

# Hybrid SWOT-AHP Analysis of Saudi Arabia E-Government

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## ABSTRACT

E-government has become an important phenomenon which attracted every country toward itself. However e-government is facing challenges which have significant effects on its performance. In order to overcome these challenges good strategies are inevitable for the e-government implementation. In this paper we analyzed Saudi Arabia's e-government using strengths, weaknesses, opportunities and threats (SWOT) technique and identified the intensities of SWOT factors using analytic hierarchy process (AHP) technique. The prioritized SWOT factors are then used to formulate alternative implementation strategies using TOWS matrix. The results indicated that user centric strategy and bridging digital divide strategy followed by good communication strategy and citizen awareness strategy are the best strategies that should be implemented for successful implementation of e-government in Saudi Arabia.

## Keywords

SWOT, AHP, TOWS, E-government

## 1. INTRODUCTION

E-government [1] is not a new concept any more. After the successful implementation of the e-commerce, governments were under pressure to provide the public services using modern telecommunication technologies. E-government has been recognized as an important tool for providing public services effectively and efficiently not only to the citizens (G2C) but also to the businesses (G2B), government employees (G2E) and other governments (G2G). E-government utilize modern ICT technologies like internet, World Wide Web (WWW) and mobile technologies for better delivery of public services, improved interactions with businesses and industries, citizen participation and more efficient government management [2] which results in less corruption, increased transparency, revenue growth and reduce cost [3]. Along with these advantages, e-government is facing several political, technical,

Economical and social challenges [4] which restrict this prominent concept to be successfully implemented and if ignored it can results in wastage of government and stakeholders resources. Therefore keeping the challenges faced by the e-government in mind there should be simple, clear and understandable strategies before implementation of the system. E-government strategies are plan for government system and their supporting infrastructure to maximize the ability of the top level management to achieve organization objectives [5].

Strengths, Weaknesses, Opportunities and Threats (SWOT) is a well known strategic planning tool to evaluate the internal

strengths and weaknesses and external opportunities and threats related to the product, service, system and organization [6]. The concept of the SWOT is shown in table 1.

**Table 1: SWOT Framework**

Internal Factors	External Factors
<p><b>Strengths</b></p> <p>Available resources which can be effectively used to achieve the objectives.</p>	<p><b>Opportunities</b></p> <p>Favorable situation in the external environment</p>
<p><b>Weaknesses</b></p> <p>Limitations and faults that makes achieving objectives difficult.</p>	<p><b>Threats</b></p> <p>Unfavorable situation in the external environment</p>

TOWS matrix was developed by Wehrich in 1982 as the next step of SWOT for developing alternative strategies [7]. TOWS matrix provides means to develop strategies based on logical combination of factors related to internal strengths or weaknesses with factor related to external opportunities or threats. TOWS matrix identifies four conceptually distinct strategic groups shown in table 2.

**Table 2: TOWS Matrix**

	Internal Strengths (S)	Internal Weaknesses (W)
External Opportunities (O)	SO: Maxi-Maxi Strategy	WO: Mini Maxi Strategy
External Threats (T)	ST: Maxi Mini Strategy	WT: Mini Mini Strategy

Analytic hierarchy Process (AHP) is multi-criteria decision making tool which uses hierarchical structure formation to show the problem and then perform pair wise comparison between the factors in order to prioritize them using Eigenvalue calculation framework [8]. The information derived from pair wise comparison can be shown in a reciprocal

matrix of weights, where the assigned relative weight enters into the matrix as an element and reciprocal of the entry goes to the opposite side of the main diagonal as shown in equation 1.

$$A = (a_{ij}) = \begin{bmatrix} w_1/w_1 & w_1/w_2 & \dots & w_1/w_n \\ w_2/w_1 & w_2/w_2 & \dots & \\ \vdots & \vdots & \ddots & \vdots \\ w_n/w_1 & w_n/w_2 & \dots & w_n/w_n \end{bmatrix} \quad (1)$$

The rows in matrix A indicate ratios of weights of each factor with respect to all others (Eq. (1)). In the matrix when  $i=j$ , then  $a_{ij} = 1$ . Consistency should be checked for the above matrix A using the formula.

$$CI = (\lambda_{max} - n)/(n - 1) \quad (2)$$

$$CR = CI/RI \quad (3)$$

CI is the consistency index and RI is random index. The matrix is considered consistent if  $CR \leq 0.1$  [8].

The purpose of this study is to investigate the combined usage of SWOT and AHP as analytical process for Saudi Arabia e-government strategic planning to overcome challenges faced by the Saudi e-government. In this study, factors that affecting Saudi e-government are determined and examined with SWOT analysis method and weighting of the factors are determined by AHP method.

The rest of the paper is organized as follows. The next section presents literature review of the concept upon which this research is based. Section III presents the methodology used in this research. Section IV discusses results of SWOT-AHP application for Saudi Arabia. The last section concludes the paper.

## 2. LITERATURE REVIEW

SWOT (Strengths, Weaknesses, opportunities and Threats) is commonly used situational assessment method [9] which identifies the internal strengths and weaknesses and highlights external opportunities and threats to the product, technology, planning or management. The SWOT analysis popular framework and gained acceptance because of its simplicity and power for strategy development [10]. Researcher used SWOT analysis method in different areas. In [11], the authors applied SWOT analysis technique to e-government in Uttarakhand, India and argued good governance improve the process of decision making and the process by which decisions are implemented. In [12] and [13] the authors reviewed and evaluated the vision, objectives and strategic framework of e-government in Singapore and Iran using SWOT analysis respectively. The author in [14] has applied the SWOT analysis method to evaluate the e-government implementation in Ghana. Some researchers argued that SWOT analysis technique is oversimplified [15] and has a limitation that the importance of the identified factors in decision making cannot be measured quantitatively [16] therefore SWOT alone is insufficient for decision making. In this study Analytic Hierarchy Process (AHP) is combined with SWOT analysis which provides a quantitative measure of importance of identified factors on decision making.

The Analytic Hierarchy Process (AHP) is well known multi-criteria decision making method developed by Thomas Saaty

in 1970. AHP uses hierarchal structure to show the problem and then develop priorities for alternative based on the decision of the user [8]. The application of AHP is common in economic, social, military and management science [17].

As mentioned before, SWOT analysis is a simple and effective method to identify the internal and external factors but cannot measure the intensities of the identified factors. By combining SWOT with AHP it will be easy to evaluate SWOT factors and equate the intensities [18]. Few studies previously used SWOT-AHP combined model to evaluate the e-government. In [19], the authors carried out SWOT-AHP analysis to evaluate e-government stage model. In [20], the author evaluated the e-government of Turkey using SWOT and AHP combined model.

The mentioned literature dealt with prioritization of the SWOT factors, strategies were not included based on prioritized SWOT factors. In this study SWOT-AHP combined model is used to prioritize the internal and external factors and then followed by developing alternative strategies based on those prioritized factors in the form of TOWS matrix.

## 3. METHODOLOGY

The methodology adopted for this research consists of the following four steps.

### 3.1 SWOT Analysis

The first step of the methodology consists of SWOT analysis. SWOT analysis is employed in this study to identify strengths (S), weaknesses (W), opportunities (O) and threats (T) of Saudi Arabia e-government. The SWOT factors are identified from the existing literature available on Saudi Arabia e-government.

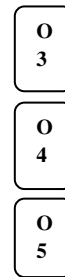
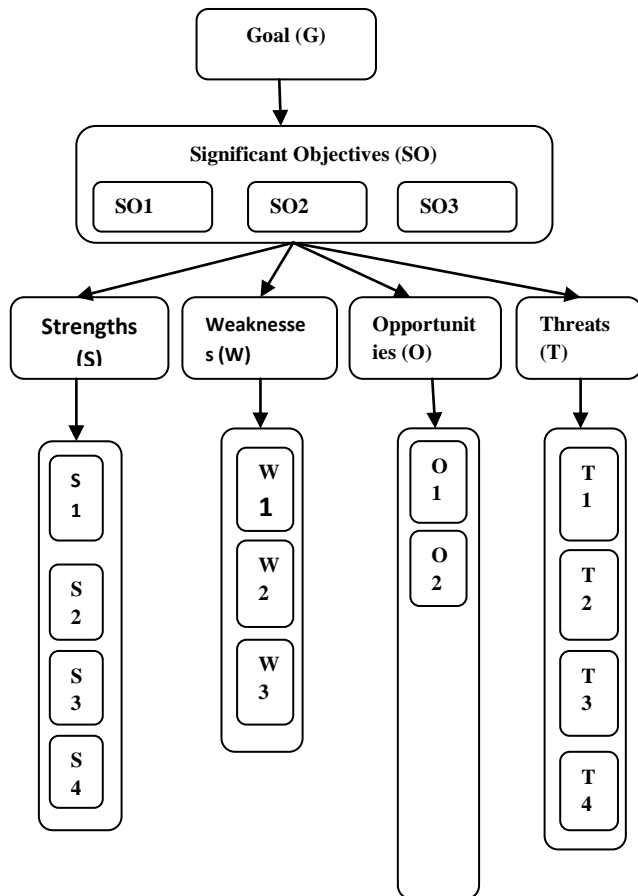
Table 3 illustrates the SWOT analysis which identifies the strengths, weaknesses, opportunities and threats to e-government of Saudi Arabia.

**Table 3: SWOT Analysis for Saudi Arabia e-government**

STRENGTHS (S)	OPPORTUNITIES (O)
<p><b>S1:</b> Political wiliness and Public Policy [21]</p> <p><b>S2:</b> Citizens focused policy [22]</p> <p><b>S3:</b> Good ICT Infrastructure in Saudi Arabia [23]</p> <p><b>S4:</b> E-Government portal and sub-portals availability [24]</p>	<p><b>O1:</b> Strong Economy of Saudi Arabia [25]</p> <p><b>O2:</b> Potential in growth in ICT Infrastructure [23]</p> <p><b>O3:</b> Legal Framework i.e. e-transaction law and IT Criminal Law [26]</p> <p><b>O4:</b> Participation of academics to support ICT [27]</p> <p><b>O5:</b> Better opportunities of employment for IT professionals [28]</p>
WEAKNESSES (W)	THREATS (T)
<p><b>W1:</b> Lack of IT skills [23]</p> <p><b>W2:</b> Digital divide [29] problems</p> <p><b>W3:</b> Common culture on e-transactions [30]</p>	<p><b>T1:</b> De-centralized Internet Governance [20]</p> <p><b>T2:</b> Individual attitude and social culture [31]</p> <p><b>T3:</b> Privacy and Security of personal information [32]</p> <p><b>T4:</b> Use of mobile technology [22]</p>

### 3.2 Hierarchical Structure

The four levels hierarchical structure used in this study is shown in figure 1. The top level is the goal of analysis i.e. the evaluation of the Saudi Arabia e-government strategies. The second level is constituted by the evaluation strategies or e-government priority issues which need to be compared. In that context, three Saudi e-government priority issues are; SO1: Effective communication with all e-government stacks holders to increase citizen satisfaction. SO2: Education and Development and SO3: Value Management. Third level of the hierarchy is constituted by the four groups of factors as defined by the SWOT analysis technique: Strengths (S), Weaknesses (W), Opportunities (O) and Threats (T) and the lowest level is constituted by the factors included in each one of the four groups of the previous level.



**Figure 1: Hierarchical Structure to Prioritize the SWOT factors of Saudi Arabia e-government**

### 3.3 Pair wise Comparison

There is no standard way to evaluate pair wise comparison. In this study, the authors made a discussion group consist of the people who have the knowledge of e-government and strategic management. The group members discussed and compared two factors. There was a question of which of the two factors has a greater weight in the choice and how much greater, was the main question in the discussion. AHP then transforms each preference to a numerical value which can be compared and evaluated. The relative importance is given a value on a scale of 1–9 [8]. Pair-wise comparisons were made separately for each set of the hierarchy. For example, pair-wise comparisons of factors within each SWOT group are needed. The number of pair wise comparisons is dependent on the number of factors within the same hierarchy level. If there are  $n$  factors, the number of comparisons within the level are required based on the equation:  $[n(n - 1)]/2$ .

**Table 4: Factor priority scores and global priority scores for SWOT factors**

SWOT GROUP	SCALING FACTOR	SWOT FEATURES	LOCAL PRIORITY	GLOBAL PRIORITY
Strengths (S)	0.49	S1: Political Willingness	0.68 [1]	0.333
		S2: Citizen focused policy	0.14 [2]	0.068
		S3: Good ICT Infrastructure	0.10 [3]	0.049
		S4: E-Government Portals availability	0.07 [4]	0.034
$\lambda_{max} = 4.208$ <b>CI = 0.0693</b> <b>CR = 0.0770</b>				
Weaknesses (W)	0.06	W1: Lack of IT Skills	0.08 [3]	0.004
		W2: Digital Divide	0.47 [1]	0.028
		W3: Common culture on e-transactions	0.13 [2]	0.007
$\lambda_{max} = 3.11$ <b>CI = 0.06</b> <b>CR = 0.096</b>				
Opportunities (O)	0.36	O1: Strong Economy	0.18 [3]	0.0648
		O2: Potential growth in ICT	0.41 [1]	0.1476
		O3: Legal Framework for e-gov	0.06 [4]	0.0216
		O4: Participation of academics	0.04 [5]	0.0144
		O5: Better employment opportunities for IT professionals	0.31 [2]	0.1116
$\lambda_{max} = 5.36$ <b>CI = 0.09</b> <b>CR = 0.08</b>				
Threats (T)	0.10	T1: De-Centralized Internet Gov	0.12 [3]	0.012
		T2: Individual attitude	0.63 [1]	0.063
		T3: Privacy and Security	0.06 [4]	0.006
		T4: Use of Mobile technology	0.20 [2]	0.02
$\lambda_{max} = 4.26$ <b>CI = 0.0889</b> <b>CR = 0.098</b>				

### 3.4 Strategy formulation using TOWS Matrix

A successful implementation of the e-government required a comprehensive strategy which is bench marked on global best practices and also applicable to country particular political, economic and social conditions. Several strategies can be proposed for e-government, but the selection or adoption of best strategies is important. This can easily be done by using combined SWOT-AHP method. In order to draw out best strategies, the SWOT table has to be searched for logical combinations. The formulation of those alternative strategies starts with finding those combinations. The TOWS matrix draws four logical combinations (strategies); First, SO-strategies, secondly WO-strategies, thirdly, ST-strategies and fourthly WT-strategies. Table 5 shows the TOWS matrix for Saudi Arabia e-government.

**Table 5: TOWS Matrix for Saudi Arabia e-government**

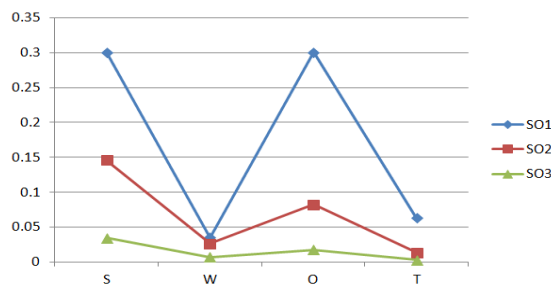
	STRENGTHS	WEAKNESSES
<b>O P P O R T U N I T Y</b>	<b>SO Strategies: Maxi-Maxi</b>  <b>Strategy -1:</b> User Centric Strategy (S2/S4/O3/O4) <b>Strategy -2:</b> Legal framework for e-governance. (S2/O3)	<b>WO Strategies: Mini-Maxi</b>  <b>Strategy -3:</b> Bridging Digital Divide Strategy (W2/W4/O4/O5) <b>Strategy -4:</b> Human Capacity Building Strategy (W1/O3/O4)
<b>T H R E A T S</b>	<b>ST strategies: Maxi-Mini</b>  <b>Strategy -5:</b> Centralized e- government System Strategy (S1/S3//T1/T3) <b>Strategy -6:</b> Pro-active Communication Strategy (S3/S4/T3)	<b>WT Strategies: Mini-Mini</b>  <b>Strategy -7:</b> Citizen Awareness Strategy (W2/W3//T2/T3) <b>Strategy -8:</b> Internet and PC Penetration Strategy (W1/W2/T2/T4)

## 4. DISCUSSION

This study intended to introduce a simple, acceptable and systematic methodology for e-government of Saudi Arabia. The ultimate success of e-government is dependent on the accuracy of effective SWOT analysis. But the problem in SWOT analysis is that it does not analytically determine the importance of factors. In order to eliminate this drawback, SWOT is combined with AHP which give priorities to the SWOT factors and compared them pair wise. In this study the two techniques were combined to analyze the Saudi Arabia e-government and developed strategies e-government in Saudi Arabia.

It can be seen that the values of Saudi Arabia e-government strengths and opportunities are higher than weaknesses and threats. Saudi Arabia e-government strengths are 7.04 times more important than weaknesses ( $0.480/0.068 = 7.04$ ) and 6.07 times more important than threats ( $0.480/0.079 = 6.07$ ). Similarly Saudi e-government opportunities are 8.220 times more important than weaknesses and 6.946 times than threats. If we compare the Saudi e-government strengths and opportunities, it is clear from analysis that both factors have almost same importance. Many opportunities are there for Saudi e-government to improve and provide best possible services to citizens and businesses. The data from table 4 is represented by the figure 2.

**Figure 2: Pair wise comparison of SWOT features with respect to significant objectives**



In Table 5, we suggested some strategies for Saudi e-government. User centric strategy and bridging digital divide strategy followed by good communication strategy and citizen awareness strategy should have adopted by Saudi Arabia for successful implementation and adoption of e-government.

The ultimate aim of the e-government implementation is to provide best possible services to citizens therefore Saudi government should give prime importance to user centric strategy. The advantage of adopting this strategy would be that the citizens will get governmental services any time without any physical location restriction; it will be economical both for citizen and government; citizens will get efficient services and the whole system will be transparent.

Another important strategy that should be adopted by the Saudi Arabia is bridging digital divide. Digital divide is a social issue which is linked to the difference in the level of information between citizens [32]. Some of the factors which cause digital divide in Saudi Arabia are unequal access to information, lack of proper ICT infrastructure in rural areas, senior citizens who have no or low knowledge of modern technologies and low adoption of technology. The strategy for bridging or narrowing the digital divide in Saudi Arabia should include the characteristics like; to provide equal information to the citizen in non-discriminative fashion, develop the ICT infrastructure in the rural areas of the

country, to educate the population especially of the rural areas and to promote ICT skills especially in old age and uneducated people.

Good communication strategy is also must for the success of the e-government. Because of this strategy citizens will be aware of the new ways of getting the governmental services online. The social culture and individual attitude are the two most important threats to the Saudi e-government. This strategy will be helpful in eliminating the negative perception from the minds of people. Citizen awareness is also related to good communication strategy. Saudi government should encourage the people to use the online services and should adopt different means like print, radio and television advertisements to make the citizens aware of the new system.

Security and privacy of personal information and people trust also play an important role in the success of the e-government adoption. Lack of trust in the e-government is the severe hindrance to its growth. Saudi Arabia government should develop a good legal framework for the e-government. A comprehensive legal framework should cover the overall aspects of the e-government from the delivery of service and provision of information to business process re-engineering within the different levels of government and its institutions.

## 5. CONCLUSION

For successful implementation and adoption of e-government projects, good strategies are inevitable. Without comprehensive strategies it is difficult to get maximum benefits from the e-government system. In this research we thoroughly studied the e-government in Saudi Arabia. Using SWOT technique, a situational analysis was conducted in order to find out the strengths, weaknesses, opportunities and threats to the e-government of Saudi Arabia. The outcome of the SWOT technique was qualitative and subjective therefore we could not identify that which factors were more important than others. In order to solve this problem the SWOT technique was integrated with AHP technique in order to find quantitative strengths, weaknesses, opportunities and threats for the Saudi Arabia e-government. Based on the numeric results of the SWOT-AHP integration we developed strategies using TOWS method for Saudi Arabia e-government which will support better decision making by the higher authorities of Saudi Arabia e-government project.

In this research the strategies for the Saudi e-government were identified but did not evaluated to find out which strategies should be given importance and should be implemented first. In the future work we can evaluate these strategies using technique like Quantitative Strategies Planning Matrix (QSPM), in order to find the importance of individual strategy quantitatively.

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technologies like e-government, M-government, Green and Cloud Computing, QoS in WiMAX and WiFi Networks.

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**Appendix A: Pair wise comparisons matrices for SWOT factors**

<b>Strengths</b>	<b>S1</b>	<b>S2</b>	<b>S3</b>	<b>S4</b>	<b>Local Weights</b>	
<b>S1:</b> Political wiliness and Public Policy	1	7	7	7	0.68	
<b>S2:</b> Citizens focused policy	1/7	1	2	2	0.14	
<b>S3:</b> Good ICT Infrastructure in Saudi Arabia	1/7	1/2	1	2	0.10	
<b>S4:</b> E-Government portal and sub-portals availability	1/7	1/2	1/2	1	0.007	
<b>Total</b>	<b>1.43</b>	<b>9</b>	<b>10.50</b>	<b>12</b>	<b>1</b>	
<b><math>\lambda_{max} = 4.208</math>      <b>CI = 0.0693</b>      <b>CR = 0.0770</b></b>						
<b>Weaknesses</b>	<b>W1</b>	<b>W2</b>	<b>W3</b>	<b>Local Weights</b>		
<b>W1:</b> Lack of IT skills	1	1/7	1/3	0.08		
<b>W2:</b> Digital divide	7	1	5	0.72		
<b>W3:</b> Common culture on e-transactions	3	1/5	1	0.19		
<b>Total</b>	<b>11</b>	<b>1.34</b>	<b>6.33</b>	<b>1</b>		
<b><math>\lambda_{max} = 3.11</math>      <b>CI = 0.06</b>      <b>CR = 0.09</b></b>						
<b>Opportunities</b>	<b>O1</b>	<b>O2</b>	<b>O3</b>	<b>O4</b>	<b>O5</b>	<b>Local weights</b>
<b>O1:</b> Strong Economy of Saudi Arabia	1	1/5	3	5	1	0.18
<b>O2:</b> Potential in growth in ICT Infrastructure	5	1	7	7	1	0.41
<b>O3:</b> Legal Framework	1/3	1/7	1	2	1/7	0.06
<b>O4:</b> Participation of academics to support ICT	1/5	1/7	1/2	1	1/7	0.04
<b>O5:</b> Better opportunities of employment for IT professionals	1	1	7	7	1	0.31
<b>Total</b>	<b>7.53</b>	<b>2.49</b>	<b>18.5</b>	<b>22</b>	<b>3.29</b>	<b>1</b>
<b><math>\lambda_{max} = 5.36</math>      <b>CI = 0.09</b>      <b>CR = 0.08</b></b>						
<b>Threats</b>	<b>T1</b>	<b>T2</b>	<b>T3</b>	<b>T4</b>	<b>Local Weights</b>	
<b>T1:</b> De-centralized Internet Governance	1	1/5	3	1/3	0.12	
<b>T2:</b> Individual attitude and social culture	5	1	9	5	0.63	
<b>T3:</b> Privacy and Security of personal information	1/3	1/9	1	1/3	0.06	
<b>T4:</b> Use of mobile technology	3	1/5	3	1	0.20	
<b>Total</b>	<b>9.33</b>	<b>1.51</b>	<b>16</b>	<b>6.67</b>	<b>1</b>	
<b><math>\lambda_{max} = 4.26</math>      <b>CI = 0.0889</b>      <b>CR = 0.09</b></b>						