E-Government: services, needs and user satisfaction

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Abstract

Within the e-government process, needs are identified and people try to come up with ideas for the public sector that will increase the effectiveness as well as lead to cost savings. Consequently, many new electronic services are being developed. As a result, Quality of Service (QoS) becomes an even more critical issue in the domain of electronic services. This paper starts by a general discussion of e-government and its services in general. Thereafter it explains different QoS factors that have been identified within the field of electronic services. The identification has been carried out by studying several researchers' work and by experience from e-government projects. The result shows that service design, security aspects, network performance issues, as well as the users' perspective, such as user requirements, are all factors of the QoS model. A new electronic service that does not take these factors into consideration might fail and therefore be rejected by its intended users.

Keywords: e-government, needs, electronic services, Quality of Service, service design, security, network performance, user's perspective, user requirements

Table of contents

List of Figures

1 Introduction

Electronic government (e-government) is a worldwide process which for instance includes service renewal and is intended to achieve a much higher effectiveness of the public sector. Many governments around the world have the goal to deliver 100 % of their services electronically by 2005.

As a result, the public sector is investing considerably large sums of money in new government services to provide their citizens with better services and to enhance the productivity of their employees. The development process often requires much time and collaboration between different disciplines, and therefore, a multidisciplinary approach is important.

Consequently, e-government and its new services will result in an alteration in the society and our lives. Citizens will be provided with services that give them access to government information and services in a better and easier way than it has been done up to now. For instance, several services from voting on the Internet to accessing medical information have already been introduced around the world.

However, if a new government service is to be of any use and be accepted by its intended users, it has shown to be important that the technical developers listen to those people that have experience in the current field. Moreover, it seems to be important that the development of the service is performed in cooperation between the different involved actors [10, 20]. Government services often require cross-agency co-operation, and as a result, the development process and the complexity increases. Some other factors that affect whether the service will be of any use and be accepted by its intended users are design [1, 4, 5, 6, 8, 13, 14, 15, 21] and performance issues [2, 9, 16, 17, 18, 19].

Moreover, when new services are being introduced into an already established department it has been shown that the employees often find it difficult to adapt to the new technologies that have been adopted in their organizations.

During the work with this report a lot of research work on the subject has been performed. For that reason, reports that have been collected from the Internet and electronic databases have been studied. Also, the work has given a lot of experience from seminars and work with real projects addressed in the e-government area. The report has been developed at Blekinge Institute of Technology within the TANGO program (Thematic Arenas Nourish Growth Opportunities) which has been partly funded through the European Commission program for Innovative Actions.

2 E-government, services and needs

Several investigations have been carried out around the world with the purpose to find out what kind of services the citizens want to be provided electronically. For example, a study in the US by Meghan E. Cook [7] shows that citizens typically wanted to have the possibility of renewing a driver's license to be provided electronically. However, the overall research within the subject that has been performed around the world varies from one study to another. A red line seems to be to achieve elimination of paper work as much as possible as well as find services that lead to effectiveness in the organisation and to provide the citizens with government information electronically 24 hours a day.

One such project that results in paper elimination and effectiveness of the organization is the student non-attendance's project. The project has been realized at Blekinge Institute of Technology as the supplier and Karlskrona municipality as the customer. The work was about providing the teachers at the upper secondary school with personal digital assistants (PDA) in which to enter a student's non-attendance. The traditional way of registration of non-attendances is by writing with a pen on a class list. Since it is common that the class lists are not updated, it forces the teachers to enter the non-attendances on a paper. Secondly, a teacher has several classes in a day which leads to redundancy between the teachers and as a result there will be many pieces of papers during a week. As a consequence, many teachers do not have the required time to book and follow up the non-attendance registration. To provide the teachers with PDAs that do all the registration automatically for them by a simple click in the non-attendance checkbox seems to be a good idea.

How can the public sector find needs in their organization that could be improved by an electronic service? There is of course no such manual that tells you exactly how to come up with good ideas. Instead the employees and the individual responsible in the public sector have to analyze their own organization and how they carry out current working tasks at the moment. For example, the following method can be applied to analyse your organization and perhaps find new good services.

1. Does your organization have a task that is carried out often?
2. Is the task carried out by many people?
3. Is the task time-consuming and/or costly?

If the organisation finds such tasks which have a great value on these factors, then they might have found a service that will have large effect on productivity and hence be valuable. However, the organization also has to pay attention to factors that will be risen in conjunction with the new service, for example, the purchase of required equipment, train and educate staff, and change current working routines and processes etc.

Several projects where some of them seem to be a good candidate to be an electronic service with high value for the public sector are described in a paper given by the IT commission [11]. The paper describes in total 21 different projects that have been carried out in the municipalities and on the county councils in Sweden.

3 The user's perspective

During the past 30 years many electronic services such as information systems have been developed and integrated into the society. Many of these systems however have failed in success because the users have not felt satisfied working with them. As a result they have been rejected.

The experience, e.g. [6, 10, 18], tells us that one cause of this problem, is that there has been an emphasis on technological attributes of these systems, and a small focus on human factors.

Since the movements towards e-government will end up with many new electronic services, it is important to learn from the mistakes. Several articles and literature have addressed this subject for a couple of years. One interesting report is given by VINNOVA [20]. The report describes the importance of an active dialogue between the developers of the system and the system's end-users.

Development   Usage

Theoretical   Experience
knowledge

Fig. 1 The backlash between the developers and the end-users [20]

As an example, an employee that has been working several years in the industry is the best person to describe the existing problems. The technical developers do not know the details around the problem but have the skills to realize them in a technical solution.

One factor that has been identified and which can influence the user satisfaction in information systems is the design of the service. This will be touched upon in the following section.

4 Design and construction guidelines for e-government web services

The research within the e-government area indicates that one factor influencing user satisfaction on electronic services is system design. Some basic attributes that should not belong to a public e-government service could seem obvious. However, the history tells us that we never can be to sure of what the future will look like.

Jakob Nielsen's quite funny alert box [14] describes and illustrates the ten worst mistakes in web design. Since many of the e-government services will be presented on a web page, it might be interesting to read this paper before you start developing a service.

As mentioned earlier, many of the e-government services will require communication between subsystems and different authorities where data and information will be exchanged. If a service has different interfaces for each authority the citizens might feel lost and frustrated when having to decide which authority to interact with and in what order. To support various tasks across different authorities, making the delivery of government services transparent to citizens seems to be a good technique to choose. Therefore a service design as illustrated in Figure 2 is preferably to the one sketched in Figure 3 [see e.g. 3].
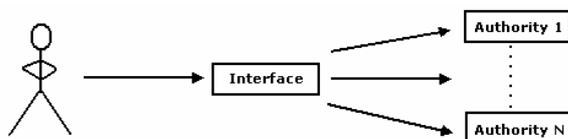
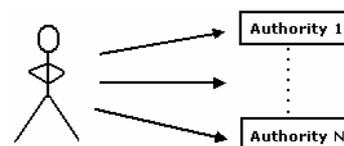Fig. 2 One interface with access to many channels

Fig. 3 Different channels with no common interface

Moreover, to ensure success in electronic services such as a web service system you have to provide efficient user support. An efficient support function increases the user's trust in the service and increases the usage of the service [1, 8, 15].

Other aspects not to be forgotten are the security issues. A lot of attention has been paid to them during the last few years, especially on services where transactions and electronic payment are made. However, many systems have failed because of weaknesses in security. The development process in e-government will lead to many new electronic services such as online web services. All kinds of information, both private and public will be exchanged between different subsystems and Internet protocols will be used as bearers [12]. Therefore it is important to build reliable and trustful services. Otherwise, they might fail and be rejected by their users.

Finally, a new service that will require information to be exchanged between different database systems at different authorities will not only be complex but might also be expensive to be purchased and maintained. Contractors come up with new good ideas and say that it will result in a higher effectiveness of the organisation, but they might not have tested the ideas in practice before. Moreover, the information that the service refers to use is already invented and stored in databases. Since many database systems are large and vulnerable against faults and the new service

requires different tests before it can be validated, it might be a good alternative for the decision makers to purchase a platform with standardized interfaces that reflect the authorities systems. As a result, this might lead to cost savings for the authority in the long run. The following figure illustrates such a test platform that also can be seen as a gateway.
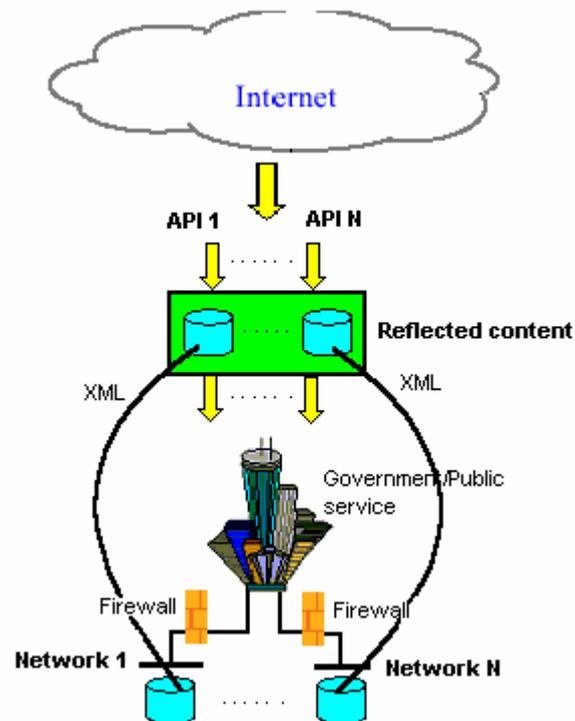

Fig. 4 Example of a test platform with databases that reflects the government/public service databases.

5 Service performance

Results within the fields of the e-government area indicate that the quality of the services correlates to user satisfaction [2, 4, 5, 9, 16, 17, 18 and 19]. In other words, if a service is developed with no respect to the quality it may not lead to success, that is, the users are likely to reject the service. Since large sums of money are invested in new electronic services this issue should be taken seriously. This section will present some considerations of how service quality can be achieved in typically web information systems with a single point of entry as shown in Figure 2.

When new services are integrated and published the buyer of course wants the service to be used, not only by the employees but also by the citizens. However, a web service that has a slow transference and often requires to repeatedly be updated before it can be displayed will lead to dissatisfaction among its users. Consequently, the users might prefer the old fashion way of accessing the service even though it will take a much longer overall time than accessing the service on the Internet. One reason is that the old fashion service often guarantees delivery and it only has to be trigged once. The new service on the Internet might have to be triggered several times and still it can not guarantee delivery, for instance, if the system hangs itself.

When unexpected delays occur many people become frustrated and annoyed. Moreover, a service with high response time and slow display rates may lead to lower productivity [19]. For instance technical aspects such as complicated technique, circumstantial connection with a slow transfer rate, are all aspects that influence the level of users' dissatisfaction [18].

To be able to hold a high quality in a web service, the service should be monitored by performance measurements functions. The measurements give the constructors the ability to analyse the problems that occur, which is a prerequisite to identify bottlenecks and trends. Moreover, the analysis will make it possible to find faults in the systems and take actions. The monitoring measurement should of course be transparent to the users and provide the service with functionality that as far as possible solve the problems automatically.

For instance, functions that measures lead times, system response times, display time as well as times that corresponds to the users behaviors are all examples of variables that needs to be analyzed to be able to take actions for achieving high service quality.   Steven L. Teal together with Alexander I. Rudnicky and Ben Shneiderman [17, 19] explain and give definitions of some of these variables.

When a user is giving an order, a confirmation is expected after a certain time that meets the customers' requirements. However, this might be a problem if receipts comes to late or does not come at all. Still, the user needs a confirmation. Therefore, time stamping and time control is required.
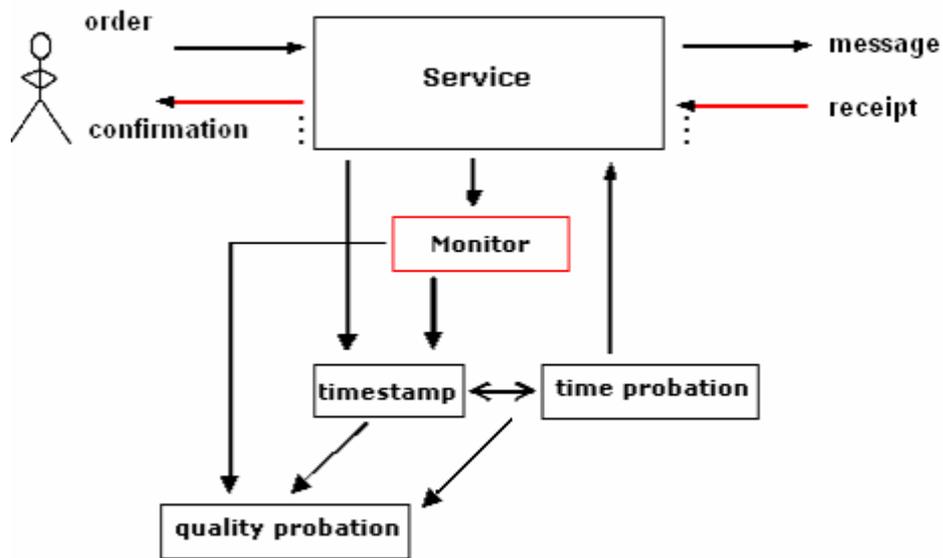

Fig. 5 A web service performance model

6 Experience from an e-government project

One of the projects that came up within the TANGO e-government arena was a service that should provide the citizens with a simple interface in which they could report illness to important instances in their private network. Such a service is illustrated in Figure 6. The interface could either be to send an SMS via the mobile phone or to report via a web page. The key was that the citizens should only have to report to one instance and from that instance the report should be processed to all the important instances such as the children's schools, the citizen's employer, the health insurance office etc. The processing of the report should be transparent to citizens and be delivered automatically.

This seems to be a good idea of a new service since at the moment one has to make many different telephone calls to all the instances involved.
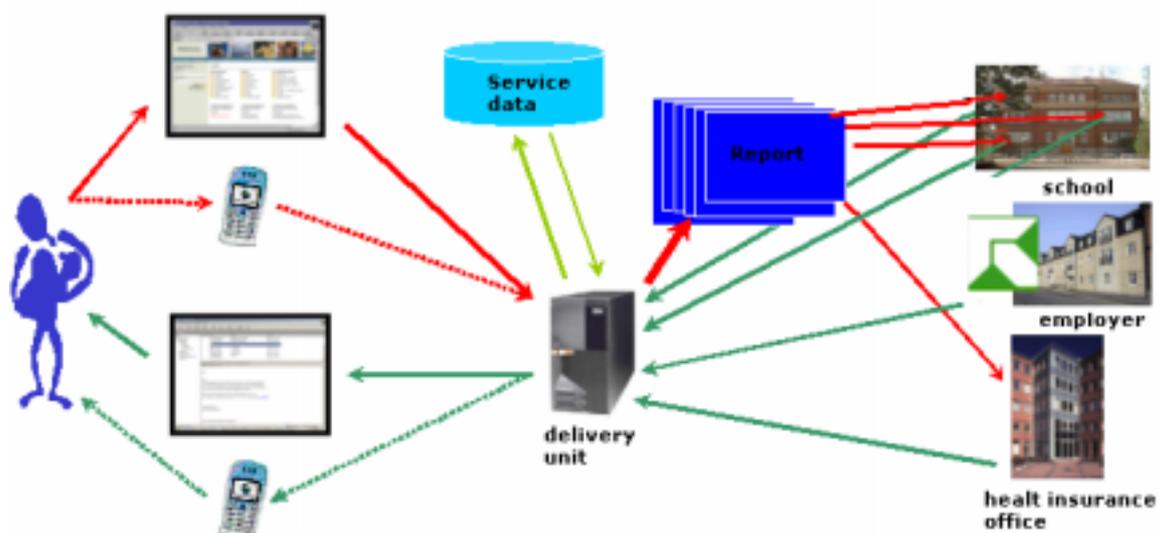

Fig. 6 Service overview

However, such a service could be quite complex and requires collaboration between all involved parts. Since the service will handle personal information it must be trustful to use. Therefore, security requirements were specified in the service. Moreover, in order to be accepted by its intended users, the service must consist of an easy to use and attractive interface as well as provide high service quality.

To find out how the service should deliver data to the different instances such as the schools and to find out how the interfaces should look like, several studies were performed. The result from these studies will be used in the development of the service.

Finally, several user scenarios were studied to analyze how the service should keep high quality. One common model is a family who has the local municipality as the employer and children in the local schools. When one of the children suddenly gets ill, one of the parents must report illness to the school, to his or her employer and to the health insurance office. To be sure of the delivery of the report, the parents will be notified by the system about the status of the report, for example which of the instances have received it. Of course, the parents want to be notified if any problems has occurred or if the system could not manage to deliver the report. As a

consequence the system must have functions that measure activities and take actions in case an activity takes longer time than it should. For instance, in the generic model shown in Figure 7, it is not only interesting to measure the total time from (1) to (4) but also to measure the system response time in every passage (2) and (3).
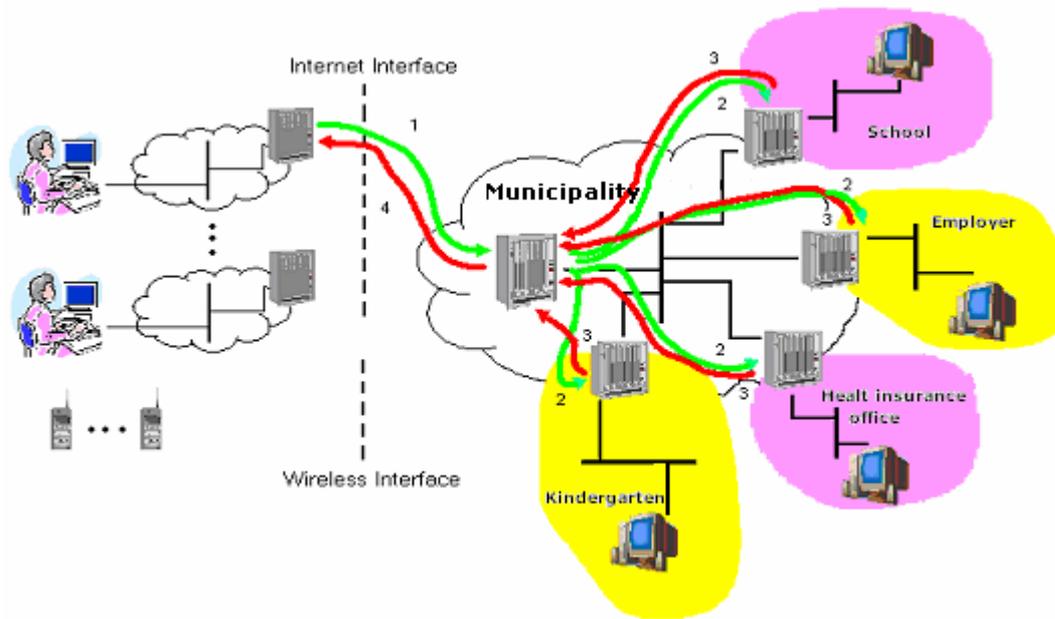

Fig. 7 Example of a general performance model in the service.

Within the project several models were studied and performed and software for performances analysis was developed in other projects within the e-government arena at Blekinge Institute of Technology. The results and the experiences we gained in the project resulted in a requirement specification. The specification is currently being used by the municipality of Sölvesborg where they have the ambition to realize the service by getting help from student workers.

7 Conclusion

Within the e-government area many new electronic services are being developed. These new services intend to speed up the effectiveness and the productivity of the organization and make our lives much less complicated. However, if we do not learn from the history and pay attention to studies that have been carried out around the world, a lot of the investments might be wasted.

Aspects that directly affect if a service will be useful or not includes availability- and reliability factors as well as design factors. A service that does not hold high quality and which is too complicated to use and has a slow transference with many technical faults will be rejected. Moreover, a service with inadequate design issues might as well fail in success. Therefore it is important that the development of a service is carried out by holding an active dialogue between the developers and the end-users as well as with those people who have the proper skills in the different disciplines covered by the service.

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