

## **A Holistic Evaluation of Greek Municipalities' Websites**

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**Abstract:** This paper investigates the state of municipalities' websites in fifty major Greek cities. First, it presents GovQual, a comprehensive evaluation framework which consists of 140 criteria organized into 13 evaluation categories. Then, fifteen trained students evaluated fifty Greek municipalities' sites using GovQual. The results identified significant shortages related to the sites' Interactivity & Feedback, as well as E-Services & Applications. Differences among the various Greek geographical regions were also identified. Regions that are economically poor and faraway from the capital came behind. Suggestions for improvement and directions for future research are given.

**Keywords:** assessment; criteria; e-government; e-services; evaluation; Greece; interactivity; local government; municipality; public services; quality.

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## **1. Introduction**

E-government is quickly gaining popularity all over the world. Municipalities develop websites in order to serve their citizens and attract tourists, businesses and investments. These websites would not only disseminate information, but also deliver e-services and enable citizen participation. In order to be effective, the user should be able to find what he is looking for and get along easier and faster than visiting the office in person.

Several previous studies proposed quality criteria regarding e-government websites. However, relatively little work has been done on applying these criteria. Usability issues were the most popular topics (Golubeva et al., 2005; Irani et al., 2006). Web usability is fundamental for the proper function of the website (Molich et al., 2007; Pallas and Economides, 2008). Criteria such as colour usage, language changes, style sheets and text equivalents are important for accessibility issues (Lazar et al., 2003). Other important criteria include privacy, regulations, technical capability and cross-referencing (Belanger and Hiller, 2006). Criteria regarding content and information include the clear and suitable content, consistent use of language, extensive and descriptive information (Kuk, 2002). Criteria regarding the interactivity and the functioning of a website include the contact information, web design features and government information delivery (Suen, 2006). Many researchers investigated criteria about the various online services (Archer, 2005; Henriksen, 2004; Ilshammar et al., 2005; Reddick, 2004; Wang et al., 2005). Their popularity is explained because e-government sites are being developed to offer government services to citizens via the web. However, few previous papers considered a holistic approach in examining the websites from various points of view (Bicharra et al., 2005; Kaylor et al., 2001; Smith, 2001).

Along a different direction of research, Norris and Moon (2005) examined the 2000 and 2002 ICMA (International City/county Management Association) E-

Government Surveys with regards to e-government adoption in U.S. municipalities. More specifically, Norris and Moon (2005) found that e-government adoption at the grassroots (measured by deployment of web sites) is progressing rapidly, while the movement toward integrated and transactional e-government is progressing much more slowly. Also, Moon and Norris (2005) found that managerial innovativeness orientation and city size are the most compelling determinants of municipal e-government adoption.

Despite the success of the Greek online tax filling project (Economides and Terzis, 2008), E-government in Greece is at the very early stages (iDABC, 2007; Wauters and Colclough, 2006). According to the Information Society Observatory (2008), the 47% of the Greek public services are offered electronically contrary to the 58% of the average European Union. The percentage of Greeks that are Internet users is 28% contrary to the 51% of the average European Union. The percentage of Greeks who use e-government services is 12% contrary to the 30% of the average European Union. In order the citizen to benefit from e-government, they should be able to effectively use the government websites. Investigating the literature, there were not found any previous papers that evaluated the status of Greek municipalities' websites. It would be useful for the Greek local governments to know the level of development of their municipalities' websites in order to take appropriate actions.

In this paper, 50 Greek municipalities' websites were evaluated from various points of view. Both previously proposed criteria as well as new ones were considered. Initially, similar previously proposed criteria were combined. They were also classified into categories. Then, they were complemented with new criteria. The result was GovQual that consists of 140 criteria organized into 13 major categories (Table). Fifteen students with average Internet experience were trained on using GovQual. Finally, these students evaluated the websites of the major Greek municipalities using GovQual.

So, the main contributions of this paper are the following: 1) it considers many evaluation criteria (some used for first time) to perform a holistic evaluation; 2) it evaluates 50 Greek municipalities' websites; 3) it employs 15 evaluators; 4) it identifies which websites' features are underdeveloped and need further improvement; 5) it points out specific inefficiencies and problems of these sites and suggests solutions; 6) it finds out that there are differences among various

geographical regions; and 7) it suggests guidelines for designing and developing useful and efficient municipalities' websites.

## **2. Methodology**

Initially, the GovQual instrument was developed (Table). It contains 140 criteria organized into 13 categories: 1) Content, 2) Presentation, Media & Format, 3) User Interface, 4) Structure & Organization, 5) Navigation, 6) Orientation, 7) Interactivity & Feedback, 8) E-Services & Applications, 9) Reliability & Availability, 10) Maintainability, 11) Performance, 12) Openness, Compatibility & Interoperability, and 13) Security. Due to space limitation, the criteria of GovQual are not analyzed here. Rather, they are discussed in the next section where the evaluation results are presented. During 2006, fifteen undergraduate students (between 19 and 25 years old; 7 males and 8 females) in an e-commerce course were trained on GovQual. These students had already taken three Informatics courses. In order to establish a degree of agreement among evaluators the Fleiss' Kappa (K) measure has been incorporated. Fleiss' kappa (K) is a statistical measure of inter-rater reliability. It is appropriate for a fixed number of evaluators. It can give a measure of the ratings' consistency of the evaluators. Fleiss' Kappa (K) is defined as the ratio of the degree of agreement that is attainable above chance over the degree of agreement actually achieved above chance. The scoring range is between 0 and 1 (perfect agreement).

Then the official websites of the biggest fifty Greek cities were identified. The students evaluated these fifty municipalities' sites using GovQual. Each one of the students rated every site for each one of the 13 GovQual categories taking into consideration all of its criteria (Table). WebXact was also used to examine the number of broken links or under construction pages of each site. For every site, each student gave a grade from 0 to 5 (perfect quality) for every category. Then the average score of a specific category was calculated as the average of all students' grades for this category.

## **3. Results and Discussion**

### **3.1 Content**

The content should be not only comprehensive but also accurate and current. However, a huge complicated amount of information may confuse the user. The amount of information has to be balanced and match the needs of standard audience (Andersen et al., 2006; Smith, 2001).

Most sites provided rich content. They presented information about local history (persons, ideas, art, buildings, locations, battles, etc.), culture/ traditions (food, music, dances, clothes, etc.), environment/ recycling, nature, tourism, as well as current issues concerning the locals. However, there were also some shortcomings. The sites did not provide information useful for people with special needs. Also, the majority of the sites used only the Greek and the English language. The sites would support other European languages (German, French, Spanish, etc.) as well other languages for tourists (e.g. Japanese), businessmen (e.g. Arabs) or immigrants (e.g. Albanian). The 2001 census showed that the majority of immigrants were from Albania, Bulgaria, Georgia, Rumania and Russia. None site provided any of these languages. Furthermore, only few sites included a section of links to other relevant sites (e.g. ministries' sites).

So, the majority (64%) of the sites achieved high scores between 3 and 4, and 28% sites achieved scores between 2 and 3 ( $K=0.4578$ ). However, four sites (8%) achieved low scores because some of their pages were under construction or they contained useless and invalid information.

### **3.2 Presentation, Media & Format**

The presentation should be media rich, aesthetically pleasant, attractive and format-consistent. A variety of media (e.g. videos, photos, maps, music, animations) would be used to present the site's content. If the mix and the position of multimedia files are not proper, then the user would be confused. Also, suitable colors, fonts and effective titles play an essential role in the appropriate organization and presentation of the site (Lazar et al., 2003).

However, only few sites supported multimedia files. Most sites showed low quality photos in photo galleries. Few sites provided advanced presentation features (e.g. video, satellite photos, traditional songs in mp3 format, maps). Most sites

provided a dynamic “introduction page” based on Macromedia Flash or Java allowing the “skip” option for those who did not want to watch it.

So, the majority of the sites (76%) achieved high scores between 3 and 4, and four sites (8%) scored higher than 4 ( $K=0.5623$ ). Although only a limited number of sites provided a variety of multimedia files (e.g. video, animated photos, maps), the overall design (titles, use of colors and fonts) was good.

### **3.3 User Interface**

The Interface of a site should be ergonomic and user-friendly to both simple and advanced Internet users (Yang and Paul, 2005). In Greece, most citizens are not advanced Internet users. So, the user interface of the governmental sites should facilitate users with limited Internet experience.

Menus, toolbars and shortcuts would be found on the user interface. Shortcuts help the users navigate easily in the site. Toolbars may assist them when they face a problem such as connection interruption or refreshing the page. If the menus are complex and difficult to use, then a user would be confused. The designers of most sites understood the user’s needs and made the user interface practical and suitable for users with limited web experience.

Personalizing the user interface to the specific characteristics, interests and needs of a user would facilitate his virtual visit to the site. For example, an advanced user can customize the user interface so that he may have many options and tools at his disposal. Also, if a user visits the site frequently and repeatedly uses specific services, then he should be able to put shortcuts of these services on his tailor-made user interface. Furthermore, people with special needs should be able to adjust the user interface to their needs. Unfortunately, none of the sites offered the option of personalization. The sites’ designers focused on developing a practical and simple interface for inexperienced users ignoring the advanced users.

So, the majority of the sites (78%) achieved average scores between 2 and 3, and only 20% sites scored between 3 and 4 ( $K=0.6347$ ).

### **3.4 Structure & Organization**

A simple and intuitive site's structure is to organize the various sections in a low-depth tree with clearly specialized directories and subdirectories. A simple structure will help the site's navigation by the users as well as the site's maintenance by the webmasters. The taxonomy and classification of the sections should be intuitive. If a site provides a huge amount of unclassified information and services, its structure would become chaotic. So, a user could be easily lost. Such problems may occur due to the inexperience and haste with which the technical staff tries to classify and link correctly various types of data (Lee et al., 2005).

Most sites supported a simple and intuitive structure to organize their large amount of information. So, the majority of the sites (78%) achieved very high scores between 4 and 5, and 20% sites achieved scores between 3 and 4 ( $K=0.9256$ ).

### **3.5 Navigation**

The navigation and orientation categories are closely related to the site's organization. Most users want to have a look at a site or explore it in a short time. If they do not find what they want quickly, they may leave the site. Easy and simple navigation facilitates the exploration of the site. Also, a site with rational and accurate navigation helps the user to find quickly what he wants. The navigation through the site becomes easier if there are shortcuts to important parts of the site, such as shortcuts to the main page of the site, e-mail directory, photo gallery (Gil-Garcia, 2005).

Most sites did not face any serious navigation problems because their structure was very simple. Only few sites presented "under construction" pages. However, most sites presented navigation errors and broken or missing links. This does not help the navigation (Smith, 2001). The administrators should regularly update the links to the site's pages as well to other sites. Also, there was rarely any explanation under the links, and there was not any warning that the link led to a large file or that this file was accessible only by members of the site. There were often crashes on links to documents in the site making the navigation a little awkward and hard to operate. The majority of the sites had a "laundry" long list with links, which is inappropriate.

So, almost half (48%) of the sites achieved scores between 2 and 3, and another 46% sites achieved scores between 3 and 4 ( $K=0.3689$ ). Only one site scored above 4 offering various navigation facilities (e.g. trail and history options).

### 3.6 Orientation

Accurate orientation enables a user to know his current location and his options in moving through the site. Orientation tools include the sitemap, the table of contents, and the subject index on the main directory with various subdirectories (Holliday and Yep, 2005).

The majority of the sites supported a variety of orientation tools. Almost all of them provided a sitemap and a table of contents. Even though the main directory was similar to most sites, there were great differences in their subdirectories. None of the sites offered an alphabetical index or glossary. Most sites had a chronological index, which was rarely updated, except in the large cities' sites. Few sites offered a geographical index which would facilitate the tourists to locate the city and the surroundings. Few sites included departmental and personnel directories. In most sites, the directory was a box full of names and phone numbers on the main page! The webmasters would have included in appropriately organized directories detailed information (e.g. name, e-mail, phone numbers, fax number, photo, duties' description and office hours) about officers and members of the municipality's authorities. Many citizens are searching e-government sites for such information. So, it is essential that the information is not only well-organised but also easy to find. A vital aspect of a municipality's site is to offer contact- information about the various public departments and officers. So, telephone directory, address directory and e-mail directory are extremely useful. In some sites there were such directories with a lot of details. Other sites offered only boxes with names, addresses and phone numbers in the main page. However, a combination of directories and boxes could be useful for a hurried user to find the most important and ordinary information in the boxes and for a specialist to find out more details in the directories.

Finally, the majority of the sites offered a simple search engine to find information, articles or certifications. Few sites provided an advanced search engine with various filters (e.g. phrase searching, field searching, date or range searching).

So, almost half of the sites (54%) achieved scores between 2 and 3, and 32% sites achieved scores between 3 and 4 ( $K=0.3945$ ). Only three sites achieved scores between 4 and 5.



### **3.7 Interactivity & Feedback**

The sites should offer not only information but also the ability for communication with the municipalities' officers. In a participial democracy, citizens would enter government sites to pose questions and requests, state their opinions and help in the solution of current municipality problems. If the administration's feedback is not appropriate and well controlled then the importance of the government site vanishes because neither the requests are answered nor the problems of the citizens are solved (Torres et al., 2005).

Unfortunately, the situation in most sites was not encouraging. Further development is rendered necessary. E-mail services, newsletters and subscriptions, direct enquiries to policy makers and appointments scheduling, elaboration of discussion forums, on-line conferences and live effects would be added to the sites (Akman et al., 2005). Only two sites provided on-line applications, and few sites provided newsletters or kept on discussion forums. Not even one site provided an option for requesting or tracking application forms, chat or video conference. An explanation of the lack of such tools would be that most Greeks did not know how to use them. Also, they might be afraid to use them because they did not trust the communications' privacy and security over the Internet. However, postal addresses, telephone numbers and fax numbers were all available through the majority of the sites. It was encouraging that some sites provided SMS notification which is particularly useful since almost all Greeks own a mobile phone (Economides and Grousopoulou, 2008). Also, few sites offered RSS (Really Simple Syndication) feeds.

Providing e-mail access to citizens expands their communication ability. There can be either a central email address for all incoming correspondence or direct links to the e-mail accounts of elected officials, departments or government employees (Ho and Ya Ni, 2004). Most sites provided e-mail addresses for correspondence.

Some sites supported complaint and suggestion forms enabling the active participation of the citizens. However, further actions should be taken to improve the interaction among the government and the citizens as well among the citizens themselves. The support of forums, communities, chat rooms, wikis and blogs would enhance the citizen participation. Both the public officers and the citizens should be educated on how to use advanced communication applications over the Internet. Also, the benefits and advantages of e-communication would be advertised and promoted.

Incentives would be offered to increase e-participation and e-communication. New Web 2.0 social networking and communication tools would be employed. Content specific “social simulations” would be developed aiming at stimulating discussion among citizens on urgent issues. The sites would support SimCity type of software which enables users to discuss, participate and decide about various social situations.

So, the majority of the sites (68%) received very low scores between 1 and 2, a disappointing 20% was rated lower than 1, and 10% was rated between 2 and 3 ( $K=0.7823$ ). Only the site of Athens achieved a score over 4.

### **3.8 E-Services & Applications**

A government site should provide not only information but also appropriate e-services (e.g. online application and delivery of certificates and licenses, payment of parking fines, employment search/offer, reservations, and registration in catalogues and lists). For example, a citizen would be able to electronically request and receive a birth or marriage certificate. He would electronically register as candidate in elections, register in polls, and vote in elections. On-line transactions include on-line purchases and payments, forms and reports submission and registration for services, participation in tenders and e-procurements (Golubeva et al., 2005). Generally on-line transactions involve actions taken by an agency in response to a request expressed by a client. On-line transactions could be open to everyone in Internet or require a registration to a site (Smith, 2001).

Unfortunately, most sites were not at a satisfactory level. Only two sites provided on-line services. In one site, a registered user could book tickets for the cinema or for the theatre. In another site, a user could buy dishes of the traditional local cuisine, and traditional (folklore) costumes. The user could pay on-line using credit cards or in cash at delivery. Although none site offered online request and issuing of certificates, some sites offered information about the necessary documents for a certificate as well the application form for the certificate.

A further step would be to support mobile services. M-government focuses on increasing service levels, constituent participation and efficiency through mobile technology (Lee et al., 2006; Sharma and Gupta, 2004). Mobile phones are used by the majority of Greeks. Laptops with wi-fi modems and i-pods are also used by many young Greeks, especially after the introduction of the third generation (3G) mobile

phones supporting internet applications (Economides and Terzis, 2008). The higher the penetration rate of mobile devices is, the more m-government initiatives will play an increasingly important role regarding e-government services (Lee et al., 2005; Sheng and Trimi, 2008).

So, half of the sites (50%) received very low scores between 1 and 2, and only 12% sites managed to gain scores between 2 and 3 ( $K= 0.8894$ ). A disappointing 38% did not score over 1.

### **3.9 Reliability & Availability**

It is important that the site operates continuously without any technical problems. All sites except one operated continuously (24X7) without any problems. However, they presented little information about their technical characteristics and the techniques used to ensure data availability. The user should feel assured when issuing a request or application. It is important that the sites back-up their data. On-line data back-up protects the data against viruses, theft, or accidental deletions. Data loss, especially for government sites, can mean disaster. There are several on-line data back-up and mirroring programs and services for data protection. Some tools also offer data recovery, system repair and data archiving. On-line back-up tools include the Amen and Nova Star online back-up (Tahinakis et al., 2006). However, none site gave any information about data back-up and mirroring. After talking to some webmasters, it was confirmed that they were using a backing-up tool.

So, the majority of the sites (78%) received very low scores between 1 and 2, and only 28% sites managed to gain a score between 2 and 3 ( $K= 0.6756$ ). These scores did not represent the actual reliability & availability level of the sites but the thoughts of the evaluators. The evaluators were not satisfied with the lack of information about the reliability mechanisms. The webmasters should try to persuade the users about their sites' reliability and availability.

### **3.10 Maintainability**

Maintainability is related to the smooth maintenance and upgrade of the websites. None of the sites informed the user about when, how and at what extent the site was or will be upgraded. Technical support and Documentation would help the user in

case he faces technical problems. The documentations should support users with different levels of information on technical issues (Gil-Garcia and Pardo, 2005). This information would be personalized to the user's technical level and abilities. Quick reference would be available to expert users. Detailed information with pictures and video would be available to novices. Also, the use of the terminology should be consistent through the entire site. All these parameters were not seriously considered by most sites.

So, 40% of the sites achieved a score between 2 and 3, and 38% sites received a score between 1 and 2. Only the site of Athens scored over 4 ( $K= 0.3248$ ). These scores did not represent the actual maintainability level of the sites but the views of the evaluators. Most sites presented limited information about their maintainability. The sites' administrators would gain the user's trust by describing the followed procedures to maintain, update and upgrade the sites.

### **3.11 Performance**

Performance is related to the speed of the site's operation. Most sites achieved high scores. Since they did not offer on-line services and applications (only some video and pictures), there was not much processing. The majority of the sites (64%) achieved scores between 3 and 4, and 30% sites achieved a score between 2 and 3. Three sites achieved scores above 4 ( $K= 0.5596$ ).

### **3.12 Openness, Compatibility & Interoperability**

A user should be able to access the site via various connection types (e.g. wired or wireless, low or high speed), using various devices (e.g. desktop pc, laptop, mobile device) and software tools (e.g. operating systems, browsers, multimedia viewers). Most sites supported various wired connection types. Although most sites claimed that they supported various browsers, some sites presented errors and crashes when Mozilla Firefox was used.

If a site uses special software applications, then some users who do not own such software would be unable to use them. So, it is necessary for a site to provide the necessary means to make it accessible by the users. For example, if birth certificates

are in pdf format, the site should provide to him the Acrobat Reader to open and read the birth certificate file. Other useful tools that would be offered for downloading include the WinZip, WinRar, Quick Time Video Codecs, Windows Media Player, etc. Unfortunately, only few sites provided such tools. Many sites supported a variety of multimedia formats (e.g. mov, mpg, mpg4, pdf files). However, most of them did not provide the appropriate plug-ins or the links for the user to download them. It is worth mentioning that most of the sites offered impressive 'Introductions' based on Macromedia Flash. Some sites were based entirely on Flash, and if the user did not have the Flash plug-in a downloading link was appearing automatically.

So, the majority of the sites (84%) achieved high scores between 3 and 4 ( $K=0.8325$ ). The evaluators tried to enter the sites using different browsers (e.g. Mozilla, Opera and Internet Explorer) and operating systems from different computer systems and connections.

### **3.13 Security**

Finally, security and privacy are of paramount importance. User's privacy rights should be protected and an explicit statement on how user's privacy rights are protected should be included in the site. Also, data exchanges between the site and the user must be encrypted. So, the protection of user's privacy rights is a practically sensitive area for government websites both because of government intrusion into individuals' personal lives and also because government agencies should be seen to be setting a "good example" in privacy meters (Smith, 2001; Torres et al., 2005).

Web-designers should show the policies, procedures and standards regarding security and privacy. Unfortunately, not even one site showed any security certifications or guarantees. Also, there was not any notification about cryptography or encryption. It seems that administrators did not consider necessary to show such detailed information, since they were not offered any e-services or transactions. WebXact was also used to check the "Temp" file in the user's hard disks for cookies after visiting a site. The results showed that the sites were not using cookies to track the users. The absence of cookies would increase the users' trust on the sites.

The evaluators gave very low scores between 1 and 2 to all sites ( $K=0.9605$ ). It is possible that they did not like the absence of any information regarding security guarantees, encryption and cryptography mechanisms. The scores did not represent

the actual security level of the sites but the thoughts of the evaluators. The sites' administrators should gain the users' trust by specifying the sites' security and privacy mechanisms.

#### **4. Geographical regions**

As it will be discussed further in the Conclusions, the best three sites were the following: Athens (capital of Greece), Thessaloniki (second largest Greek city), and Kalamaria (a municipality at the suburbs of Thessaloniki). Furthermore, other sites of municipalities at the suburbs of Athens and Thessaloniki achieved higher scores than those away from these metropolitan cities. It seems that sites in metropolitan regions outperformed those in county regions.

It would be also interesting to discover whether there are differences among the various geographical regions. So, the non-metropolitan municipalities were classified into 9 groups according to their geographical region: 1) Peloponnese, 2) Macedonia, 3) Epirus, 4) Thessaly, 5) Thrace, 6) Crete Island, 7) Aegean Islands, 8) Ionian Islands, and 9) Sterea Ellada.

Regarding the Content, the majority of the sites provided a lot of useful information on various subjects (environment, history, tourism, etc.). However, there were some differences among the regions. Crete Island, Ionian Islands, and Aegean Islands achieved the highest scores (3.58, 3.46, and 3.28 respectively). All of them are Islands and popular tourist destinations. Their high scores may be attributed to the fact that they provided a lot of tourist content. Thrace received the lowest score of 2.63. Thrace is a poor region faraway from Athens.

Regarding the Presentation, Media & Format, all regions achieved high scores between 3.15 and 3.56, except Sterea Hellada which scored 2.90. Regarding the User Interface, all regions scored mediocre between 2.35 and 3. Aegean islands and Ionian Islands achieved the highest scores of 3, while Thrace and Crete Island received the lowest scores of 2.43 and 2.35 respectively.

Regarding Structure & Organization, all regions achieved very high scores between 3.5 and 4.5. Again, Ionian Islands achieved the highest score of 4.5, while Thrace received the lowest score of 3.5.

Regarding Navigation (scores between 2.43 and 3.13) as well as Orientation (scores between 2.25 and 3.4), all regions scored mediocre. Peloponnese and Aegean

Islands achieved the highest scores in Navigation, Thessaly and Peloponnese achieved the highest scores in Orientation. Thrace received the lowest scores in both cases. Surprisingly, the Greek islands (Crete Island, Aegean Islands and Ionian Islands) achieved low scores. It is possible that their huge amount of information rendered the orientation difficult. However, incorporating advanced search engines and shortcuts would alleviate this problem.

Regarding Interactivity & Feedback (scores between 0.45 and 1.95) as well as E-Services & Applications (scores between 0.75 and 1.75), all regions failed. Large differences were also identified among the regions. Thrace received the lowest scores in both cases. The sites' administrators considered the sites as information hubs and not as a medium of communication with the citizen. They tried to satisfy the information needs of the citizens and the tourists, and not their transaction needs with the local government. For example, a person born in a city who lives in another city was not able to apply and receive a birth certificate via Internet. Rather, he had to travel to his birthplace to acquire it in person.

Regarding Reliability & Availability (scores between 1.65 and 2.3) as well as Maintainability (scores between 1.56 and 2.44), all regions received low scores. That was due to the fact that the webmasters did not inform the users about reliability and maintenance mechanisms and policies. So, the evaluators were not convinced about the quality of these issues. Peloponnese achieved the highest scores, while Crete Island the lowest scores in both cases. Differences were also identified among the regions with respect to Maintainability. Regarding Performance, all regions scored mediocre between 2.75 and 3.19. Thessaly achieved the highest score, while Ionian Islands the lowest. Regarding Openness, Compatibility & Interoperability, all regions achieved high scores between 3.03 and 3.54. Epirus achieved the highest score, while Peloponnese the lowest. Finally, regarding Security, most regions received the lowest score of 1.29, while Peloponnese achieved the highest score of 1.57.

In summary, there were differences among the regions especially with respect to Interactivity & Feedback, E-Services & Applications, and Maintainability.

## **5. Conclusions and Future Research**

Municipalities' sites would provide information and services not only to locals but also to visitors. These sites would offer to citizens the ability to buy permits (parking,

pavement, constructions, etc.) or tickets (public transport), pay utilities or fines (parking, speeding, pollution, nuisance etc.), register in catalogues (voting, social security, etc.), services (library, kindergarten, etc.), classes, or utilities, apply and receive certificates (birth, marriage, death, etc.), licenses (car, pet, business, etc.), employment, etc. Also, they would be used as a marketing tool to attract tourists, businesses or investments. Furthermore, they would be used as a political tool to propagandize the city's and region's achievements.

This paper presented GovQual, a comprehensive evaluation framework consisting of 140 criteria organized into 13 evaluation categories. Fifteen students evaluated fifty Greek municipalities' sites using GovQual. The evaluation results showed that the Greek municipalities' sites were at a satisfactory level with respect to Content, Presentation, Structure, Performance, and Openness. However they presented weaknesses with respect to Interactivity & Feedback as well E-Services & Applications. Furthermore, these weaknesses were even worst in some geographical regions. Despite the efforts of the websites' designers and developers to develop easily usable and accessible sites with plenty of information, there are more steps to be taken in order to construct effective municipality sites. The sites should offer more interactivity and e-services than that currently offered. Also, in order to achieve a citizen-centred government, the sites should serve each individual citizen in a personalized way. Furthermore, e-government leaders should be educated on such issues (McDaniel, 2005).

The best three sites were those of Athens (capital of Greece), Thessaloniki (second largest city in Greece), and Kalamaria (in the suburbs of Thessaloniki). If a citizen wants to visit the municipality offices in such large cities, he has to spend a lot of time due to traffic, parking problems and bureaucracy. Many citizens would like to find all governmental information and complete their transactions with the government via the Web. Otherwise, they should spend a lot of time visiting the local offices in person. Usually, such cities have more resources and budget to accomplish their tasks than the rest cities. Furthermore, many Universities are located in these cities. So, there are many experts and hi-tech companies to offer advanced services. On the contrary, cities in less developed areas presented low efficiency sites.

Most sites provided standard information about the municipal authorities and specific download forms. The sites' webmasters tried to present the information using a minimum of multimedia. Most sites included only some photos and few sites



provided video. Multimedia makes the site more appealing to the common user and facilitates the site's exploration without the need to continuously read text. The appropriate amount of multimedia in the proper position would create a more relaxed and entertaining way of visiting a governmental site. Furthermore, interactive maps, navigation facilities and GIS (Geographical Information Systems) would improve the sites' quality.

Most sites provided asynchronous communication. Email communication, submission of complaint and suggestion forms were common services. However, the sites would also provide real time information such as real-time traffic web cams, real-time air pollution measurements, real time weather forecast. Mobile applications would also greatly enhance the offered services. For example, alerts to mobile phones containing instructions regarding accidents (e.g. car collisions, traffic jam), emergency conditions (e.g. air or water pollution, food safety) or disasters (e.g. flood, earthquake) would be imperative. Interested citizens would be also informed about events (e.g. cultural, political). Similarly, personal notifications regarding application's status, job's search, committee's participation would be useful. Furthermore, interactive maps on smart phones would navigate the users.

In addition, the sites would support interactive communication and discussion forums among the citizens and/or officials about personal or community issues. An easy way to make governmental sites more accessible to citizens is the addition of new popular Web 2.0 features. For example, the sites would support Blogs in order for the citizens to express their ideas and thoughts about the city, the site and the society in general. Also, government officials would support their personal Blogs in order to communicate with the citizens. Furthermore, Blogging assemblies would be developed. Similarly, the adoption of Wikis would enhance e-participation.

Eventually, the sites would provide secure applications (e.g. requests for certificates; filling applications for licenses, permits, jobs, constructions; voting), secure delivery of certificates and licenses, and e-payment (e.g. utility bills, parking fines, permits). However, most Greek citizens are not regular Internet users. So, they should be educated on using these e-services. Another serious barrier is the fact that many Greek Internet users do not trust transactions over the Internet. Consequently, mechanisms should be developed to alleviate their fear and mistrust about their safety on Internet. Note that concerns regarding trust and confidentiality have been reported for other countries too (Kolsaker and Lee-Kelley, 2007).

Since most Greek citizens were not experienced Internet users, the municipalities' sites would be designed to be accessible by ordinary users. For example, the pages would be simple but efficient. Also, the "Help" button would provide all the necessary tips and hints for the inexperienced users, because such users will follow the instructions of the "Help" closely (Molich et al., 2007). However, in order to gain a high rank in various benchmarking (Wauters and Colclough, 2006), the sites should provide advanced features.

Finally, it is important to emphasize the need for education and training on Internet of both the citizens and the public officials. Future research would be to replicate this study in other public sectors in Greece as well other countries. Also, a different group of evaluators (e.g. middle-aged citizens, professionals) would evaluate the various municipalities' sites. Furthermore, the effect of city size and residents' demographic characteristics on the websites' quality would be explored.

## References

Akman, I., Yazici, A., Mishra, A. and Arifoglu A. (2005) "E-government: A global view and an empirical evaluation of some attributes of citizens", *Government Information Quarterly*, Vol. 22, Issue 2, pp. 239-257.

Andersen, K.V. and Henriksen, H.Z. (2006) "E-government maturity models: Extension of the Layne and Lee model", *Government Information Quarterly*, Vol. 23, pp. 236-248.

Archer, N.P. (2005) "An overview of the change management process in e-government", *International Journal of Electronic Business*, Vol. 3, No. 1, pp. 68-87.

Belanger, F. and Hiller J.S. (2006) "A framework for e-government: privacy implications", *Business Process Management Journal*, Vol. 12, No. 1, pp. 48-60.

Bicharra Garcia, A.C., Maciel, C. and Bicharra Pindo F., (2005) "A quality inspection method to evaluate e-government sites", *Electronic Government, International Conference (EGOV 2005)*, Springer-Verlag, Lecture Notes in Computer Science, Vol. 3591, pp. 198-209.

Economides, A.A. and Grousopoulou, A. (2008), "Use of mobile phones by male and female Greek students", *International Journal of Mobile Communications (IJMC)*, Vol. 6, No. 6, pp. 729-749.

Economides, A.A. and Terzis, V. (2008) "Evaluating tax sites: An evaluation framework and its application", *Electronic Government, an International Journal (EG)*, Vol. 5, No. 3, pp. 321-344.

Ghapanchi, A., Albadvi, A. and Zarei, B. (2008) "A framework for e-government planning and implementation", *Electronic Government, an International Journal*, Vol. 5, No. 1, pp. 71-90.

Gil-Garcia, J.R. and Pardo, T.A. (2005) “E-government success factors: Mapping practical tools to theoretical foundations”, *Government Information Quarterly*, No. 22, pp. 187-216.

Gil-Garcia, J.R., (2005) “Exploring the success factors of state website functionality: An empirical investigation”, *Proceedings of the 2005 National Conference on Digital Government Research, ACM International Conference Proceeding Series*, Vol. 89, pp. 121-130.

Golubeva, A., Merkurjeva, I., and Shulakov N. (2005) “Development of e-government in St. Petersburg: Evaluation of web sites performance and usability”, *Occasional Papers in Public Administration and Public Policy VI(2)* (Spring 2005).

Henriksen, H. Z. (2004) “The diffusion of e-services in Danish municipalities”, *Electronic Government, International Conference (EGOV 2004)*, Springer-Verlag, *Lecture Notes in Computer Science*, Vol. 3183, pp. 164-171.

Ho A., T.-K. and Ya Ni A. (2004) “Explaining the adoption of e-government features: A case study of Iowa county treasurers’ offices”, *The American Review of Public Administration*, Vol. 34, No. 2, pp. 164-180.

Holliday, I. and Yep, R. (2005) “E-government in China”, *Public Administration and Development*, Vol. 25, Issue 3, pp. 239-249.

iDABC eGovernment Observatory (2007) “Factsheet: E-government in Greece”, *European Communities*, pp. 1-35. Retrieved March 15, 2008 from [http://www.epractice.eu/index.php?page=document&doc\\_id=3090&doclng=6](http://www.epractice.eu/index.php?page=document&doc_id=3090&doclng=6)

Ilshammar L., Bjurström A. and Gronlund, A. (2005) “Public e-services in Sweden: Old wine in new bottles?”, *Scandinavian Journal of Information Systems*, Vol. 17, No. 2, pp. 11-40.

Information Society Observatory (2008) <http://observatory.gr/>

Irani, Z., Al-Sebie, M. and Elliman, T. (2006) "Transaction stage of e – government systems: Identification of its location & importance", *Proceedings of the 39<sup>th</sup> Hawaii International Conference on System Sciences (HICSS'06)*, pp. 1-9.

Kaylor C., Dashezo R. and Van Eck D., (2001) "Gauging e-government: A report on implementing services among American cities", *Government Information Quarterly*, Vol. 18, Issue 4, pp. 293-307.

Kolsaker, A. and Lee-Kelley, L. (2007) "G2C e-government: Modernisation or transformation?", *Electronic Government, an International Journal*, Vol. 4, No. 1, pp. 68-75.

Kuk, G. (2002) "The digital divide and the quality of electronic service delivery in local government in the United Kingdom", *Government Information Quarterly*, Vol. 20, Issue 4, pp. 353-363.

Lazar, J., Beere, P., Greenidge, K-D. and Nagappa Yogesh (2003) "Web accessibility in the Mid-Atlantic United States: A study of 50 homepages", *Universal Access in the Information Society*, Vol. 2, pp. 331-341.

Lee, S.M., Tan X. and Trimi, S. (2005) "Current practices of leading e-government countries", *Communications of ACM*, Volume 48, Vol. 10, pp. 99-104.

Lee, S.M., Tan, X. and Trimi, S. (2006) "M-government, from rhetoric to reality: learning from leading countries", *Electronic Government, an International Journal*, Vol. 3, No. 2, pp. 113-126.

McDaniel, E.A. (2005) "Facilitating cross-boundary leadership in emerging e-government leaders", *Electronic Government, an International Journal*, Vol. 2, No. 1, pp. 1-10.

Molich R., Jeffries R., and Dumas J., (2007) "Making usability recommendations useful and usable", *Journal of Usability Studies (JUS)*, Vol. 2, Issue 4, pp. 162-169.

Moon, M.J. and Norris, D.F. (2005) “Does managerial orientation matter? The adoption of reinventing government and e-government at the municipal level”, *Information Systems Journal*, Vol. 15, pp. 43-60.

Norris, D.F. and Moon, M.J. (2005) “Advancing e-government at the grassroots: Tortoise or hare?”, *Public Administration Review*, Vol. 65, No. 1, pp. 64-75.

Pallas, J. and Economides, A.A. (2008) “Evaluation of art museums' web sites worldwide”, *Information Services & Use*, Vol. 28, No. 1, pp. 45-57.

Reddick, C.G. (2004) “A two-stage model of e-government growth: Theories and empirical evidence for U.S. cities”, *Government Information Quarterly*, Vol. 21, Issue 1, pp. 51-64.

Sharma, S.K. and Gupta, (2004) “Web services architecture for m-government: Issues and challenges”, *Electronic Government, an International Journal*, Vol. 1, No. 4, pp. 462-474.

Sheng, H. and Trimi, S. (2008) “M-government: Technologies, applications and challenges”, *Electronic Government, an International Journal*, Vol. 5, No. 1, pp. 1-18.

Smith, A.G. (2001) “Applying evaluation criteria to New Zealand government websites”, *International Journal of Information Management*, Vol. 21, Issue 2, pp. 137-149.

Suen I-S., (2006) “Assessment of the level of interactivity of e – government functions”, *Journal of E-government*, Vol. 3, No. 1, pp. 29-51.

Tahinakis, P., Mylonakis, J. and Protogeros, N. (2006) “The contribution of e-government to the modernisation of the Hellenic taxation system”, *Electronic Government, an International Journal*, Vol. 3, No. 2, pp. 139 – 157.

Torres, L., Pina, V. and Acerete B., (2005) “E-Government developments on delivering public services among EU cities”, *Government Information Quarterly*, Vol. 22, Issue 2, pp. 217-238.

Wang L., Bretschneider, S. and Gant J. (2005) “Evaluating web-based e-government services with a citizen-centric approach”, *Proceedings of the 38<sup>th</sup> Hawaii International Conference on System Sciences*, pp. 1-10.

Wauters, P. and Colclough G., (2006) “Online availability of public services: How is Europe progressing? Web based survey on electronic services. Report of the 6<sup>th</sup> Measurement”, i2010, Information Space Innovation & Investment in R&D Inclusion, Retrieved October 7, 2007 from <http://www.epractice.eu>

Yang, J. and Paul, S., (2005) “E-government application at local level: Issues and challenges: An empirical study”, *Electronic Government, an International Journal*, Vol. 2, No. 1, pp. 53-76.

**Table:** GovQual criteria

<b>1. Content</b>
Content Personalization
Comprehensive and Complete Content
Valid, Accurate and Correct Content
Useful and Relevant Content
Simple and Clear Content
Right Spelling, Grammar, Syntax
Unique Content
Current and Updated Content
Uniform and Consistent use of terms
Multiple Languages
Special Needs Persons Consideration
Non-discrimination and Objectivity
Variety of links to other useful Websites

<b>2. Presentation, Media &amp; Format</b>
Presentation Personalization
Variety of Media
Quality and Fidelity of Multimedia
Appropriate and Effective Titles
Aesthetics
Suitable and Consistent use of Style and Format
Suitable and Consistent use of Colors
Suitable and Consistent use of Fonts
Right Quantity of Multimedia
Right Mix of Media
Right Position of Media
Special Needs Persons Consideration



### **3. User Interface**

User Interface Personalization

Easy to find the site

User Profile Registration, Modification, etc

Effective Layout

Simple and Easy to use Menus

Useful and Effective Menus

Simple and Easy to Use Toolbars, Buttons and Shortcuts

Useful and Effective Toolbars, Buttons and Shortcuts

Appropriate and Useful Frames

Ergonomic User Interface

Right Position of Menus, Toolbars, Frames, etc

Consistent and Stable Position of Menus, Toolbars, Frames, etc.

Appropriate Background

Various Versions (e.g. Frame vs. No Frame)

Input Alternatives for Special Needs Persons

Output Alternatives for Special Needs Persons

### **4. Structure & Organization**

Simple Structure and Organization

Intuitive and Rational structure and organization

Appropriate Number of Levels and Choices per Level

## **5. Navigation**

Easy and Simple Navigation

Intuitive and Rational Navigation

Accurate Navigation

Consistent Navigation

Alternative Paths to a Page

Shortcuts

Return to Home from Every Page

Help from every Page

Notification when transfer to other website

No Navigation Errors

No Broken and Missing Links

No under construction Pages

Clear and Consistent Highlighting of Links

Navigation Prediction

Navigation Trail and History

Special Needs Persons Consideration

## **6. Orientation**

Variety of Orientation Methods

Appropriate Quantity of Orientation in every page

Accurate Orientation in every page

Consistent Orientation through the whole website

Simple Search

Advanced Search

Site Map

Table of Contents

Subject Index and Directory

Alphabetical Index and Glossary

Chronological Index

Geographical Index

Departments Director

Persons Director

Telephone Directory

E-Mail Directory

Address Directory

URLs Directory

## **7. Interactivity & Feedback**

E-mail

Telephone

Fax

Postal Address

Chat

Video Conference

Discussion Forums, E-Communities

Blogs

Wikis

Polls, Surveys & Voting

Newsletter

Alerts for new or Special content or deadlines

SMS

RSS feeds

Podcasts

Downloadable forms (Applications, Requests, Complaints, Suggestions, etc.)

Online Applications, Requests, Complaints, Suggestions, etc.

Notification of Application, Request etc. Status

Tracking Application, Request etc. Status

Easy Use of Interactivity

## **8. E-Services & Applications**

Variety of E-Services  
Easy to Find the E-Services  
Easy to Use the E-Services  
Description of e-services procedures  
FAQ  
What's new service?  
Easy Request a Service  
Tracking the Process of a Service  
Fast Delivery of a Service  
Easy Disposal of Requirements  
Easy Printing  
Easy Downloading and Storing  
Easy Payment

## **9. Reliability & Availability**

Continuous Operation  
Recoverability and Reusability in case of error  
Back-Up & Mirroring  
Asking for Confirmation  
Acknowledging Transaction

## **10. Maintainability**

Smooth Maintenance and Upgrade  
Continuous Operation  
User Technical Support  
Documentation and Help

## **11. Performance**

Input Speed  
Output Speed  
Processing Speed  
Support many concurrent Users

## **12. Openness, Compatibility & Interoperability**

Support Open Source Software

Standards Conformance

Support various User's Connection Types

Support various User's Operating System

Support various User's Browsers

Support various Multimedia Format

No Need for User to have special software and plug-ins

Data Portability to/from various software applications

## **13. Security**

Security Certifications and Guarantees

Encryption and Cryptography

Confidentiality and Privacy of user

Trustworthiness

Control of Personal Data and Profile by user

Non – Obligatory Registration

No unauthorized user monitoring (cookies)