The Usability of Israel's Government Websites

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Abstract- E-Government is continuously developing in Israel, which has recently launched the 'GovX' project with the goal of improving the E-Government infrastructures. In this study, we evaluate the usability of twenty-four Israeli government ministry websites using thirty-seven usability variables, which are grouped into six dimensions: Online Services; User-Help; Navigation; Legitimacy; Information Architecture and Accessibility Accommodations. We identify three groups of deficiencies: Absence of adequate online services, deficiencies that limit equal access to the government and errors in information design. We find that the new 'GovX' infrastructure does not adequately solve these deficiencies.

Keywords- E-Government; Israel; Usability; Government Websites

I. INTRODUCTION

Governments today attempt to provide better-quality services, focus on citizens' needs, embrace more efficient and effective work practices and improve administrative processes. These goals motivate many governments throughout the world to develop various forms of E-Government, i.e. Internet websites and portals, which enable online access to government services and information [1].

As more services move online, it is imperative that the governments ensure that E-Government services are delivered to all citizens, including those who are less digitally experienced and knowledgeable [1-3]. Even people who do have access to the government websites may encounter difficulties, forming what [4] coins as "the other digital divide". The "other digital divide" is the gap between those who understand more about the government and are more likely to be able to successfully cope with poorly designed government websites, and those who understand less about the agencies whose websites they are visiting and may not be able to find the information they need nor manipulate the system effectively. The latter may lose interest after a minute or so of trying to figure out the website, leave and not return [5], thus impeding the evolution of E-Government, to the detriment of both citizens and government [2, 6].

According to Stowers [4], bridging the "other digital divide" involves making the websites easier to use, by "removing barriers due to lack of experience with the Internet". She claims that designers and developers of public-sector websites should "assume that those using their sites have limited training and experience and will need sites designed with usability and effective information architecture in mind". She further identifies and labels 6 dimensions that comprise E-Government website usability. These dimensions are extended by Baker [2] to form a measuring usability methodology [7].

In this research we utilize this methodology to measure the usability of the Israeli government ministries' websites. Our research identifies a number of deficiencies and can be used to improve those websites in terms of usability.

In Israel, E-Government has evolved in the past two decades, mainly in the form of the Mimshal Zamin ('Accessible Government') project, initiated and funded by the Accountant General's division of the Ministry of Finance [8, 9]. A recent survey ordered by the division's 'Accessible Government' unit reveals that "the Internet has positioned itself as the principal means of communication between the government and its citizens" [8]. It is therefore a cause for concern that government data indicates that citizens are experiencing difficulties orienting themselves within government websites, and cannot perform full online transactions or obtain complete information [10]. In an attempt to improve the citizens' experience with government websites, it was decided in early 2008 to develop a central infrastructure for these sites, named GovX, with the purpose of achieving unification of their basic structure [10]. In the following years the Ministries of Finance launched its new website based on the new infrastructure. While this research was being conducted, five more government ministries were in various stages of developing websites based on the GovX infrastructure.

The Israeli government annually examines – using several quantitative measures it defined – the extent and manner in which the ministries invest in the GovX project and awards the leading ministries the Available Government Award. Despite these efforts, these examinations are lacking and incomplete when compared to the aforementioned Baker's methodology.

II. LITERATURE REVIEW

A. Usability and Website Usability

The development and growth of personal computers in the last couple of decades has made computers available to many,

including those lacking a technological background [11]. This new variety of end users required that extra attention be given to their abilities and needs while designing new hardware and software [11, 12], and led to the development of a new field of study - HCI (Human-Computer Interaction) [13]. One of the main goals of HCI research is the development of usable computer systems [14]. It is widely accepted among usability experts that usability must affect the outcome of the user-computer interaction [15] and that usability "can be measured by the effectiveness, efficiency and satisfaction with which specified users achieve specified goals in particular environments" [16].

As the Internet rapidly grew and became an increasingly essential interface, usability research began to focus on extending the basic usability principles to the web environment [17]. There are many focuses on website usability. In Palmer's [17] opinion, website usability also comprises "clarity of interaction, ease of reading, arrangement of information, speed and layout". According to Spool et al. [18], "the more a site helps people find the information they are looking for, the more usable it is". Reference [19] describes website usability as "a broad concept that encompasses many aspects of design, including a website's presentation, its navigational features and its functionality or usefulness to visitors", and Baker [7] asserts that website usability "refers to the relative ease with which a novice manoeuvres around an actual website".

Website usability advocates the claim that the success of a website depends mainly on its usability [20]. If users encounter many functional barriers on a website, they may decide to refrain from using it in the future [21], and if its features or design irritate, confuse or frustrate the users, it may lead them to another website that better meets their needs [19]. A highly usable website, on the other hand, will create an intention and willingness to use it [17].

In order to ensure that a design or a product is behaving as expected and meeting the users' requirements, usability evaluation must be carried out. This is typically done by using an evaluation method "to measure or predict how effective, efficient and/or satisfied people would be when using the interface to perform one or more tasks", with the methods ranging from laboratory-based user observations and controlled user studies to inspection techniques [22]. Usability evaluation methods can be divided into four main categories: cognitive modelling methods, inquiry methods, testing methods and inspection methods. One of the most popular methods is heuristic evaluation - an inspection method which consists of a usability expert judging whether established usability principles (the "heuristics") are followed - as it is comprehensive, fast and inexpensive and does not require much experience [23-25].

B. E-Government

In the past, the dominant public service delivery paradigm was one that saw three modes of service delivery: face-to-face, telephone and postal mail service. The advances in information technology created a fourth mode: E-Government, which can be defined as "the use of information technologies to deliver government information and services and to involve citizens in the democratic process and real-time government decision making" [26]. The goals and objectives of most E-Government initiatives include delivering better services to citizens, improving efficiency in government, increasing trust between government and citizens and improving democratic processes [27]. E-Government helps overcome barriers of time and place, and offers the citizens unprecedented access [7, 28].

More and more levels of government information and services are moving online, with many government agencies having the ultimate goal of developing a global knowledge-sharing platform [29, 26]. Evaluation of the usability of government websites is, therefore, of great importance: first, government investments in delivering E-Government services are usually enormous and must be justified [27]; second, democratic values require that E-Government aim for user-friendliness, otherwise, less-knowledgeable citizens will have unsatisfactory contact with their government, and "the evolution of E-Government will be stymied" [7]. Studies show that many citizens are currently avoiding online interaction with the government due to difficulties in locating the information they seek, and as long as these usability barriers continue to exist, E-Government will not reach its full potential [21]. Conversely, positive user experiences on government websites will be communicated to other potential users and lead to more frequent use, and as a result, citizen trust in government will increase.

E-Government website usability measurement is still in a developmental state, and there is currently no agreement on what constitutes an effective government website or on appropriate benchmarks [7]. Baker, who develops the methodology, which is considered "the standard for usability studies" in the field of E-Government, does so by using triangulation to determine common variables from six existing E-Government studies [6]. Baker conceptually organized these variables by Stowers' six dimensions of website usability [2]. These dimensions are: online services; user-help; navigation; legitimacy; information architecture and accessibility accommodations. These dimensions are described by thirty-seven variables in Roach's [6] research of government websites' usability. In her research, Roach examines the 18 ministry websites of the Trinidad and Tobago government. A similar study was conducted a year earlier by Baker [2] for 30 United States government agencies websites. Our research will complement those efforts by comparing their results with the usability of Israeli government websites.

C. E-Government in Israel

The Israeli government has shown great interest in advancing E-Government in the country. In 1996, it initiated the Mimshal Zamin ('Accessible Government') project, a collection of static web pages containing limited government information,

which has grown and evolved into complex websites based on sophisticated technologies [9]. Unfortunately, at present, citizens experience difficulties orienting themselves within those websites, as they greatly differ from one another, requiring that extra time and effort be spent on locating components and deciphering site structure and means of navigation. It was therefore decided to develop a central infrastructure for government websites, with the purpose of achieving unification of their basic structure. The project, named 'GovX', was initiated in 2007, and in 2009, the Ministry of Finance became the first ministry to launch a GovX-based website [10].

In order to examine the information and services available to the citizens online, the government of Israel began publishing an annual report in 2005, which makes use of a number of "objective, quantitative and comparable" measures [9]. In the 2009 report [9], these measures included statistics, forms, transactions, tenders, online services, communication channels with the public and accessibility.

Each measure could receive one of four possible values: compliance with guidelines, non-compliance with guidelines, partial compliance with guidelines (requiring further attention) or irrelevance. Comparing these measures with the thirty-seven usability variables, which we use in our study, reveals that there are many aspects of usability that are ignored by the 'Accessible Government' reports' methodology, and hence the importance of the study, which fills a gap in the existing literature.

III. RESEARCH QUESTIONS

The research questions for this study were developed to address this gap:

(1) How usable are the websites of the Israeli government ministries, both in general and broken down by Baker's 6 usability dimensions, and what are the most common usability deficiencies among the Israeli government ministry websites?

(2) Are the Israeli government ministry websites based on the new GovX infrastructure indeed more usable than the websites based on the older technology, and by which usability deficiencies are the GovX websites characterized?

(3) How does the usability of the Israeli government websites compare with the usability of the United States and Trinidad and Tobago websites?

IV. METHODOLOGY

A. Population

The websites of all twenty-four Israeli government ministries (at the time of the research) are evaluated.

B. Operational Definitions

Baker's [2] six dimensions of usability used to evaluate the websites are represented by the thirty-seven variables developed by Roach [6]. These variables comprise twenty-two dichotomous variables and fifteen scale variables. In Appendix A we give the operational definitions of these variables.

C. Research Design

Data for the study was collected using an E-Government website evaluation form similar to the one used by Roach [6]. Reliability of the evaluation form is demonstrated by a high Cronbach's alpha of 0.736. The form variables are organized by Stowers' six usability dimensions. Dichotomous variables could be assigned the values 0 or 1, representing absence or presence of a characteristic, respectively. Scale variables could be assigned a value between 0 and 4 (for details on the scales constructed for each such variable, see Appendix B).

D. Procedure

The online website usability evaluation was conducted by the researchers during the months of August and September of 2009, one website at a time. The objective nature of the thirty-seven variables eliminated the need for a second evaluator to increase reliability.

Each evaluation began by accessing the ministry's website through the World Wide Web and connecting to its home page, which provides a snapshot view of the ministry and what services it provides, its mission, vision and other information relevant to its operations. From here, an examination of the website's content is conducted, based on the 37 usability variables. With the exception of the 'EvalAccess compliance', 'Webmaster contact', 'Feedback' and 'Communications with officials' variables, all variables are tested "down to the third click", considered to be "the farthest that users will go in their search for information" [2]. This approach ensures that the research is performed from a user's perspective. 'EvalAccess compliance' variable is tested using the EvalAccess 2.0 tool (see [30]). 'Webmaster contact', 'Feedback' and 'Communications with officials' variables are tested by sending e-mails to the appropriate addresses.

After the variables are assigned a value for a given ministry website, we compute the score for each of the six usability

dimensions by summing the value of the variables composing each dimension. The dimension score is then normalized so that each dimension's score can be between 0 and 16.67. The overall score of the ministry website is the Usability Index (UI) and is calculated by summing the six usability dimension scores. The UI value can be between 0 and 100.

Several considerations lead to choosing the calculation method described above. First, we claim that each of the six dimensions should receive equal weight (despite the variation in the number of variables between dimensions) since "all dimensions make important and distinctive contributions to the aggregate measure of website usability" [7]. Second, we choose not to unify the ranges of the dichotomous and scale variables, so that each variable makes a contribution to the UI score proportional to its importance [31]. Third, by using the same calculation method as Baker [31] and Roach [6] studies we facilitate a comparison of our results with those studies.

E. Study Limitations

Some of the variables use heuristic evaluation, which is based on assumptions regarding the nature and preferences of the users. As with any ASSUMPTION, if violated, results may have less meaning. Additionally, as recognized by the developers of the Stowers/Baker methodology themselves, the Accessibility Accommodations dimension, which consists of only two study variables is less comprehensive than the other five E-Government usability dimensions, and may not paint an adequately thorough picture [7]. For example, for websites in languages using different character sets with the ASCII standard, text may appear on different systems unintelligible. Using technological solutions such as in [32] websites can overcome these format and presentation problems.

V. RESULTS

A. Research Question 1

We examine the 24 government websites and derive the Usability Index (UI) and dimensions scores for each website. Results are given in Table 1, which also details the average monthly number of user hits for each website during 2008. Data for the number of hits is taken from [9]. UI scores range from 35.8 to 74.6 out of a possible 100, with higher scores indicating higher usability. The mean score is 59.5, the median is 62.7 and the standard deviation is 10.2. In Table 2 we detail the mean, median and standard deviation score for each of the dimensions. In the next paragraph we highlight specific results for each dimension.

No.	Ministry	D1	D2	D3	D4	D5	D6	Total	Hits
1	Environmental Protection	13.5	10.4	15.2	11.1	11.1	13.3	74.6	354
2	Education	11.5	9.4	15.2	12.5	11.1	13.3	73.0	1380
3	Industry, Trade & Labor	15.4	11.5	13.6	9.7	11.1	10.0	71.3	500
4	Agriculture & Rural Development	14.1	9.4	13.6	13.9	6.9	10.0	67.9	107
5	Communications	10.9	8.3	9.1	15.3	12.5	10.0	66.1	32
6	Finance	13.5	6.3	13.6	9.7	12.5	10.0	65.6	1100
7	Justice	14.7	9.4	13.6	11.1	5.6	10.0	64.4	330
8	Immigrant Absorption	9.6	10.4	12.1	9.7	12.5	10.0	64.4	174
9	National Infrastructures	10.9	11.5	13.6	13.9	4.2	10.0	64.0	73
10	Health	10.9	9.4	12.1	9.7	11.1	10.0	63.2	465
11	Foreign Affairs	10.9	10.4	13.6	9.7	8.3	10.0	63.0	604
12	Transport & Road Safety	11.5	8.3	13.6	9.7	9.7	10.0	63.0	75
13	Defense	15.4	9.4	13.6	5.6	8.3	10.0	62.3	471
14	Tourism	11.5	9.4	12.1	9.7	8.3	10.0	61.1	300
15	Religious Services	9.0	9.4	10.6	9.7	11.1	10.0	59.8	48
16	Prime Minister's Office	10.9	8.3	13.6	12.5	4.2	10.0	59.5	254
17	Culture & Sport	10.3	7.3	13.6	9.7	5.6	10.0	56.5	18
18	Social Affairs & Social Services	10.9	7.3	12.1	2.8	11.1	10.0	54.2	140
19	Public Security	10.3	6.3	13.6	8.3	5.6	10.0	54.0	60
20	Construction & Housing	10.9	11.5	9.1	4.2	6.9	10.0	52.6	87
21	Interior	11.5	4.2	13.6	9.7	2.8	6.7	48.5	197
22	Development of the Negev & the Galilee	4.5	7.3	12.1	1.4	5.6	13.3	44.2	-
23	Science & Technology	9.6	7.3	6.1	1.4	5.6	10.0	39.9	-
24	Senior Citizens Affairs	1.9	10.4	4.5	2.8	2.8	13.3	35.8	-

TABLE 1 WEBSITE USABILITY INDEX RANKING (D1: ONLINE SERVICES, D2: USER HELP, D3: NAVIGATION, D4: LEGITIMACY, D5: INFORMATION ARCHITECTURE, D6: ACCESSIBILITY ACCOMMODATION)

TABLE 2 MEAN, MEDIAN AND STANDARD DEVIATION OF THE DIMEN	SIONS' SCORES
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No.	Dimension	Mean	Median	SD
1	Online Services	11.0	10.9	3.0
2	User Help	8.9	9.4	1.8
3	Navigation	12.2	13.6	2.6
4	Legitimacy	8.9	9.7	3.8
5	Information Architecture	8.1	8.3	3.1
6	Accessibility Accommodation	10.4	10.0	1.5

• Online Services: Within the Online Services dimension the websites scored high for the 'basic information'; 'documents/publications' and 'downloadable forms' variables. The websites scored poorly for the 'chat areas/message boards', which was largely absent from the ministry websites, and for 'online transactions'. The scores varied for the rest of the variables of this dimension.

• User Help: Within the User Help dimension the variables with the lowest scores are the 'index', which is absent in most websites, and the variable 'search', which scored low because of inadequate searching tools. Technical information about the site was also largely absent, but most websites provided a link for requesting site assistance via e-mail, which partially makes up for this deficiency. Other variables with medium scores are 'PDA/wireless' and 'Foreign Language'.

• Navigation: Navigation achieved the highest score among the six dimensions. The only deficiency in this dimension is the absence of chat rooms or message boards for general discussion. Another point for improvement is the addition of navigation aids to some of the websites.

• Legitimacy: Within the Legitimacy dimension the variables with the highest scores are achieved by the dichotomous variables 'contact information' and 'disclaimer statements' (100% and 95.8% respectively). The variables that score low are 'webmaster contact information' and 'privacy policy', which are linked only from selected pages within each site and cannot be accessed throughout the entire site.

• Information Architecture: The variable with the lowest score is 'personalized/customizable'. Almost all the websites offer no user customizable features and those who do offer too few. Another low scoring variable is 'audience-focused/centric' for which the results were polarized. Nine websites (37.5%) received the highest possible score for this variable, ten others (41.7%) received the minimal score, and only five websites received intermediate scores.

• Accessibility Accommodations: All websites score zero in the dichotomous variable 'text telephone'. Results for the 'EvalAccess compliance' variable are high with 23 of the 24 websites demonstrating only one Priority 1 error or less.

We conduct a Pearson correlation test between the average monthly number of visitors to each website and its Usability Index ranking. We find a significant positive correlation of r_s =.439 (p<0.05).

B. Research Question 2

The second research question compares the usability Ministry of Finance's GovX based website with the older technology. In what follows we compare between the Ministry of Finance's website, with the two best-ranked websites still using the old technology (Ministries of Environmental Protection and Education).

By Table 1, the Ministry of Finance website scores lowest on four dimensions (User Help, Navigation, Legitimacy and Accessibility Accommodations), scores highest on the Information Architecture dimension and ties at the highest with the Ministry of Environmental Protection in the Online Services dimension.

For the dichotomous variables, the Ministry of Finance's score is 15 (of 22), which is lower than the Ministries of Education (18) and Environmental Protection (19).

We next compare the scale variables' scores of each website. Results are given in Table 3. In this comparison results are mixed with the Ministry of Finance scoring zero only for one variable ('webmaster contact'), whereas the Ministry of Environmental Protection scores zero for two variables ('webmaster contact' and 'Personalized/customizable'). The Ministry of Education scored positive in each of the scale variables.

TABLE 3 THE SCALE VARIABLES' SCORES FOR THE MINISTRIES OF FINANCE, ENVIRONMENTAL PROTECTION AND EDUCATION

Scale Variable	Finance	Environmental Protection	Education	
Documents/publications	4	4	4	
Communications with officials	2	2	1	
Downloadable forms	4	4	4	
E-commerce applications	4	2	1	

Employment information	3	4	3
Feedback	1	1	1
Foreign language	1	2	2
Search	3	3	3
Navigation tools	4	4	3
Link to other agencies	4	4	4
Privacy policy	3	4	3
Webmaster contact	0	0	2
Audience-focused/centric	4	4	3
Personalized/customizable	1	0	2
EvalAccess compliance	3	4	4

C. Research Question 3

We compare the results of the Israeli websites with the results of previous research conducted in the United States [2], Trinidad and Tobago [6]. The six dimensions' scores are given in Table 4. In terms of the average Usability Index, the United States is highest, followed by Israel, and Trinidad and Tobago is last. For each of the dimensions, Israel's average score trails that of the United States. For three dimensions Israel is lower than Trinidad and Tobago (Navigation, User Help, and Information Architecture).

TABLE 4 MEANS, STANDARD DEVIATIONS AND SIGNIFICANT DIFFERENCES BETWEEN ISRAEL, THE U.S. AND TRINIDAD AND TOBAGO WITH REGARDS TO GOVERNMENT MINISTRY WEBSITE USABILITY

	Israel (N=24)		Trinid Tobag	Trinidad and Tobago (N=18)		USA (N=30)		F
	М	SD	Μ	SD	М	SD	_	
Online Services	0.66	0.18	0.44	0.15	0.82	0.09	2,69	43.801*
User Help	0.53	0.11	0.54	0.25	0.61	0.16	2,69	1.965
Navigation	0.74	0.16	0.80	0.17	0.80	0.09	2,69	1.526
Legitimacy	0.54	0.24	0.40	0.29	0.70	0.24	2,69	8.651*
Information Architecture	0.49	0.19	0.65	0.32	0.57	0.19	2,69	2.644
Accessibility Accommodations	0.62	0.09	0.42	0.25	0.66	0.17	2,69	11.680*
Overall	0.60	0.10	0.54	0.17	0.69	0.09	2,69	10.753*

We conduct a one-way ANOVA test with country as the independent variable. This test demonstrates that there is a significant difference (p<.001) between the countries in the Online Services dimension (F(2,69)=43.8), the Legitimacy dimension (F(2,69)=8.65), the Accessibility Accommodations dimension (F(2,69)=11.68) and the overall usability scores (F(2,69)=10.75). The results of the ANOVA test are given in Table 4

Post-hoc Scheffe tests reveal that in the Online Services dimension, the scores for the Israeli government ministry websites (M=0.66) are significantly lower (p<.001) than the scores of the American government websites (M=0.82) and significantly higher (p<.001) than those of the Trinidad and Tobago government ministry websites (M=0.44). In the Legitimacy dimension, the significant differences do not involve the Israeli government ministry websites, while in the Accessibility Accommodations dimension, the scores for the Israeli websites (M=0.62) are significantly higher (p<0.01) than those of the Trinidad and Tobago websites (M=0.42). Finally, the overall usability scores of the Israeli government ministry websites (M=0.60) are significantly lower (p<.05) than the overall usability scores of the American government websites (M=0.69).

VI. DISCUSSION

In this study, a detailed evaluation of twenty-four Israeli government ministry websites is performed, in an attempt to assess the efforts made by each ministry to bridge "the other divide", point out common usability faults, and determine whether sites based on the new infrastructure currently being developed by the government (GovX) have higher usability. The evaluation is based on the six dimensions of E-Government website usability which were defined by and extended by Baker [2, 31]. We compare our results with the results of previous research conducted in other countries. The first is of the United States government's websites [2], which finds an average UI score of 69. We will use this score as the threshold score for high usability levels. The second [6] examines Trinidad and Tobago websites, which score an average UI of 54. We will use this number of threshold level for low usability levels.

In our first research question, we examine the level of usability of each website (Table 1). The findings show that only three websites have high usability (manifested in an overall score above 69), five have low usability (an overall score less than 54) and sixteen websites have a moderate usability. We therefore find that almost all Israeli government websites have room to improve in terms of overall usability.

We can group the deficiencies that we divide into three groups. The first group is characterized by the absence of online services such as chat areas, message boards and online transactions. Improving these services is essential in order for E-Government to offer a full function alternative to the three traditional modes of public service delivery (face-to-face, telephone and postal mail service).

The second group comprises deficiencies that result in inequality between different groups of site visitors in terms of their ability to use the site. This group includes the insufficient indexing, search capabilities, technical information, insufficient PDA support, foreign language and support for text phones. Such inequality between users stands against the 'Accessible Government' project's vision to "provide online services which may be conveniently accessed by all Israeli citizens and businesses" [9]. Furthermore, it prevents E-Government from reaching its full potential, since it causes many citizens to avoid online interaction with the government due to difficulties in locating the information they seek [21].

The third group of usability deficiencies comprises features that equally affect the user experience of all site visitors. These include the low score variables of the Legitimacy and Information Architecture dimensions. For example, only 58.3% of the websites are found to be audience-focused. This is contrary to Nielsen's [33] requirement to avoid displaying information that is irrelevant to the user, as it decreases the visibility of relevant information and also contrary to the Friedman-Berg, Allendoerfer & Pai [21] recommendation to organize E-Government websites in a way that suits the citizens' needs.

We find a significant positive correlation between the average monthly number of visitors to a government website and its Usability Index ranking was observed. This finding supports the claim [17] that a high usability website creates an intention and willingness to use it. This finding is also in accordance with the claim [21] that a positive user experience will be communicated to other potential users and lead to more frequent use of the website.

The second research question sought to find out whether the website based on the new GovX infrastructure (Ministry of Finance) is indeed more usable than the other websites, and which usability deficiencies characterize the GovX website. The Ministry of Finance's UI ranks the sixth, which, considering the investment in the transfer to the new technology is disappointing. We identify a few weaknesses in the website, which if addressed, will advance the website to the technological front in terms of usability. These weaknesses include the Online Services and the User Help dimensions. In terms of Online Services, the website does not allow adequate communication with officials, there is no access to multimedia applications and there are no chat rooms or messaging services available. In terms of User Help the website is not indexed, does not support mobile phone or PDA access, user feedback is not facilitated and is unwelcome to foreign language speakers. Other notable deficiencies are the lack of means to contact the webmaster. The developers of the website can learn from other ministries' websites such as the Ministry of Environmental Protection website and the Ministry of Education website, in an effort to improve those deficiencies.

In our third research question we compare the results from the Israeli government websites with studies from two other countries: the United States [2] and Trinidad and Tobago [6]. We find that Israeli websites perform better than the Trinidad and Tobago, but worse than the United States. Our results are similar to [34], which examines government websites from around the world and ranks the Unites States, Israel and Trinidad and Tobago as 4th, 44th and 93rd, respectively.

The differences between the countries are the reflection of the stage of development of E-Government in each country. E-Government in Trinidad and Tobago is nascent, and consists mostly of pages that provide partial services or information. The United States, on the other hand, has a mature E-Government policy and began promoting E-Government as far back as the early 90's, several years before the Israeli government initiated the 'Accessible Government' project. Other aspects in which the three countries differ and may help in understanding the findings are the definition of a clear policy with regards to E-Government and the promotion of pertaining legislation (something which had yet to happen in Trinidad and Tobago as of 2007, and began happening in Israel only few years before), as well as allocation of funds and resources.

VII. CONCLUSIONS

In this paper we examine the usability of twenty-four Israeli government websites according to the six dimensions of usability defined by Baker [2]. We identify the common weaknesses of these websites in term of usability, and compare the usability of the website based on the new GovX infrastructure to the websites using the older technology. Additionally, we compare the results of this study with studies conducted in different countries.

Our study's major contribution is the methodical examination of all Israeli government ministry websites. More importantly, the information derived can be used to improve the usability of these websites as it identifies the usability deficiencies of each website. By categorizing the deficiencies we facilitate a broader understanding of these deficiencies and the best way to eliminate them. Websites with similar deficiencies may cooperate in improving their usability, thus reducing costs and eliminating duplicate work. Second, usability deficiencies common to many of the websites may help the government decide on areas for future investment. Finally, the examination of the new infrastructure, GovX, enables improving the infrastructure's shortcomings at a minimal cost while it is still in the initial deployment stage.

Beyond the methodological limitations of this study, which are described in the Methodology section, this study is limited in that it focuses only on government ministry websites and does not include websites of other government functions and agencies or subdivisions of ministries.

It is interesting to follow the development of the Israeli government ministry websites in terms of usability over the course of several years, in order to examine the progress being made and identify trends. Additionally, a thorough examination of Israeli local government websites is also in order, as they are another important channel between government and the citizenry.

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APPENDIX A

Dimension/Variable	Operational Definitions / Dimension				
Online Services					
Basic information	Elementary data identifying website and host agency				
Documents/publications	Official printable material from host agency				
Communications with officials	Contact information for elected and management individuals responsible for agency				
Downloadable forms	Printable on user demand for official business				
E-commerce applications	Individual commerce and citizen transactional				
Interactive forms	Online form completion and submittal on demand				
Interactive databases	Online access to public databases on demand				
Multimedia applications	Online access to videos, or audio clips on demand				
Chat areas/message boards	User venue(s) for communication oriented/organized around a common interest				
E-mail updates/listserv	Registration for e-mail update service for user interest items				
Employment information	Online access to public job information on demand				
User-Help					
About the site	Basic data link about the site, targeted for new users or those with little knowledge of ICTs				
E-mail us	Customized e-mail template for site assistance				
Feedback	Link for comments about how site works and impressions				
Foreign language	Translation site version(s) for non-native users				
Search	Tool to search content of the site				
PDA/wireless	Internet portable or wireless mechanism that allows access to any site				
Index	Alphabetized information that permits new users to display site facts and other material				
Navigation					
E-Government services	E-Government services enabled through direct links to execute various online functions or transactions				
Navigation tools	The number of navigation tools provided to the user				
Link to other agencies	Ability to directly make contacts through links with other government agencies				
Link to contact information	Direct links readily available to e-mail host agency				
Chat areas or message boards	Users' forum for live discussions/communications and or messaging				
Legitimacy					
Contact information	Contact information for users to address questions to and to be assured that it is a credible and official government agency				
Disclaimer statements	Disclosure data about the site informing users or visitors of what it is about or not about				
Privacy policy	Statements about the extent to which privacy is honoured or maintained				
Security policy	Statements about the extent to which security is honoured or maintained				
Authentication password/digital sign	Visible mechanisms to determine site identity or affiliation				
Webmaster contact	Recognizable website manager communication				
Information architecture					
Audience-focused/ centric	User centric approach and outlook on the site especially targeted for new users and those with little knowledge about ICTs and government agencies				
Agencies/departments	Agency or government ministry listing				
Personalized/ customizable	Features customized to satisfy users' preferences within reason				
Services	Agency or government ministry's functions noted for novice users				
Branch of government	Identification of type or kind of government represented - e.g. ministry				
Branding/structure/metaphor	Publicly recognizable identity or image or symbol communicated - e.g. national coat of arms, national flag, logo				
Accessibility Accommodations					
EvalAccess compliance	Accessibility test to ascertain if there are design errors that hinder disabled accessibility				
Text telephone	Provides ability to communicate via keyboard equipped telephone message to guarantee disabled access				

APPENDIX B

- Communications with Officials

- 0 Absence of contact information
- 1 Address or phone number
- 2 E-mail address (provides access to address or phone number)
- 3 Responds to e-mail within 72 hours (three full days)
- 4 Responds to e-mail within 24 hours (one full day)

- Documents and Publications

- 0 Absence of documents and publications
- 1 Routine information
- 2 Organizational service descriptions
- 3 Civic engagement oriented (e.g., policy-maker meeting agendas and minutes)
- 4 Governance oriented (e.g., ordinance and budget information)

- Downloadable Forms

- 0 Absence of downloadable forms
- 1 One to three downloadable forms
- 2 Four to six downloadable forms
- 3 Seven to nine downloadable forms
- 4 More than nine downloadable forms

- E-Commerce Applications

- 0 No capability
- 1 One to three distinct business transactions with one or more online payment mechanisms
- 2 Four to six distinct business transactions with one or more online payment mechanisms
- 3 Seven to nine distinct business transactions with one or more online payment mechanisms
- 4 More than nine distinct business transactions with one or more online payment mechanisms

- Employment Information

- 0 No employment information
- 1 Explanation of application process
- 2 Full job description
- 3 Downloadable application form
- 4 Interactive application completion and submittal online

- Feedback

- 0 Absence of feedback mechanism
- 1 Website feedback mechanism (i.e., self-addressed, e-mail, or host agency [or ministry] interactive form)
- 2 Routine agency [or ministry] acknowledgment notice
- 3 Specific agency [or ministry] feedback within 72 hours (three full days)
- 4 Specific agency [or ministry] feedback within 24 hours (one full day)

- Foreign Language

- 0 Absence of non-native language translation
- 1 One non-native language translation
- 2 Two non-native language translations
- 3 Three non-native language translations
- 4 More than three non-native language translations

- Search

- 0 Absence of search mechanism
- 1 FAQ (frequently asked questions)
- 2 Site map

- 3 Search help features
- 4 Sort search relevance feature

- Links to Other Agencies

- 0 Absence of link to other non-host, public agencies or community based organizations
- 1 Link to one to four other non-host, public agencies or community based organizations
- 2 Link to five to eight other non-host, public agencies or community based organizations
- 3 Link to nine to twelve other non-host, public agencies or community based organizations
- 4 Link to more than twelve other non-host, public agencies or community based organizations

- Volume of Aids

- 0 Absence of navigation aids
- 1 One to four navigation aids
- 2 Five to eight navigation aids
- 3 Nine to twelve navigation aids
- 4 More than twelve navigation aids

- Privacy Policy

- 0 Absence of privacy policy
- 1 Unclear privacy policy
- 2 Unclear privacy policy with link periodically repeated throughout the website
- 3 Clear privacy policy
- 4 Clear privacy policy with periodically repeated throughout the website

- Webmaster Contact

- 0 Absence of webmaster contact information
- 1 Routine agency acknowledgment
- 2 Specific responses beyond 72 hours (more than three full days)
- 3 Specific responses within 72 hours (three full days)
- 4 Specific responses within 24 hours (one full day)

- Audience-Focused

- 0 Absence of apparent audience-focused areas
- 1 One distinct audience-focused area
- 2 Two distinct audience-focused areas
- 3 Three distinct audience-focused areas
- 4 More than three distinct audience-focused areas

- Personalized or Customizable

- 0 Absence of personalized/customizable variable
- 1 One personalized/customizable feature
- 2 Two personalized/customizable features
- 3 Three personalized/customizable features
- 4 More than three personalized/customizable features

- EvalAccess Compliance

- 0 Four or more errors
- 1 Three errors
- 2 Two errors
- 3 One error
- 4 No error