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APPLICATION OF NEW TECHNOLOGIES IN THE UNIVERSITY LIBRARIES

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PRIMJENA NOVIH TEHNOLOGIJA U SVEUČILIŠNIM KNJIŽNICAMA

SAŽETAK

U prvom se dijelu rada knjižnica definira kao dinamični i složeni sustav koji neprestano korespondira s vanjskim svijetom. U knjižnični sustav stalno ulazi građa i informacije, kao i administrativni podaci potrebni za poslovanje. Knjižnično se poslovanje odvija u skladu sa skupom internih varijabli koje se prilagođuju karakteru ulazne građe i tako aktivno doprinose naravi i dostupnosti proizvoda koji izlaze iz sustava. Najvažniji su proizvodi za korisnika svakako informacije i podaci o nabavljenoj novoj građi, kao i o vezama te građe s onom koja već od ranije postoji u knjižnici, a slična joj je po sadržaju ili značenju. Svijet izvan knjižničnoga sustava pruža knjižnici povratnu informaciju koja se koristi za stalno mijenjanje organizacije, strategija i ciljeva sustava te vrednovanje i procjenu njegove djelatnosti u odnosu na korisničke zahtjeve. Sastavnice knjižničnoga sustava jesu sama knjižnica i njezin upravljački odnosno administrativni sustav. Vanjski čimbenici koji utječu na upravljanje knjižnicom jesu: nacionalna ili lokalna/e politika, povratne informacije, tj. zahtjevi za nabavom nove građe ili pružanjem novih usluga i informacije, koje se odnose na status knjižnice. Na knjižnicu utječu odluke upravljačkog odnosno administrativnog sustava i informacije primljene neposredno od vanjskih čimbenika, npr. dobavljača, nakladnika itd. te od drugih knjižnica, koje pripadaju širem knjižničnom sustavu.

U drugom se dijelu rada govori o informatizaciji knjižnice i pomagalima koja mogu osigurati pružanje novih usluga. Dosadašnji je rad na informatizaciji knjižnica uglavnom obuhvaćao osnovno interno poslovanje, pa je prema tome bio pretežno usmjeren prema korisniku knjižničaru. U drugoj se fazi informatizacija usmjeruje neposredno prema krajnjem korisniku knjižnice, pa se izrađuju takva pomagala koja omogućuju sučeljavanje različitih vrsta podataka (različitih datobaza) i informacijskih pomagala s raznim kategorijama krajnjih korisnika. Postavljaju se višefunkcionalna radna mjesta (work station) s kojih je moguće:

- pristupiti u kataložne banke podataka s izravnom vezom koje pružaju lokalne podatke o građi i njezinoj dostupnosti; izrađene su smjernice za postavljanje i razvoj prototipa OPAC za korisnike četiri sveučilišne knjižnice (Padova, Verona i dvije knjižnice venecijanskog sveučilišta),
- pristupiti datobazama s izravnom vezom,

- pristupiti datobazama s izravnom vezom i ostalim izvorima informacija pohranjenim na CD-ROM-u,
- osigurati dostupnost elektronske pošte za komuniciranje s drugim korisnicima,
- osigurati telefaks,
- osigurati pristup različitim bankama podataka dostupnim putem sustava vizuelnog predočivanja (viewdata).

Na padovanskom je sveučilištu izrađen prototip OPAC za čiju je izradu upotrebljena programska podrška razvijena u okviru talijanskog nacionalnog projekta knjižnične informatizacije, tzv. SBNa (Servizio bibliotecario nazionale). Projekt je započet u proljeće 1989, a očekuje se da otpočne radom krajem 1990. odnosno početkom 1991. Odvija se u tri faze: 1) utvrđivanje kategorija korisnika i analiziranje njihovih zahtjeva, 2) specificiranje funkcija OPACa za krajnje korisnike i 3) izrada i razvoj prototipa OPAC.

Zbog razlika između ciljeva projekta SBN koji je izrađen za korisnika - knjižničara i projekta OPAC, koji je usmjeren prema korisniku sveučilišne knjižnice definirani su posebni zahtjevi koje projekt OPAC mora ispuniti:

- program mora biti izrađen modularno, tako da se u budućnosti može nadograđivati,
- mora biti omogućeno različito predmetno označivanje i pretraživanje,
- korisničko sučelje mora biti pristupačno za uporabu,
- korisniku se mora pružiti mogućnost tiskanja rezultata pretraživanja i stvaranje standardnih bibliografija ili popisa literature; također mora biti omogućeno pamćenje načina pretraživanja,
- korisni podaci o pretraživanjima u sustavu moraju se čuvati poradi kasnijega vrednovanja.

Planira se pokusni rad sustava koji će omogućiti njegovo vrednovanje.

SUMMARY

The first section of this paper gives the overall methodological and reference insight necessary when interacting with a so-called 'library system', whether such interaction be required for handling or for making use of the services offered by the library. With this reference insight in mind, the second section of the paper describes some of the available information processing instruments which permit supply and/or planning of innovative library services.

1. Introduction

The point of view by which we hereby consider the application of new technologies in the university libraries is primarily that of the final user who should be able to greatly benefit both in a qualitative sense as well as in a quantitative sense from such technologies. However, before starting to consider the actual specific usage aspects of new technologies in the university libraries from a point of view of the necessities of the final users, the characteristics of the library ought to be viewed and a reference frame of the 'library system' needs to be extracted. After having done so, we might be able to consider the introduction of these new

technologies in correspondence to an improvement of the user/library interaction and of the services from which the user may benefit.

When planning the use of an automatic information processing system in a 'library system' environment, one must first be aware of that reference frame. Only in this manner, in fact, it may be possible to keep into account the complexity of the system with which one is interacting, and to be aware of the necessity to carry out a series of operations consistent with actions and activities to which the automatic information processing system have no direct competence, but which constantly interact with it.

In the last few years we have noticed the availability and introduction of a series of hardware and software instruments on the market, providing innovative services for libraries; among these instruments/services we may here mention a few: the various available library automation software tools, 'on-line' databases which can be accessed directly or by means of a CD-ROM, 'scanners' for visual acquisition of documents, viewdata systems, electronic mail systems, telefax, etc.

However, the introduction of these instruments into the library system, due to the fact that it is seldom accompanied by an overall project for improvement of the services offered to the users, has hardly ever reached the expected results. A tendency currently emerging in the information processing sector, may however, give some interesting results if correctly, and entirely, applied to the automation of the 'library system'. This tendency is analysed in the paper.

2. The library system

2.1. Introduction

The point of view by which we hereby consider the introduction of information processing instruments in a library is primarily that of the final user who should be able to greatly benefit both in a qualitative sense as well as in a quantitative sense from such automation.

However, before starting to consider the actual specific usage aspects of informative instruments in a library from a point of view of the necessities of the final users the characteristics of the library itself ought to be viewed. After having done so, we might be able to consider the introduction of these informative instruments in correspondence to an improvement of the user/library interaction and of the services from which the user may benefit.

Every single library consists of an organization whose main objective is that of providing information and culture, in order to adequately satisfy to this end the information requirements of its users. Consequently the operators who work within the library and pursue the aims and objectives of the library itself normally maintain a certain contact with various different categories of operators who work outside the library who contribute permitting it to operate properly - these may

be, for example, documentary material suppliers - and also with the many different categories of library service users and readers.

Under the light of this fact, a library may be seen as a sort of organization or system which interacts with the outside world in order to acquire information or documentation which must later on be re-elaborated and linked in such a manner as to supply useful, final information. Owing to the fact that the library has to respond to a wide variety of external requirements in order to be able to yield a set of usable informative products, a library may be seen, at least from a structural point of view, as a *dynamic and complex system* /Waddington, 1977/ which constantly keeps contact with the outside world, receiving documents, information and administration requirements of the same. The documents, information and administration requirements therefore all make up the *input* of the library system; these items influence the operation of the library which is regulated by means of a set of internal variables which must satisfy the connections identifying the structure of the library itself. In fact, every library consists of a system having an appropriate structure which may be represented by a set of relationships of internal variables regulating its function.

According to the kind of input the system receives, the internal variables are adapted and thus give way to an active production and availability of output to the outside world; amidst the most important output items to the final user, we may include information and data regarding newly acquired documents and the relative connections existing between them. The internal processing operations of all the input elements help the library to provide the various informative products and services; among these, the most important for the final user is the availability of documents the library has received as input, together with the explicit identification of the relating connections between these and other existing documents already in the library, and which are similar in structure and/or derivation, or still more important, similar in content or semantics.

The library system is constantly influenced by external factors, making it necessary to continuously modify its status. In particular, the users of the library who benefit from the output produced actually constitute the factor which, according to the kind of output received, tends to modify the requirements giving further identification or giving rise to newer informative necessities, thereby performing an effective '*feedback*' on the entire organization of the library, in order to obtain a different and more suitable output. Due to this feedback, which is essentially primed by the users themselves but also by other external factors, thereby entirely by the outside world, the library is forced to revise its own organization strategies and objectives, and to evaluate from time to time the effectiveness of the strategies chosen according to the new informative requirements expressed by the users.

Up till now, the library system has always been considered as a single structure; it is now possible, or rather essential, to analyse it under a higher level of

detail; it is in fact necessary to decide which are the constituent components of this system and to see the various different roles the outside world assumes with respect to the library system.

2.2. The components of the library system

Within the "'library system' it is possible to identify two separate elements: the management and administration system, and the library itself.

The management and administration system

The management and administration system carries out the actual handling policy as well as medium and long-term development policies, according to the national and local political directives, with respect to information coming from other libraries and from cultural institutions; in order to carry out these tasks the administration system must:

(a) elaborate the management and administration policies of the library on the basis of three types of requirements:

- *external*, namely those which are set down by national or local policies;
- *feedback* namely those requirements which refer to requests for acquisition of *new material* (books, magazines, etc.) not present in the library, or referring to the supply of new services on behalf of the library: for example, providing the possibility to interact/consult the collections not yet present, or the possibility to make use of an efficient loan service between libraries and/or supplying copies of material to be used individually; these requirements all stem from the outside world and represent the requests which the user elaborates according to the services (output) offered by the library;
- information regarding the *status of the library*;

(b) elaborate and give out information regarding the management and administration, influencing the *structure of the library*, permitting adaptation, due to its non rigid nature, in *order to turn it into an optimum structure*, according to specific objectives, and in connection with the various requirements which emerge during its operation.

The library itself

Library input generally consists of two distinct types: information, and management and administration signals both coming from the management and administration system.

Furthermore, it must be noted that the outside world plays various different roles from outside the 'library system'. One of these is that of an actually so-called outside world, that ist the entire environment which surrounds the library, but which interacts with it supplying documentary material (e.g. suppliers, etc.). Another is that of a factor which interacts with the library due to the fact that each library is part of a wider library system to which the single library may participate. / See the overall library system illustration at the end of this article./

To consider the library as a system may, especially in the future, permit the isolation of some of the subsets or subsystems of the library in order to devise *service effectiveness and efficiency evaluation means* regarding the library's services to the users. Here *effectiveness* means the effective satisfaction of the users' real requirements by the service being offered, and *efficiency* means the rapidity with which the service actually responds to these requirements. In fact, the user often needs to gain rapid access to the information he is searching for, so that this information might still be of some use to him.

2.3. Automation and the library system

It is now necessary to illustrate the perspective by which a planner of an automation system considers a library as a function of a prospective automation of some of its operations. We must keep in mind the fact that this is a difficult passage in which we are trying to explain the purpose and the means used by the information processing system planner in connection to the system-based approach which we have up to this moment illustrated in an intuitive manner, as far as the library system is concerned. It often happens that the purpose of a system-based approach be that of examining the system under observation in order to be able to construct a functional model of the system which might simulate the function and behaviour of one or more parts or sections of it. The simulation makes it possible to carry out forecasting calculations on the system's operations, and may also be of use to those who have some kind of responsibility connected to the management of the system. For example, a weather forecasting system might be of some use, if sufficiently reliable and rapid, to the people who operate in the field of protection of the citizens living in the geographical area being kept under surveillance by the system. The functional model consists of several different sections, among which the mathematical model of the real system and the collection of information and data regarding the system are necessary for the model to function correctly.

A planner's approach towards an automatic information processing system, in the specific case of library automation systems, is somewhat different and under most aspects less ambitious or widespread than that of a system-based approach. The main objective of this kind of system planner is not therefore that of elaborating a functional model of the system being considered, but rather to consider the complete *information* system of the system being considered, and to develop an automatic instrument which will be able to automatically administer a part or section of the complete information system. Such an automatic system, which is capable of automating a part of the information processing requirements, or that of a specific, interested part of the information system, is thereby called an *information processing system.*

Thus the information processing system operates on the information and data collection which represents the subsystem of the information system here

being observed, which is in turn a subsystem of the entire library system. As a consequence of these conditions, it is therefore necessary to explain the kind of relationship existing between an organization (in this specific case, the library system) and its information system: the information system constitutes one of the most fundamental elements of any organization. Taking view of the *library system*, we may define its *information system* as an overall collection of human resources together with all the necessary instruments for carrying out information acquisition, processing and storing operations, as well as the set of manual and automatic procedures for handling the information, and organization rules; all these put together permit the library to function properly.

3. Information processing instruments and services

3.1. Introduction

When planning the use of an information processing system in a library system one must first be aware of the above- described reference frame. Only in this manner, in fact, may it be possible to keep into account the complexity of the system with which one is interacting, and to be aware of the necessity to carry out a series of operations consistent with actions and activities to which the automation system have no direct competence, but which constantly interact with it. In the last few years we have noticed the availability and introduction of a series of hardware and software instruments on the market, providing innovative services for libraries; among these instruments/services we may here mention a few: the various library automation instruments, 'on-line' databases which can be accessed directly or by means of a CD-ROM, 'scanners' for visual acquisition of documents, viewdata systems, systems of electronic mail, telefax, etc.

However, the introduction of these instruments into the library system, due to the fact that it is seldom accompanied by an overall project for improvement of the services offered to the users, has hardly ever reached the expected results. A tendency currently emerging in the information processing sector, may however, give some interesting results if correctly, and entirely, applied to the automation of the 'library system'. This tendency corresponds to the over-growing attention which information system planners now dedicate towards the planning and realisation of user-friendly interface software tools in order to make it possible for the final users to access information resources which would otherwise continue to be used only partially.

3.2. Interfacing and its purpose

In order to make the informative resources available to the final users, up till recent times the efforts for implementing an information retrieval system were

basically concentrated on the fundamental internal elements of the automation system. Quite commonly it was assumed that the person who was to interact with this information processing tool would have to be a specialised user of the specific application sector. Within the library and documentation centres therefore, it was always assumed that the user would be the librarian or document keeper himself. Nowadays instead, a planner/developer of such innovative applications always tends to take into account the necessity to make the information retrieval tool available even to the final user. Within the library and documentation centres this is particularly revealed in the planning and implementation of interfaces to data banks, constructed by means of library automation tools, as well as to on-line data banks; a further trend which satisfies most of the final users is that which makes available these various different types of informative resources by means of a single type of *user interface*.

With the term user interface we may also include the software tool used for making it, that is for example, window handling software or hypertext systems, but also, particularly in this kind of context, regarding interfaces for whatever or towards whatever. It is in fact particularly important to implement interfaces which provide a new functionality to information retrieval for the final user, in particular towards on-line databases and catalogue data banks /Belkin & Marchetti, 1990/.

Considering the possibilities offered by means of the new technologies currently available but which will certainly evolve in the course of the next few years, one ought to devise a way of integrating a *polyfunctional workstation* into the library system, equipped with a single user interface device and which may provide the various different functionalities. Access to on-line catalogue data banks, in order to permit information research operations integrated together with the possibility of localisation and direct examination of the availability of documents from which the information has been retrieved; next section introduces the guidelines of the design and development of an OPAC (Online Public Access Catalogue) prototype for university library users which has been developed to permit an easy access to the catalogue database of the four universities of the Region of Veneto (the University of Padua, the two Universities of Venice, and the University of Verona). Also, a single user interface may provide access to on-line databases, access to on-line databases and other information resources stored on CD-ROMs and access to the various different data banks available by viewdata. They have the availability of on e-mail system to communicate with the other users and use of telefax systems (reception, transmission, and storage on magnetic support apparatuses of fax message texts).

3.3. The OPAC functionality of a polyfunctional workstation for university libraries

This section reports on the guidelines of the design and development of one of those functionalities of a polyfunctional workstation for university libraries: the OPAC facility that has to be used to give an easy access to the catalogue database for the final user.

An OPAC prototype for university library users has been designed and developed to permit an easy access to the catalogue database of the four universities of the Region of Veneto; this is a prototype of a third-generation OPAC /Hildreth, 1985; The online catalogue..., 1989/ for the retrieval of information from the bibliographic database of the four universities /Agosti et al, 1990/.

The libraries database is managed by one of the software tools which have been designed and developed for the Italian National Project of library automation: the SBN project (SBN stands for "Servizio Bibliotecario Nazionale") /Istituto Centrale..., 1985; Istituto Centrale..., 1987/. The software tool which is in use at the University of Padua has been developed in NATURAL and the database is managed by the DBMS ADABAS / I progetti ..., 1987/. A general study has been conducted at the University of Padua to analyse its complex library system of more than one hundred libraries with one million and a half books and twelve thousands serials /Agosti & Favotto, 1987/. Following this general study a specific study has been started for the design of the OPAC prototype /Agosti et al, 1989/.

The OPAC design project started in spring 1989 and the OPAC prototype is expected to fully operate by the end of 1990/beginning 1991.The project has been organised into three main steps:

- identification of end-user's categories and analysis and design of end-user's requirements /Moressa, 1989/;
- design of functional specifications of an OPAC for university library end-users;
- design and development of the OPAC prototype.

The main target of the SBN library automation project is the creation and management of an integrated and unique catalogue which contains the bibliographic descriptions of the documents of the complete library system. The SBN procedures which are implemented by this software tool have to be carried out by the librarian: cataloguing, acquisitions, serials control, and subject indexing. This means that this software tool has been designed to interact with a professional user: the librarian.

In an university environment it is not possible to imagine all the different types of end-users to interact with the librarian, or to continue to use the traditional card catalogues. For this reason in early 1989 it has been evaluated that it was necessary to develop a prototype of an online catalogue for the end-users of the university libraries. In mid-1989 the project for the design and development of an experimental prototype OPAC has been launched.

It is important to bear in mind that this project intends to design, develop and evaluate only a prototype, because the role the University of Padua intends to play is not a role of professional developer of software, but the role of the organisation which has the end-users ready to use advanced library automation and information retrieval facilities and the technical and scientific experience to be in the position of really develop and test a prototype of an OPAC.

These have been the guidelines for the design and implementation of the architecture of the OPAC database and software tool /Agosti et al, 1989; Agosti et al, 1990/. The software tool needs to be modular, so it will permit to add more easily in the future new capabilities. The design of the database und of the software tool needs to support different subject indexing procedures. The end-user needs to have an user-friendly interface. It is necessary to support the end-user with the possibility of printing search results using standard ways of producing bibliographies or list of references, and with the possibilities of retaining his/her search strategies. Mechanisms of keeping useful data of search sessions have to be included for subsequent evaluation.

The nature of the OPAC prototype is to be in a constant evolution. Up to now the subsequent changes on the database architecture and on the retrieval features have been decided on the base of the project guidelines. The prototype is now ready to be given to a small sample of end-users for collecting first impressions and initial logging data on its use. We will then be able to express an initial evaluation on the rightness of the features provided in the prototype and on the efficiency of the chosen software tools. In paralfel with the design of the prototype evaluation tools, we are designing new features to implement in the next version of the prototype: an automatic selection of alternative retrieval paths when the set of retrieved documents is empty; in the 'next searches', it must be possible to ask the system to find other documents similar to those just retrieved; refine the interface for inexperienced end-users.

3.4. Future availability

The planning outlook presented in section 3.2 is one of short/medium term, currently being pursued within the global SBN Venetian University Project.

As a direct consequence of this, a polyfunctional workstation having at least some, if not all, of the above mentioned functions, will be made available, even if only on an experimental basis, for use in a few of the Universities throughout the Venetian Region. It will however be necessary to analyse and examine the kind of feedback which will be primed by the users themselves, and the way in which the "library systems" of these University libraries will have to, or manage to, react in accordance to the new requirements of the users.

Conclusion

In the first section of this paper we provided an overall methodological and reference insight to the matter which must be kept in mind while interacting with

a "library system", in whichever manner this may be done. In the second section, instead, a few of the information processing instruments by which the various innovative library services can be provided and/or planned were briefly presented.

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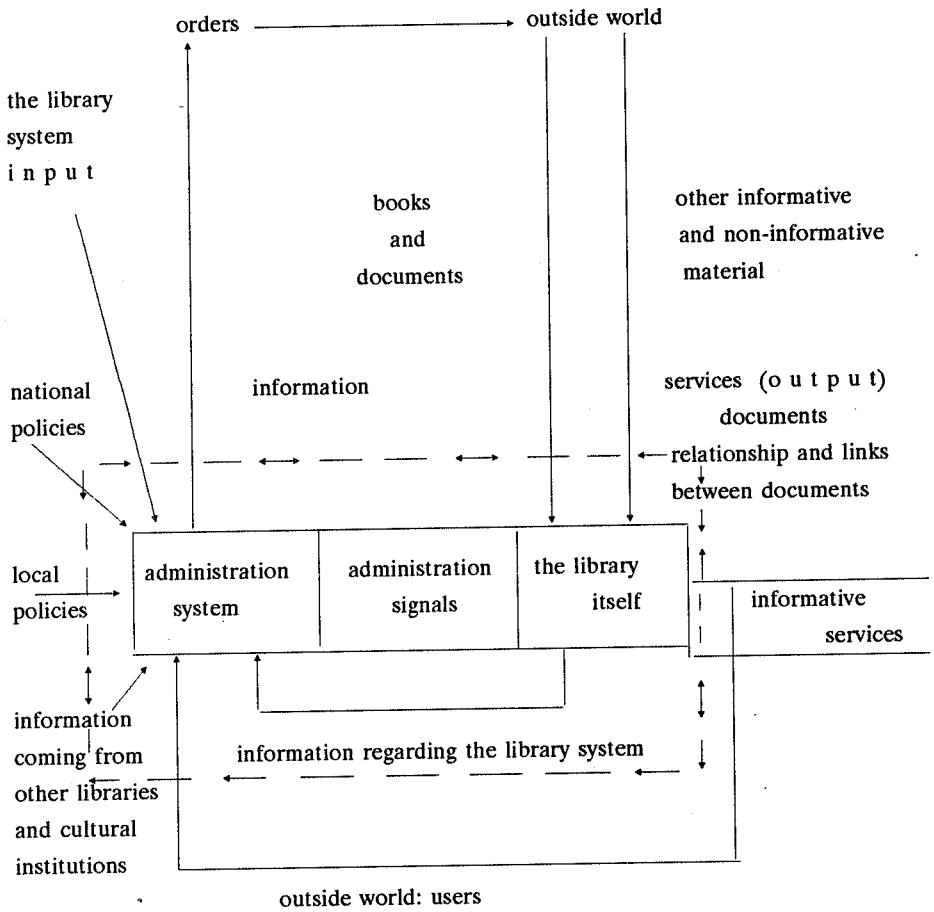
Illustration: The Library system



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