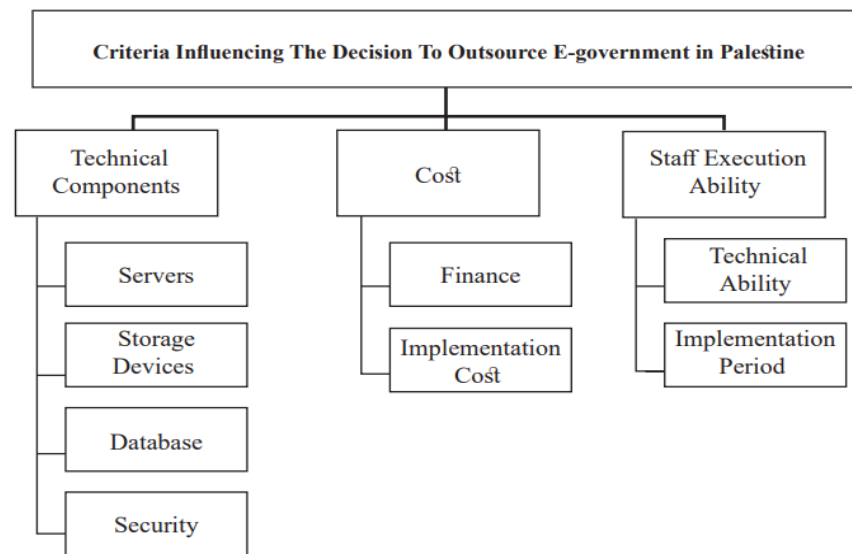


Figure (2): Criteria Influencing Outsourcing Decision in the Palestinian E-Government.

a- Technical Components: The physical and software elements required to build and maintain a system and they are divided into:

- **Servers:** Computers or systems that provide resources, data, or services to other devices.
- **Storage devices:** Hardware used to store and retrieve data (e.g., hard drives, SSDs).
- **Database:** Organized collections of data, managed for easy access and manipulation.
- **Security:** Measures and tools to protect systems and data from unauthorized access or threats.

b- Cost: The expenses involved in a project or system and they are divided into:

- **Finance:** The management of funds and budgeting for the project.
- **Implementation Cost:** Expenses related to deploying and setting up the system.

c- Staff Execution Ability: The team's capability to successfully complete tasks and it's divided to:

- **Technical Ability:** The team's skills and expertise in handling technical tasks.
- **Implementation Period:** The time required to deploy and operationalize the system.

By applying the PESTLE analysis with decision-maker, we identified several criteria directly influencing the outsourcing decision. These criteria, representing various dimensions of the PESTLE framework, were subsequently integrated into the next step of the methodology.

Relationships Between Criteria: The potential dependences among PESTEL criteria were identified and mapped via DEMATEL. Thus, the initial direct-relation matrix (*A*) is formed according to the views of the expert team. After PESTEL analysis, DEMATEL method helps unveil interdependencies, providing a nuanced understanding of how different criteria influence each other. Direct and indirect effects among PESTEL criteria are shown in table (5), Total Relation Matrix shown in APPENDIX A.

Table (5): DEMATEL Affecting Criteria.

			D	R	D-R	D+R
AFFECTING CRITERIA	Technical Components	Servers	5.38	5.18	0.20	10.57
		Storage Devices	4.45	4.79	-0.34	9.24
		Database	5.10	5.04	0.06	10.14
		Security	5.88	5.72	0.16	11.60
	Cost	Finance	5.83	6.05	-0.21	11.88
		Implementation Cost	6.30	6.17	0.13	12.46
	Staff Execution Ability	Technical Ability	5.23	5.05	0.18	10.29
		Implementation Period	4.96	5.13	-0.17	10.10

The influence of one criterion on other criteria and relationships was ascertained with the aid of D+R and D-R values. It is acknowledged that criteria with positive D-R values have a greater influence and precedence over other criteria when the D-R values are taken into account. We refer to this category of criteria as causer. On the other hand, it is implied that criteria with negative D-R values are less important and are influenced more by other criteria. We refer to this category of criteria as receivers. The relationships between each criterion and the other criteria are indicated by the values in column D+R. Higher D+R criteria are more closely associated with other criteria. On the other hand, criteria with low D+R values have less correlation with other criteria (Aksakal and Dağdeviren, 2010).

From the values of D-R in Table (5) It has been noted that the only five criteria with positive values of (D-R) are "Servers", "Database", "Security", "Implementation Cost", and "Technical Ability". This finding suggests that these five criteria are more important and have a greater influence when determining E-government outsourcing. The elements that are influenced more by the other criteria are "Storage Devices", "Finance", and "Implementation Period", with respective negative D-R values of -0.21 and -0.34. The factor "Servers", which has the highest D-R value, is referred to as the master dispatcher and is placed ahead to other criteria. A master dispatcher is identified by the factor "Storage Devices" with the lowest D-R value.

When the column D+R is investigated in Table (5), One may conclude that the criteria for Implementation Cost, Finance, Security, Servers, and Technical Ability are more related to each other than the other criteria, whereas the remaining criteria are less related to each other. The finance component with the highest D+R value (11.88) has the strongest correlation with the other components. Furthermore, storage devices have the least relationship to the other components, with a score of 9.24. The DEMATEL analysis revealed a clear distinction between causal and effect criteria in the decision. The primary casual factor includes servers, database, Security, implementation cost and technical ability, as indicated by their positive D-R values. These criteria exert greater influence on the decision that they receive, positioning them as the driving forces of the decision. Moreover, the analysis of D+R values highlights implementation cost, Finance and security as the most central and significant criteria due to their strong overall interactions with other variables. Figure (3) presents dimension causal relationship network:

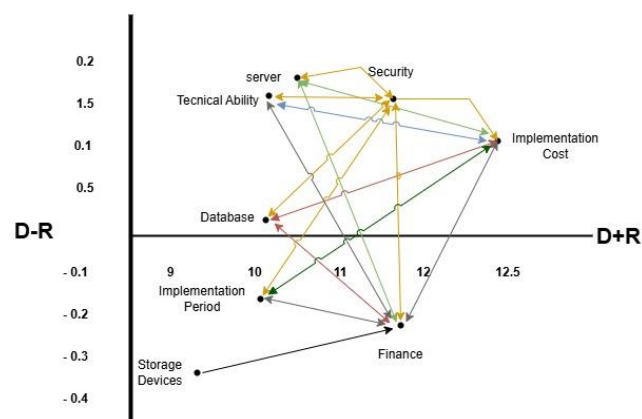
**Figure (3):** Dimension Causal Relationship Network.

Figure (3) illustrates the interaction between criteria. The Figure 3 shows, for example, that the server affects the cost of implementation, security, and financing. In contrast, the duration of implementation affects the cost of implementation financing and security.

Weights of Criteria: Building upon the results gained from PESTEL and DEMATEL,

the research utilizes the ANP method for further quantitative analysis. ANP calculates weights and for PESTEL criteria, offering a more nuanced perspective on the significance of each factor. This method is widely recognized for its application in MCDM. Table (6) presents the ANP Limit matrix that has the weights of every criterion. The Normalize Supper Matrix shown in APPENDIX B.

Table (6): ANP Limit Matrix.

		Criteria Importance Weight	Criteria Importance Weight (%)	Ranking
Technical Components	Servers	0.0643	6.43%	7
	Storage Devices	0.0069	0.69%	8
	Database	0.0879	8.79%	5
	Security	0.3021	30.21%	1
Cost	Finance	0.1020	10.20%	4
	Implementation Cost	0.2039	20.39%	2
Staff Execution Ability	Technical Ability	0.1670	16.70%	3
	Implementation Period	0.0660	6.60%	6

The study found that one of the most influential criteria in the outsourcing decision is the security factor, which is a very important aspect for preserving data and user privacy. Since government data is usually sensitive data, followed by the cost of implementation, which is an important criterion in the outsourcing process, and whether there are financial capabilities allocated to the outsourcing process. But not followed by the technical capabilities of existing staff within the ministry, and whether there is a need for external expertise. Next, the form of financing through which the outsourcing process can be completed, whether it is internal financing from the government or supported by regional or international entities and projects. As noted, technical criteria came in the end as criteria influencing the decision, the Palestinian E-government infrastructure is mostly capable of keeping up with the expansion and does not represent a major obstacle in the process of developing E-government and its services. It is noted that the criteria of the duration of implementation came in sixth place, which indicates that there is no significant pressure on time, as the government regulations come within

the framework of development and not in response to pressing and pressing circumstances.

The results are consistent with the results of (Demircan, 2024) that see cost and information security are the most sensitive criteria for the selection decision. Also consistent with Cox *et al.* (2011) that cost of implementation affects the outsourcing process; the cost of the process and its inflexibility makes it more difficult for councils to focus on long-term goals. Han & Li (2009) agreed that the most influential criteria in the outsourcing decision is the security factor: “The government should greatly guard information security in outsourcing of e-government by all kinds of ways such as law, management, systems and so on”.

The results also were similar to the study by Yin *et al.* (2009), which proved that cost, security, and technology promotion criteria play important roles in outsourcing decision-making, and that financial support demand has a significant effect. Additionally, the findings align with the research of Estember & Jacob (2019), which highlight technical skills, cost savings, and infrastructure as major criteria affecting

outsourcing decisions. Fatih *et al.* (2015) found that data protection obtained the largest weight, and cost became a major concern for IT specialists in government. Aragão, & Fontana (2023) indicated that when the public sector suffers from budgetary constraints, outsourced services may be the first to suffer negative impacts, affecting public service continuity, this aligns with our results that figured how the form of financing affects outsourcing process. Badampudi *et al.* (2016) agreed also with our study by taking cost of implantation as a main factor that affects outsourcing process.

Conclusion and Discussion

This study has provided a multi-criteria analysis of the criteria influencing outsourcing decisions in the context of E-government. Through a multi-criteria research methodology encompassing PESTEL analysis, DEMATEL, and ANP, we have identified and ranked the criteria impacting outsourcing decisions. Within the framework of the previous results, an outsourcing policy can be formulated by evaluating the external costs of software outsourcing, taking into account the protection aspect and the ability to achieve it by both parties of the outsourcing. Then finding a model that can measure the technical capabilities of implementing projects, whether at the government level or private companies. This approach considers a range of other criteria, including technical criteria and external financing for e-government outsourcing projects. In summary, this research not only contributes to the theoretical understanding of outsourcing in E-government but also provides actionable insights for policymakers and stakeholders. By understanding and prioritizing the criteria that influence outsourcing decisions, governments can make informed, strategic choices that balance efficiency, security, and innovation in the digital transformation of public services.

Theoretical Implications: This research employs MCDM methods to study the criteria that influence outsourcing decisions in e-government. Since this aspect has not been addressed in previous studies in the field of e-government, it makes a valuable contribution to the body of knowledge on e-government outsourcing. It aims to gain a greater and deeper understanding of outsourcing decisions in e-government. It is also recommended that future studies explore outsourcing more extensively, particularly by incorporating the private sector.

Practical Implications: The results revealed that security is the most influential criterion, underscoring the importance of safeguarding sensitive government data and ensuring user privacy. Cost considerations, technical capabilities of the existing staff, and the form of financing also emerged as critical criteria. The technical infrastructure of E-government found to be sufficiently robust. The objectives of this research serve as a guideline for E-government decision-makers to understand the criteria affecting outsourcing, thus contributing to more informed outsourcing decisions in e-government projects.

Limitations and Future Research

Although this study provides valuable insights, it is not without limitations. The sample size may appear limited; however, this is due to the use of a census approach, as the study population was small and restricted to government officials responsible for decision-making regarding e-government adoption. Moreover, the study examined the influencing criteria primarily from a governmental perspective. Future research is encouraged to investigate these criteria from the perspective of the private sector as well, in order to provide a more comprehensive understanding of the determinants of e-government adoption.

Disclosure Statement

The authors declare that they have no relevant or material financial interests that relate to the research described in this paper

- **Ethical approval and consent to participate:** participation in this study was voluntary. Information about the aim of this study was provided to the participants. It was confirmed that privacy was maintained during the study.
- **Availability of data and materials:** The data used and/or analyzed during the current study are available from the corresponding author upon reasonable request.
- **Author contribution:** All authors conceived and designed the study, collected and analyzed the data and drafted the manuscript. All authors reviewed and approved the final manuscript.
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