

A Web-based Management Tool for Health Care Services with Appointment Required

Luis Anido-Rifón
ETSI Telecomunicación
Campus Universitario s/n
E-36200 Vigo, Spain
+34 986 812174
lanido@ait.uvigo.es

Fernando Aguado-Agelet
ETSI Telecomunicación
Campus Universitario s/n
E-36200 Vigo, Spain
+34 986 812122
faguado@tsc.uvigo.es

Olga Folgueiras-Artime
ETSI Telecomunicación
Campus Universitario s/n
E-36200 Vigo, Spain
+34 986 812174
ofolgueiras@gist.ait.uvigo.es

ABSTRACT

We present a Web-based management Tool for Health Care Services with appointment required. This tool lets patients request appointments with doctors and specialists via the Internet. It changes the previous situation where the only way to get an appointment was via a telephone call. Now, with the new system, it is possible to use a desktop computer or a WAP-enabled cellular phone to request appointments for health care services. Additionally, the system eases daily work to doctors and administrative staff, reducing previous paper work significantly and improving the whole service. According to the users, transparency, flexibility and availability are the main advantages of the new system.

Keywords

Web applications, Novel applications, Health Care Service, WWW/WAP, Multi-access, User Interfaces.

1. INTRODUCTION

Currently, Internet technologies are widely used all over the world. Almost every aspect of our daily life is affected, and usually improved, by the use of the WWW. Nevertheless, this is not the case for the Public National Health Care System in Spain. The Spanish Health Care System, with a total budget of 87.732 millions of Euros, is continually taking advantage of new technology improvements, for example, the telemedicine. This year, more than 26.940 million Euros of the Spanish national budget has been dedicated to support public hospitals and medical centers. Nevertheless, this policy, which has been maintained by different governments since 1960's, had no effect up till now in the incorporation of the WWW based services for the end user, in this case, the patient. The Spanish Health Care System WWW site [1] is composed of a set of static pages that only provide general information about the services offered, geographical location for several centers, etc.

In this paper, we present the first experience of the use of WWW technologies to offer an appointment service for the Spanish National Health Care System. Patients access through the Web to get and appointment with their doctor, who can consult his workload or request a specialist doctor appointment for the patient. Both computer desktops and WAP-enabled [2] cell phones can be used. Administration duties for the whole system, which is geographically distributed, can also be carried out through a desktop computer using a Web interface. Security to protect patients' privacy is handled using SSL [3] and WTLS [4].

2. A WWW/WAP-BASED SOLUTION

We implemented a WWW-based management tool for Health Care Services with appointment required. This tool is used by patients to request an appointment with their doctors and make later modifications if needed. It is important to stand out that the implementation that was carried out maintains the current appointment service by telephone calls integrated with the new one. In fact, there are three different possibilities to get an appointment with the doctor:

1. A telephone call to an appointment center. Administrative staff at this center use a Web interface to manage requests from patients.
2. Web-based request through a desktop computer. In this case, a Web browser is used to support the appointment request.
3. WAP-enabled cell phone. Using the mobile phone it is possible to request or modify an appointment with the doctor.

Anyway, there is a centralized database where all information is stored and, even for the first case, the process has been completely computerized. In fact, the Web interface used by the administrative staff at the new appointment center has been proved as a very easy-to-use from the experience recorded so far.

We believed it was important to maintain the three interfaces. The telephone call system represents the traditional system. It is essential because there is still an important percentage of the population in Spain that does not have Internet access. This is especially true for elderly people, who, by the way, are an important group of users for Health Care Services.

The Web browser interface (c.f. Figure 1) has been actively used during the last months. It provides a very easy-to-use tool that makes it very quick to get an appointment. Internet users are now estimated in 4 million people in Spain, that is a 10 % of the whole population. In 1997, there were only 600,000 Internet users. Numbers are increasing exponentially. With the recent adoption of a plain tariff of 16.4 Euros per month, it is expected that during the year 2001 the number of users will be increased over 25%.

There are 24 million mobile cell phones in Spain. After the 1999 Christmas sales and for the first time, this number surpassed the number of cable phones at office or home locations. Cell phones will outnumber PCs sometime around 2005. Although there are not too many WAP-enabled mobile telephones at present, by 2005, there will be Internet-enabled mobile devices in 45 million cars, 300 million homes and

countless other non office locations all over the world. Moreover the third generation, 3G, cell phone standard promises to bring ubiquity to the global mobile telephone industry and increase the bandwidth to 2 Mbps. Taking these facts in mind, it seems quite reasonable, if not essential, to provide a cell phone interface to access the service (c.f. Figure 2).

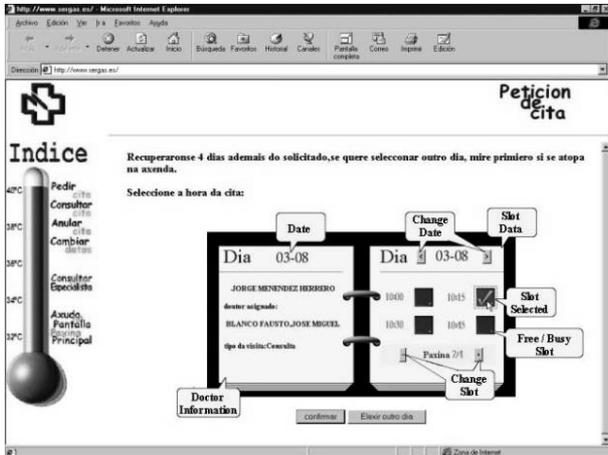


Figure 1: Selection of appointment slot

Doctors are provided with both a WAP and WWW interface to access the following services: consult their assigned workload, manage patients' records and request referrals to specialists. Administrative staff is provided with a Web interface on a desktop computer to manage all data stored in a centralized database. They are responsible for tasks like registering new doctors or patients, set up every doctor's schedule and slot characteristics, move patients from their Health Care center to a new one, etc.



Figure 2: WAP Interface on a Nokia's 7110

3. ADVANTAGES OVER THE PREVIOUS SYSTEM

From the patient point of view, the introduction of the new system offers:

1. *Transparency.* The appointment request is managed by the patient by himself, who is allowed to access all the information about his doctor availability. Therefore, previous confusion on the mechanism that generated so

long waiting queues is now clarified. The Health Care Service's willingness to disclose information has been reflected in the information offered to the end user.

2. *Efficiency.* There are no long phone waiting times at busy hours. Both the Internet and cell phone interfaces offer an always available appointment service. Typical service times range from 1 to 3 minutes depending on network delays. Previous studies showed that service time reached 15 minutes at rush hours. Moreover, appointments with a specialist are more agile since, with the new system, the referrals are directly requested by the family doctor and confirmed by the system automatically.
3. *Availability.* The new service is offered 24 hours per day, 365 days per year. There are no office hours never again.

Benefits for the Health Care System are twofold: firstly, the image offered to its users has been improved, secondly, the new system implies financial savings. Administrative staff needed to maintain the appointment service is reduced.

Data is now gathered around an integrated service that eases patient movements among health centers, change of assigned doctors, management of patient records, etc.

4. CONCLUSIONS

The previous situation in the Public Health Care System regarding the appointment telephone call centers made it essential to reduce waiting times and system availability. The tool presented in this paper brought a new appointment system to the Galician Public Health Services. While keeping the previous system, which was essential to cope with the habits of many people, especially the elderly, two new possibilities were offered: access through a web browser and WAP-enabled cell phones.

Drawbacks are mainly related to the fact that some users were reluctant to change the previous system they were used to, despite of its disadvantages. This was the reason to maintain a telephone call center integrated with the new system. Also, there are not enough computers in the local health centers to allow every doctor to use the new system. The same computer must be used by several doctors making it difficult to take full advantage of it (for example, doctors have to share the same computer to access patients' records or request appointments with specialists). We hope this situation will change in a near future. In fact, the success of the new appointment service is encouraging Galician politicians to invest more on Web technologies.

5. ACKNOWLEDGEMENTS

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6. REFERENCES

- [1] Spanish National Public Health Care System. <http://www.seg-social.es>
- [2] WAP Forum. Wireless Access Protocol (WA). <http://www.wapforum.com>
- [3] Netscape. SSL. <http://home.netscape.com/security/techbriefs/ssl.html>
- [4] Infinite WAP Server: WTLS. <http://www.waplite.com/wtls.html>