

## ***InfoParco: an experience in designing an information system accessible through WEB and WAP interfaces***

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### **Abstract**

*INFOPARCO is a system to support the exploitation for touristic purposes of the environmental, architectural, natural and economic resources of the natural park Velino-Sirente in the Abruzzo region.*

*The system supports access through different technologies, notably through a sophisticated web interface and through a WAP interface that allows access through mobile terminals. The kind of services accessible through the WAP interface are of various nature both static and dynamic, more in detail we can access information on services of public use, accommodations, weather forecasts, description of natural resorts and itineraries, cultural exhibition and leisure in general. In this paper we will discuss the design guidelines we followed in designing the set of services accessible via WAP interface (e.g. guaranteeing a logical coherence with the way the same information is provided at web level) , the technological limitations and the adopted solutions. We will end summarizing on our experience.*

### **1. Introduction**

In this paper we present the INFOPARCO system. This is an information system to support the exploitation for touristic purposes of the environmental, architectural, natural and economic resources of the natural park Velino-Sirente in the Abruzzo region, in Italy.

The system allows access through different technologies, notably through a sophisticated web interface and through a WAP interface that allows mobile terminals access. The kind of services accessible through the WAP interface are of various nature both static and dynamic.

In this paper we will mainly focus on the mobile access and we will discuss the guidelines followed in designing the set of services accessible via WAP, the technological limitations and the adopted solutions. INFOPARCO has been funded by Regione Abruzzo and carried out by a consortium which grouped together an association of architects called GLOBALIA (Global Interactive Architecture

<http://infoparco.regione.abruzzo.it/parcosv/globalia/InfoGlobaliaE.html>) expert in the study of the territory,

interested in a rational use of it, a team of computer scientists from University of L'Aquila and a wireless provider company (Omnitel Pronto Italia <http://www.omnitel.it>) the second mobile operator in Italy. INFOPARCO has been designed with two clear requirements in mind. It should both provide an external user with an easy, flexible and smart access to all the relevant information, and represent an effective tool for the park operators to manage and control the access policy to the park resources. The latter means that the fruition of park resources might dynamically change in order to reflect control and protection environmental policies. This has the obvious meaning that the information accessed through web and WAP have to be necessarily dynamic.

This is a key concept of the InfoParco system: it must operate in a logic of protection and of the natural balance of territory. For example, when showing information on some areas of the natural park or on some animal species, the system can "hide" or keep customers away from those places where special events are in place. For example, protected animal species reproduction in some periods of the year.

This is a typical example of how the tourist fruition can be modeled depending on the variable conditions of a territory that can change many times during a year. This type of information can have an high impact only if accessible, besides the web, through very diffusive media like mobile devices, since due to their dynamic nature their value changes in time and in space.

The park operators can at any time change the parameters involved in the routing process algorithm and specify the amount of time that an area must remain protected and this for every information present in the system. This can be achieved changing the main parameters database through a special graphical interface designed specifically for park staff. For example you can change the status of a single animal point of presence to "hidden" thus preventing that point from being listed in park resources and routes.

The paper is organized as follows. In the next section a short introduction on the use of WAP in the InfoParco context is given. Section 3, presents the list of services at present implemented or under implementation. Section 4,

discusses future extensions and briefly summarizes our experience so far.

## 2. Wap and InfoParco

In order to guide the global development of the new wireless applications, the leaders of the telecommunications industry formed the Wireless Application Protocol Forum [1].

The WAP Forum has proposed the WAP specifications that extend and leverage mobile networking technologies, such as digital data networking standards, and Internet technologies, such as IP, HTTP, XML, URLs, scripting and other content formats.

Nowadays, although with non trivial problems of standards still unresolved, programming in WAP is technically feasible. However, the success of these applications depends on the way they are designed in order to best exploit the characteristic of mobile devices and bypass/easy their limitations.

In order to meet these goals, is very important to consider the characteristics of the target devices and the wireless environment in which they operate. In our case we concentrate on WAP version 1.1 compatible telephone terminals since these will be the target terminals for our application. The main difference between WAP 1.1 and 1.0 reside mostly on displaying features (1.1 introduces table and images).

The WML (Wireless Markup Language) is a light markup language similar to HTML. It has been optimized to be used by wireless handheld devices, to meet the needs of wireless communications. Instead, WML is case sensitive and is a language derived from XML and specified in a DTD document.

Our system is optimized to run best on Nokia 7110 and on Phone.com browsers. The WML can be variously interpreted by browsers from different manufacturers both in display and behavior. A single generic application can be developed with a subset of WML that works on multiple browser phones, but often a well targeted application performs best in usability and navigation.

To test the application we used two SDKs: the Phone.com UP.SDK 4.0 and the Nokia SDK 1.2 since they render the content almost differently (different layout and different commands for the user). The web server can identify the type of browser requesting HTML or WML pages and consequently output web or WAP content and in the latter case a further distinction is made between a UP.Browser phone, a Nokia 7110 or a generic one; the distinction is accomplished by redirecting the browsers to customized home pages.

### 2.1. Limitations

Providing Internet and WWW services on a wireless data network is not straightforward.

In our case the most important limitations on the wireless devices side concerned the limited displays and phone keypad. From the wireless data networks side we had to take into account the less bandwidth, the more latency and the less connection stability. Actually GSM Data and SMS are used as WAP bearer and in a short future also GPRS. The SMS bearer will easily be migrated to GPRS, as it is available.

This implied that our design guidelines tried to focus on small, precise but added-valuable information requests. In the following section we will present a set of services that, in our opinion, have the above mentioned characteristics.

### 2.2. InfoParco

The InfoParco WAP interface is necessarily simple due to the standard of actual mobile networks and wireless devices, but in the meanwhile allows for a good balance between information retrieval and speed, that is the number of steps involved querying the system.

As well as the web site, the InfoParco WAP site is bound mainly to dynamic content and access the same real-time database of the web site.

The main group of information concerns addresses and telephone numbers of public services, accommodation, food, emergency numbers, weather forecasts, cultural attractions, free time, roads condition and many others. Some of these services will be analyzed in detail in the next section.

The WAP interface basically consists of a series of WML stacks that contains cards, that are the equivalent of a web page, in which users operate their selections among multiple choices in a menu of entries. In this way the user can navigate inside the WAP site following the links and outside the WAP site specifying new addresses (URL).

The WML stacks and cards are dynamically generated thus making it possible to present different pieces of information to different users and more importantly allowing the information to be modified in real-time by park operators (e.g. due to weather conditions some routes can be closed) using a Microsoft Windows GUI front-end to the main database designed specifically for them.

### 2.3. Design Guidelines

In general, any guidelines for developing an effective application are largely determined by user requirements and design constraints. When developing an application for mobile phones, the device constraints are serious

limiting factors and usability of an application becomes even more important in this case.

The design guidelines mainly concern the way information is searched in the site (navigation guidelines) and the way the intermediate and final results are presented to the users.

All the improvements in the interface are all directed towards the main four parameters to keep in mind when doing WAP applications:

- Small displays and poor user input facilities
- Limited bandwidth and latency than traditional networks
- Great variability among different phones
- The user pays per seconds of connection and costs are still high (at worst equals to voice calls)

User selections are preferably displayed as a selection list seldom asked as a raw input, trying to minimize the use of the phone keypad. This also cuts down on mental workload that would otherwise have to be performed in order for the user to get what options and actions are currently possible and then map those intentions to commands that the phone can accept (Paap and Cooke, 1997).[3]

When coping with a fixed sequence of selections the user can at any time terminate the preference insertion phase and go directly to the end assuming a default set of preferences.

Another improvement in navigation regards the way services located in different places can be accessed. When the number of places is low, it is intuitive to display the list of all localities and then operate a second selection on the resources there available. But if not all localities present the same resources then it is more suitable a resource based selection and on the following card only the localities where those resources exist. For example, selecting the item "Hotels" would display of all and only the localities where there are hotels, thus minimizing the number of choices and organizing the information more suitably for a narrow territory like the Sirente-Velino park as shown in Figure 1.

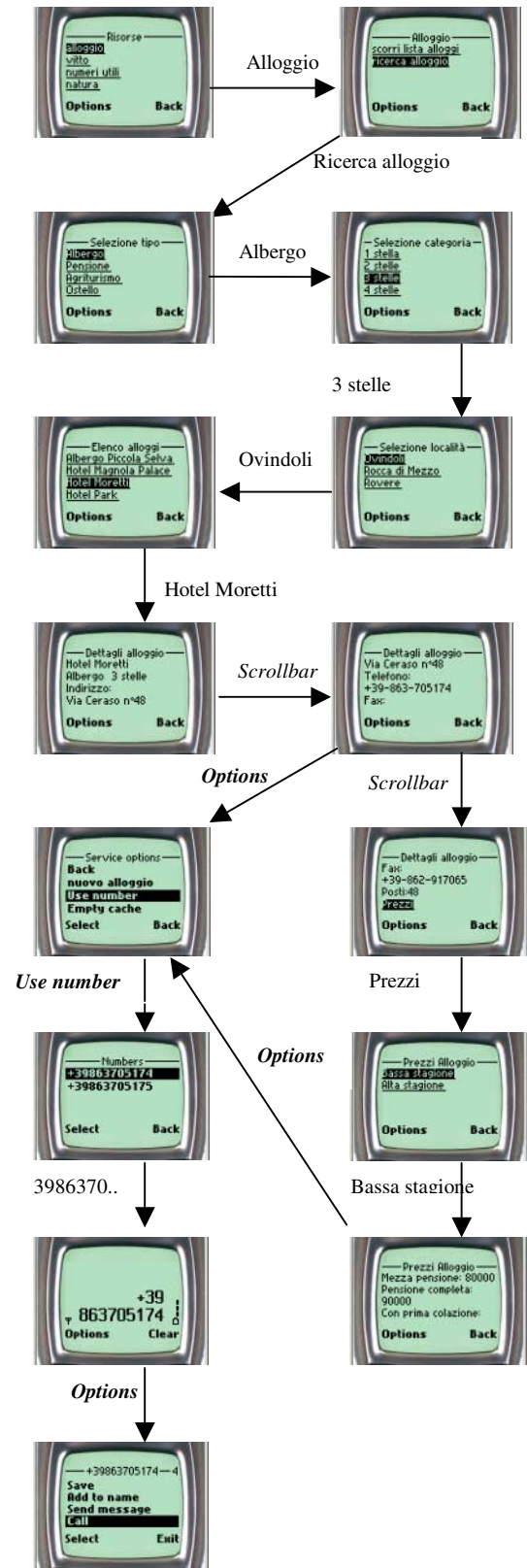


Figure 1 – Hotel reservation screenshots

One of the most important element in our project was the careful design of the menu-based navigation system and especially the main menu. Is on the look and feel of the main menu that the user become acquainted with the application and also by carefully ordering voices in the list: we give them an order putting the items most likely to be chosen first.

It has to be remembered that user will perceive the efficiency of the system by the navigational structure also. The less the steps involved in obtaining the information needed, the best user satisfaction, shorter times, less costs, etc.

The obvious solution is trying to flatten the menu structure adding more voices to the main menus and trying to keep low the number of levels: it's not a bad idea to sacrifice the length of the main menu and consequent ones because the user become familiar with static menus even when there are long lists of voices. A good number for limiting menu voices seems to be 8, since most browsers support 8 lines it's equivalent to 2 screen scrollings.

Designing a good user interface for this kind of devices it is still a research topic and an open field of experimentation. Few works are reported in the literature on how users interfaces of consumer products should be designed. [4]

Efforts to solve the lack of standards among different browsers lead us to define design constraints and a new set of design guidelines. The first consideration we can make is about the number of characters per line, since a generic browser has 15 characters ad 4 lines, while a Phone.com browser can have 2 to 8 lines depending from the model and a Nokia 7110 browser has 18 characters and 4 lines.

At last stating our essential design guidelines we have the following list:

- Limit the length of links and labels trying to choose names that are easy to understand. This is an interoperability issue since some browsers can truncate labels and make them lose their meaning, so it's best to reduce than being self-reduced.
- Organize application menus with short words rather than abbreviations. Whenever possible it can be helpful the use of icons.
- Define a backward navigation on every card. It's very common on some WAP sites to reach pages without a way of exit. With a web browser this is not a real problem, with a WAP phone is absolutely annoying.
- Minimize the number of levels of menu hierarchies. The user can get lost between multiple levels menus.
- Always use a headline for every card. The navigation will be simpler.

- Like wap navigation use links to expand a concept. Texts will be shorter and the user is free to ask for further details.
- Perform readability and navigational tests with different WAP emulators. Every phone manufacturer distributes applications like this
- Make use of fonts and their attributes to highlight the hierarchy between shown elements
- Always use dimensional attributes for images to have a perfect layout of cards

### 3. Services

In this section we will have a look at the main services available on the InfoParco WAP system.

#### 3.1. Accommodations

In this section appear the information services on:

- Hotels, boarding house, landlord, Bed and breakfast, ...
- Restaurants, family restaurants, pizzeria, pubs, cafe, ...
- Camping, ..

Trough a driven selection the user makes choices on parameters like price, type of service, cooking specialties, and so on. The system gets back the list of resources that best fit the input parameters and makes it possible to display many other details registered in the database and to place a direct telephone call.

In the Velino-Sirente park it has been activated a pilot-project to experience remote reservations. The project consists of an integrated human and automated reservation process: the InfoParco system takes the initial request from the user through the WAP interface, sends it to the tourist operator via e-mail, SMS or FAX together with the mobile phone number of the user.

The operators that receive the information from InfoParco system can handle it electronically, integrating their mailing application with the account application, or manually. In any case the operator will acknowledge either by calling back the user or by sending him a single SMS to confirm the reservation request.

#### 3.2. Weather forecasts

Weather forecasts are becoming of strategic importance, especially when targeted for a particular area. The Velino-Sirente park is the ideal destination for mountain excursionists and skiers in the winter and his main visitors are from the Abruzzo region and from the capital Rome.

The forecast system interfaced by InfoParco permits the definition in the range of 5 km and so can take advantage of the fact that the park territory is narrow and concentrated in a relatively small area.

The forecast service is administered by the Parco Scientifico e Tecnologico d'Abruzzo and can be accessed on internet with a web interface at the following address <http://www1.aquila.infn.it/mm52web/index.html>. It provides daily weather forecasts for Italy using a particular model of simulation that allows to lower the resolution for Abruzzo (the region that comprise Sirente-Velino park) to only 3km. In this way you can have very accurate weather forecasts on the entire extension of the park. The service is further customized for InfoParco including the forecast for all the major centers in the park, the temperature for five hour-zone during the day, the forecast for minimum and maximum temperature and general info about rains and clouds.

### 3.3. Routes through the park

This is a very useful functionality, though still under beta testing. This can be seen as a typical WAP application since many visitors of the park need an aid when they are on the place, where the typical kind of visitor is the weekend tourist, who has not planned before the holiday and needs to be driven through the beautiful places in the park. There are two ways of navigation: with starting points from a chosen locality or by selecting standard routes in the park, such as marked routes and specific routes signaled by Italian guide clubs. The first let the user select a starting point (a locality) and then let him specify preferences such as architectonic, natural, folkloristic, etc. and the used transportation medium (foot, car, horse, motorbike, bike).

The system replies with a list of localities matching the user preferences and shows a textual list of possible routes through that points.

Another possible use of the first mode is inserting a number associated to a geographical or natural point and signaled by an appropriate label on the road or by the park maps. This reference system helps the user step by step during his travel in the park. So, if someone gets lost in the park it is possible to call the InfoParco WAP service, insert the number read on the label and get all the necessary information to continue the route or reach the nearest center.

This involves marking the territory with labels reporting numbers corresponding to those registered in the InfoParco system. This work has yet to be done.

The second functionality steers the visitor through well known routes, highlighting noticeable places along the

track and permits the same grade of interaction of the first mode.

## 4. Future extensions and conclusions

### 4.1. M-commerce

Mobile electronic commerce (m-commerce) has seen a rapid evolution in latest years in contrast with the slow growth of e-commerce in the first years of World Wide Web history. The latter was because of technical issues like the low number of wired Pcs and the lack of secure transaction standards and partly because of cultural or psychological issues, since people were not acquainted with Internet and all its idiosyncrasies. At present the WAP scenario is non very dissimilar from that depicted above. Wireless devices have a wide diffusion, and especially in Europe in many countries the diffusion of PC in families is much lower than that of cellular phones. This, on one side is a real advantage if compared to the Internet rise, but on the other side there are still too few WAP enabled cellular phones and WAP services available. Moreover there is a lack of standards for secure transactions with the WAP protocol despite the GSM network itself is considered secure.

At the same time cultural and psychological barriers seem finally defeated by the new-economy trend and the definitive affirmation of Internet.

The future development of InfoParco sees the extension of the actual reservation mechanism toward a secure system that "guarantees" the user reservation by mean of secure transactions., for example in order to send credit card info for hotel or restaurant reservations.

Again InfoParco will be able to keep in contact the park operators (small producers, manufactures, shops, touristic operators) with the Internet community in a interactive manner carrying out an e-commerce framework and what's more important freeing the user from the incumbency of organizing all the aspects of her holidays.

### 4.2. Location Based Services

At present wireless companies do not supply information about the user's geographic position but this is expected to become soon possible, when technical and social difficulties will be solved. We think that the use of location information might be usefully exploited to enrich the set of InfoParco services going from people positioning services to people assistance along a path, high mountain assistance, etc. Also the already existent services will greatly benefit of this new parameter, besides the new actual piece of information, location information can be used to simplify the user interactions by

automatically customize the system selections depending on the actual user location.

### 4.3. Present state

At present InfoParco is a prototype with public access. We expect to release a first version of the system after a limited time of controlled experimentation.

The experience we have gained so far has been mainly related to the study of design guidelines to make the InfoParco Wap interface useful and flexible for a generic user. In the actual application programming there were difficulties due to the lack of information and to the lack of conformity in between the used simulation environments and the actual application behavior as displayed on the real device. Moreover the lack of standards among different browsers introduces another level of complexity and makes experimentation in this field difficult and time consuming.

There are still too few running applications to draw sensible conclusions on the effectiveness of the proposed approach. At the present stage of development of the WAP technology we think much more experimentation should be possible and the lack of a reliable and widely accessible network infrastructure and of reliable terminals does not favor the diffusion of WAP technologies and the improvement of WAP programming techniques.

## 5. References

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