

Mobile Upgrade of University Information Systems

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Abstract: *Two approaches based on the contemporary mobile communications in respect of their application for university information systems have been analyzed – a WAP or SMS based access. General algorithm for the operation of a SMS accessed UIS has been presented and some most typical applications compared in respect of their convenience for use and volumes of delivered information.*

Special attention has been given to the social and economic aspects of this modernization as well as some further applications of the new approach outlined.

Key words: *mobile communications, information systems, university, mobile information systems*

INTRODUCTION

Contemporary University Information Systems (UIS) are based as a rule on the sole use of computer hosted databases. The specific organization of such a UIS depends first of all on the requirements of the management of the university and partly on certain already established traditions related to the general organization of the educational process in the country and in particular at the specific university. The overall structure of the UIS covers various projections of the university operations in their complexity. Nevertheless certain common functional features can be derived in what we may determine as typical UIS. These features could be listed (without priority) as follows:

- modular structure;
- authorized access;
- service oriented;
- multi access;
- dynamically updated;
- databases contain private and public information;
- relatively unchanging structure.

All of the above features when combined act in unity to produce certain end-user outputs. These in turn through a number of interfaces interact with the departments and units of the university, thus sustaining the overall educational process.

The following types of functional subsystems shall exist in a typical UIS from an organizational point of view, in order to consider it comprehensive and up to the minimal contemporary standards: **finances, students, staff, curriculum & schedules.**

The major function of the financial information subsystem is to hold and supply all necessary information related to financial and accounting issues as well as analytical data requested by the management in the process of planning and strategy building. By its nature, all information available in and produced by this subsystem should be treated as confidential. This defines access and even more operations with this subsystem limited and not of public type. Accordingly, all services supplied must be delivered upon strict authorization.

The information system dealing with students' status is of a more open type. Students are external to the educational institution. They come, stay and go some day, but there always remains some link between them and the university as far as they appear to be customers to its services. The result effects of these services or the traces they leave in students fates may be seen or stay for life. Such interaction makes the contacts with this information subsystem more open and hence defines it as generally public oriented. This orientation however shall not be seen as reason for unlimited access to the content of the system. As far as we are talking about personal data hold in this system, we must follow certain rules for operating with such information. In most developed countries, the law prescribes quite strictly the way such information is treated and manipulated. A special exception of this principle is the use of the personal data related to the admission procedures when these foresee open competition between the candidates. Such case

exist in number of countries where some or all state owned universities require open bid for the available free student positions. Disregarding this specific situation (which however should be seen transitional) in all other cases the personal data held in the students' information subsystem shall be treated as publicly available, but always individually requested.

Quite similar but not the same is the situation with the data held in the information subsystem dealing with staff issues. Again, we have individual data, which by law belongs to the staff members. However being members for some time of the university's employees group, they have to place at the disposal of the employer or the rest of the academic community facts and data related to their personality, professional path and achievements. Some of this information is shared by necessity for the period of their stay with the university at least within the staff community, but may become closed or with limited access upon their leaving of the university.

Lastly, the information held and processed by the fourth major information subsystem – curriculum & schedules – is obviously fully public, as it exists for and through the public perception. Naturally, such information should be as easily accessible as possible. Something more – this type of information is perhaps second most dynamic after the information in the financial subsystem.

GLOBAL REQUEST FOR INFORMATION AND UIS RESPONSE

It has been mentioned earlier that functions of the UIS are service oriented. The services may be requested both internally (within the institution) or externally (from any other body outside the institution). The term "internal services" is somewhat conditional as these types of interactions are rather internally innate to the institution than provoked by some specific interest of the requesting party. This is even truer if we take into consideration that in our case we have an institution, a great deal of the mission of which has a very strong social exposure. Hence, we may not apply correctly in the case the principles valid for purely market-oriented units like companies for instance. Therefore, the case of the internally originating relations based on profit generation with all consequences of this, falls beyond the scope of this work and will not be analyzed further. Let now focus on the external relations of the UIS and how this would affect their operation and output.

If we assume that external inquiries are based on satisfying certain interests of bodies that remain outside the institution, than most natural will be treating such inquiries as normal trade orders and accordingly apply to them all principles of a normal deal. Such commercial approach may not seem understandable in the beginning, but it describes the situation most realistically in terms of its practical implementation. Something more, it gives a clear distinction between any measurable and non-measurable characteristics of the information exchange process. As a result, we may distinguish priorities amongst performed functions by the system and accordingly apply most adequate approaches in satisfying these external interests.

Today's realities strongly affected by the globalization processes determine wider opening of human minds, institutions' relations and general interaction between everybody and everything in the society. What was considered yesterday just internal question today becomes a matter of common interest to many. Therefore, purely functional acts of certain system are treated now as part of a more complex interaction between the parties involved in the information exchange process. To describe this new interaction it is easier to assume that some of the output functions of the UIS have now been converted into services. Once we take this for granted the solution for the task is shifted on a different plane. Now we do not look at the processes of delivering information as at purely technical sequence, but treat them by the customer service principles. One of the most important among these principles is that customer interests are leading in the communications.

It will be fare to admit that the "service" relations have been existing ever since the modern UIS originated. This was done in the form of delivering various notice and

confirmation letters or documents, certificates, etc. to the students or third parties requesting them. This form of interaction comprised the public side of the communication. It still exists and will exist as this kind of "production" ties to the very essence of the universities' services. We may refer here as well the granting of the formal diplomas upon completion of the higher education course. This example is a good reason to remind that sometimes the public nature of the services delivered by the UIS have (and must maintain) ritual like form. Otherwise, we may loose the connection with the moral merits that measure the social importance of the status gained through the universities. However to remain focused on the organizational and technical side we would not examine further this kind of interaction that sticks more to the intrinsic values of the higher education.

The institutional or private access is always clearer in respect of the formal actions that it requires to deliver the desired information. Therefore, certain bureaucracy is always present in this kind of interaction, sometimes bringing the formalities to an absurd level. As mentioned, modern society needs fast and cost effective procedures to communicate and run its everyday life. This very often contradicts with the actual situation at the universities when it comes to receive some trivial information concerning student's or staff's present or former status. Obviously existing forms of communication with the appropriate UIS are not sufficient to achieve the desired level of effectiveness. Realizing this, the universities have already turned to some modern forms of interaction with their students (it will be fairer to call them clients), staff or other institutions. Such forms are the various types of Internet based reference or information pages that practically every university maintains nowadays. The Internet technologies however contain some inconvenience, especially in their classical appearance with computer based access and use of public networks.

The fast, almost explosion like development of the mobile communication technologies the last years gave new chances for qualitative rise in the use or the access to the UIS. Both the tremendous improvement of the hardware and the increasing of the connections' speed allowed for full implementation of these new means of contact in a field considered until very recently absolute conservative and almost completely personally managed.

TECHNOLOGICAL BACKGROUNDS OF MOBILE ACCESS TO UIS

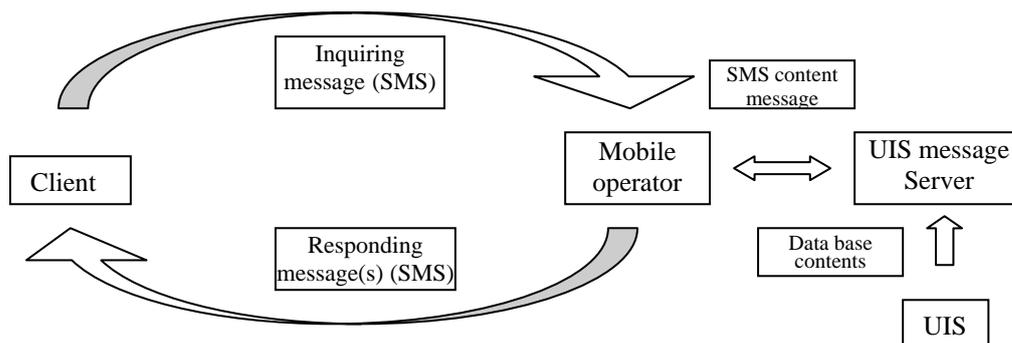
Talking about mobile technologies and their implementation in the management and use of the UIS, we should note that the first attempts in this respect copied almost completely the approaches existing by the time of their appearance, the Internet. The analogue to the Internet WEB pages access in the mobile communications initially was the WAP (Wide Application Protocol) technology. The principle of its work is very similar to the basic principles used in building and working with the well-known WEB pages. However, the specific nature of the mobile phones does not allow for much convenience through this technology. For unbiased developers the WAP based information interfaces seem quite tempting to use when they first start to design the system. When it comes to practical implementation however, it becomes clear that such systems are inconvenient to both manage and use. Though there are still examples of using this type of technology, it did not gain much popularity. Partly this is due to inconveniences in its use, partly to imperfections in the parameters of the technology and the speeds at which it was run. No matter what the reasons for its unpopularity were, this method of interaction is generally limited in use and possibly will extinguish with the appearance of the new mobile technologies for information exchange.

Another, more prospective alternative in using the mobile technologies for the purposes of UIS is the SMS (Short Message System). Unlike WAP technology, this one is much easier to use, it does not require sophisticated hardware (virtually every mobile telephone can send and receive SMS's) and finally it utilizes in a much more efficient way the capacity of the mobile networks. Probably for these and few more reasons, this technology gained much more popularity amongst both the operators and the information

systems developers. Being oriented to the packet transmission however, it suffers the inconvenience of the limited size of the information carrying packets. The standard length of a SMS is usually limited to 160 symbols, this imposing certain restrictions on the organization of the information exchange. Actually, these restrictions are the starting point when commencing the design process for the mobile options of the UIS.

Generally, the SMS based information system works on the principle of queries and answers. This mode is imposed because of the fact that the SMS exchange in the mobile networks is always performed off-line, i.e. there is breaking in the continuation of the information flows (unlike the work with WEB pages). In fact, most of the time the information exchange channel in the mobile network stays off which is very much in favor of the efficient use of the latter by the operator. Probably for this reason, the mobile operators welcome the use of their facilities for information exchange through SMS's. However, as usually happens in life, what is good for one is not necessarily good for the others. The first that face the disadvantages of this technology are the designers and the developers of the mobile information system. In order to optimize the work of the latter, very careful planning of the systems' command structure is needed with the aim to minimize the number of inquiries to the system in order to get the desired information (every inquiry is a separate message from the client and respectively imposes cost on him).

The general working layout of such mobile information system is as shown on the figure:



By default, the active party in the information exchange process is the client (there may be some cases when the UIS message server takes the communication initiative, but generally, this should be avoided for legal purposes). Once a need for certain information arises, the client initiates an inquiry process, by sending a single message to a predetermined short mobile number with the following general format:

Command Code [personal identifier] Parameters

The **Command code** tells the UIS Message Server what actually is required as return information. The **Parameters** specify certain details in the inquiry (dates, departments, subgroups of information, etc.). The **personal identifier** is not compulsory as information about the inquiring party (mobile number) is normally included into the message by the standard exchange protocols. In some cases, the normal work with the mobile information system may require preliminary registration of the users aiming to identify them more precisely later in some specific data searches. Such an approach reduces significantly the amount of sent information by the client and makes the overall communication with the system easier.

It is not a purpose of this paper to analyze all possible applications of so described mobile information system, but virtually all types of general-purpose information may be transferred with it as far as the delivered information may be grouped in relatively small blocks, corresponding to the size limitations imposed by the SMS technology. In the

special case when larger amount of information has to be delivered to the requesting party, this can be distributed in a sequence of responding messages, delivered to the inquirer consecutively. The primary purpose of such systems however, is to supply at every point and time just reference information, which should always be kept in mind during the design process. Failure to comply with this simple rule may (and most probably will) deteriorate the practical usefulness of the system.

NON-TECHNICAL ASPECTS OF THE MOBILE ACCESS TO UIS

It is interesting to access as well the social and economic aspects of the introduction of this new type of information system. First and most obvious effect is the significant increase of the transparency in the society. The system allows for continuous, direct and completely dependent on the will of the citizens check for important personal and public data. Because of the high level of automation, the system makes it possible to inform all interested parties round the clock increasing this way greatly the convenience of use. Something more – the practical elimination of the human factor in the contact, prevents completely any existing corruption practices or these that might appear in the future. The chosen hardware base for the operation of the system – the mobile phones - makes it virtually possible for everyone to be informed easily and at a low cost. Another advantage arising from the selected mobile technology (the SMS exchange) simplifies significantly the interaction of the clients with the information sources. This definitely is not applicable for WEB based information system, which require both special means of contact (Internet and computers) and certain skills to operate with this equipment, which in any case exceed much further the knowledge required to operate a simple mobile telephone set. The system is also more efficient in terms of its economic parameters. Apart of the low maintenance cost (practically no permanent service staff is needed), the actual expenses related to the use of the system depend solely on the price policy of the mobile operators. Whatever this policy might be, the cost of a SMS is usually incomparably lower to any other costs related to the mobile services. In fact, this was the major technical objective when first the idea of the system was discussed. There is another economic aspect of the selected structural approach – this is the adopted principle that the delivery of information is paid by the one who asks for it. Implementation of such philosophy makes the whole process fairer and all parties more responsible, while keeping the overall cost of service at the lower levels.

CONCLUSION

The modern communications open new opportunities for everyone including the universities. The concept and implementation of the mobile information system presented in this paper is just an example of how these opportunities may serve in harmony the interests of the society and the institution. Because the structure and the technological platform of the system are fully based on use of software, practically the only limit of the scope of the services is the imagination of the developers and the physical limitations of the mobile networks. Even with the present generation of the mobile networks and phones, the information system implemented and operated by the Technical university of Varna is capable of delivering all types of references that usually students require. Though sometimes the format of the messages is a bit unusual, this by no means affects their practical usefulness. The designers' team is already working on the next stage of the project, focused on the introduction of the MMS (Multimedia Messages System) technology into the system and adding functions for managing standard office services through the mobile information system (like remote printing, E-mail sending and receiving, fax transmissions management, dynamic data base content's management).

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