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URUCIB: An Executive Information System in the Presidency of the Republic of Uruguay

Victor Ganón
Jorge Faral
Elena Ganón
Uriel Leiferman

Presidencia de la República del Uruguay, Oficina de Planeamiento y Presupuesto, Consultoría Informática, Edificio Libertad—2° piso, Montevideo—C.P. 11600, Uruguay

Abstract

This paper describes the experience of the implementation of an Executive Information System to support the decision-making process at the level of the President of the Republic of Uruguay. The URUCIB project was conceived as a pilot project for the region under the auspices of the United Nations Development Program and the OPP (Planning and Budget Office). Its objectives were set as to reduce the delay of relevant information, establish early warnings of data structural changes and summarise the information with quick access to the same.

This report shows the overall structure and the technical characteristics of the project together with all its component areas. Besides, it traces the progress of the project, noting its specific characteristics, problems and future.

URUCIB was inaugurated in October 1988. Its visual part is located in a Management Centre at the Libertad Building, seat of the national Executive Power.

1. Introduction

URUCIB—URUguay CIBernético (Cybernetic Uruguay)—is an executive information system in real time to support decision-making at the level of the President of the Republic and his collaborators. This system has been in operation at Libertad Building, seat of the national Executive Power, since October 1988.

It goes back to a prefeasibility study on the needs for information technology for the Presidency of the Republic of Uruguay carried out in 1985.

In July 1986, under the auspices of the United Nations Development Programme (UNDP) and with the support of the Planning and Budget Office (OPP) the project started with Professor Stafford Beer's advice. The URUCIB

system was conceived as a regional pilot experience in Latin America.

The situation existing before the start of the project may be summarized as follows: the information available at the different Administration levels was abundant and in general of good quality. The problems faced by decision-makers were the difficulty in the access to the information reaching them, as well as the dispersion and delay of the same. Besides, the different agencies were isolated. The greatest complexity then arose from the lack of a structured and automatic information sending and storage channel.

It is against this background that the project objectives were determined:

- a decrease in the delay of the information coming from different sources.
- early warning systems of data structural changes.
- summary of the information at a macro-level with quick access to the same.

The instruments used to meet this demand were:

- the creation of an infrastructure applicable to different organisations capable of supplying specific information to the system.
- the application of an organisational criterion to determine the information listing required by the system.
- the creation of a communications network that allows one to obtain information with the least possible delay, in real time, and exchange it between the agencies.
- the storage of all the information in a data base.
- the application of a statistical model to filter information and detect changes.
- a new environment for decision-making.

2. Overall view

In order to make the understanding of the URUCIB system operation easier, information flow from the moment the data is produced to the moment it is visualised by the President will be described together with the sequence of activities and processes carried out (See figure 1: Overall View). To that end, a particular example will be considered: the daily indicator of maximum consumption of electric power throughout the country. This data is generated by the National Administration of Electric Power Plants and Transmissions (UTE).

It is important to bear in mind that every indicator

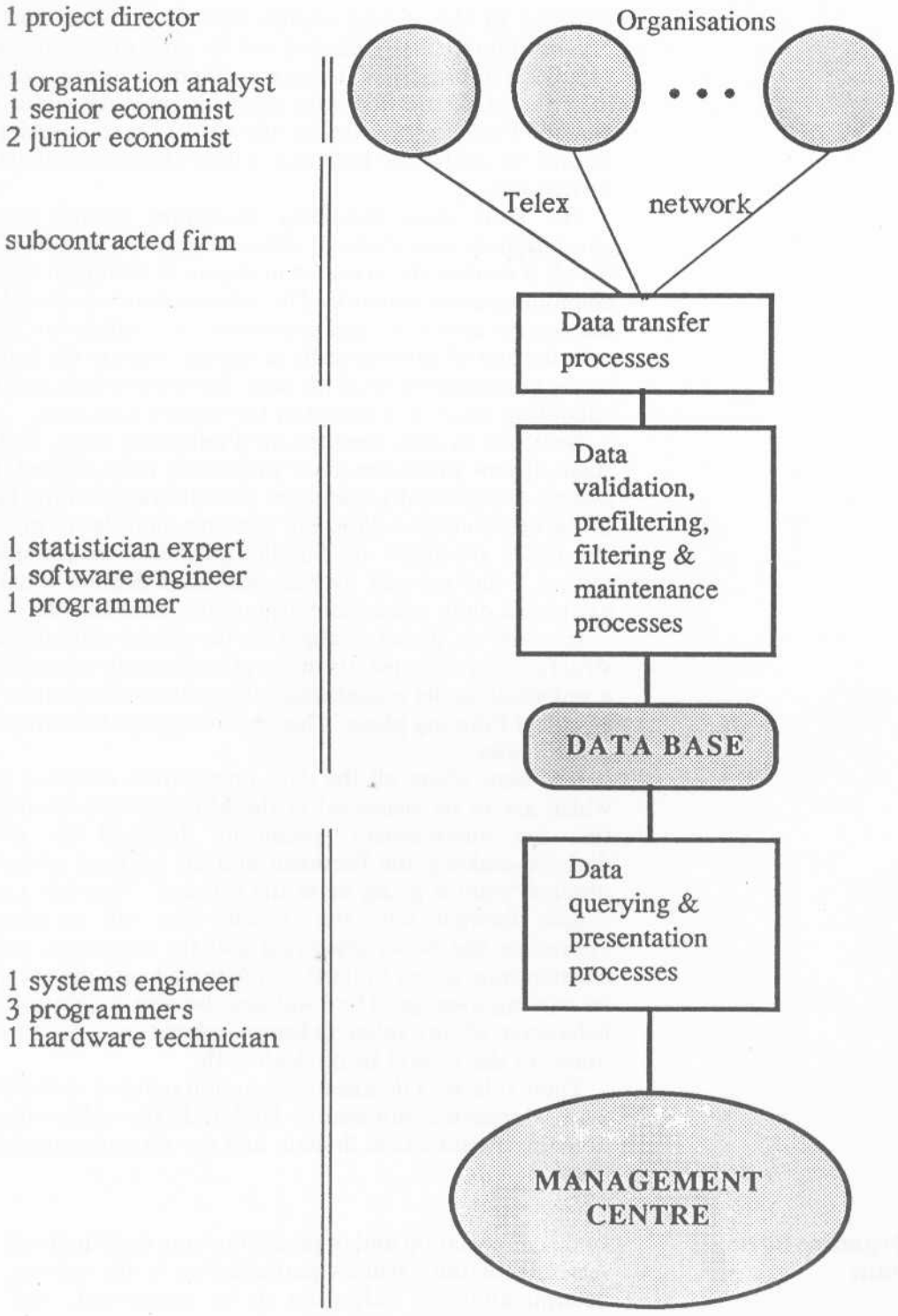

Fig. 1: Overall view of URUCIB

included in the system results from a previous task of organisational survey carried out in each of the agencies supplying information. There is a standard format defined in terms of distributed data entry to enter data into the system. Furthermore, before the data is sent, a series of actions to define the indicator within the system is to be carried out.

The daily data regarding maximum electric power consumption goes through different sections within UTE before it reaches the operator in charge of sending it via the communications network. The information is received by the system and it is then submitted to a validation stage with the aim of automatically detecting errors in the format or the numerical value of the data. Should the data pass the validation stage, it is stored in the system data base.

Next, the system executes the Prefiltering stage. In this stage, if new indicators have previously been defined, the system automatically calculates the new value on the basis of the newly entered data. For example, in order to smooth the peaks produced by Sunday periodical consumption falls, a 7-day moving average has been defined which is calculated daily when the consumption data arrives.

In order to detect changes in the power consumption structure, for example, its increase in the early winter days, a statistical model is used which is applied to the data in the so-called Filtering phase. This increase generates a warning called News.

It is here where all the data preparation activities end, which are to be visualised in the Management Centre. In this new environment specifically designed for group decision-making, the President and his advisors gather to observe 'what is going on in the country'. Through a very simple dialogue with the system, they will be able to appreciate the News generated and the maximum power consumption graph by itself, or compared with the graph of its moving average. They will also be able to observe the behaviour of any other indicator related in some way or other, to the subject being dealt with.

There follows a detailed explanation referred to the three major domains comprised by URUCIB: the organisational domain, the statistical domain and the systems integration domain.

3. Organisational domain

In this information and organisation area were analysed the selection of the agencies participating in the system, the determination of indicators to be monitored, and the creation of the whole infrastructure required for continuous data transfer.

3.1 Agency Selection

In the URUCIB project it was necessary to select an initial group of organisations participating in the system. The major causes of this need are summed up in the existence of limited resources and in the purpose to achieve a final product likely to serve as a support system to decision-making. It was also important to select a limited number of organisations so as to optimize the use of the prototype development strategy and learning processes. To this end, criteria that were likely to guide this selection were sought.

It is important to consider the level this project is focussed on: the system has been devised to support decision-making at the level of the Executive Power. A guideline fundamental to the development of our system is that it is user-oriented. For this reason, the opinion of the President of the Republic regarding his specific needs has been deemed essential for the elaboration of the selection criteria.

First, the President did not want information on the different Ministries, since he personally meets the persons respectively responsible once a week. His major concern lay in the most apparent lacks inherent to his own decision-making process. The information areas required by the President are the following:

Information about the management of Public Enterprises and Municipalities

Within the country prospect required at a presidential level, it is imperative to include some State enterprises engaged in essential sectors, such as the electric power, the fuel and oil by-products sectors and the telecommunications sector. On the other hand, their relevance is stressed by the fact that the State enterprises engaged in these areas rank among the 5 major enterprises in the country. Moreover, while these enterprises meet basic needs, they are absolute competence of the Public Administration and there was no structured channel to inform the President about these organisations. This also applies to Municipalities' management.

Information about Banking and Foreign Trade

It was relevant to include the most influential representatives of the national banks, that dominate the housing sector, the foreign sector and the monetary sector as well as the lines to foster the development in many productive sectors.

Information on social indicators

To this end, the inclusion of information on primary education and of information on milk entry through the country's major dairy cooperative was attained. As well as other social indicators—bus fare sales, public shows tickets (cinema, theater, football), construction licences—coming from municipalities, as for example, the specific case of the Municipality of Montevideo.

Information on Social Security

To that effect, the Social Security Bank, a body dealing exclusively with these subjects, participates in the system.

Information on State income and expenditure

Indicators achieved on the basis of the connection with the agencies in charge of these areas.

Information on the economic and employment situation

Another fundamental step is the inclusion of organisations elaborating statistics. The Uruguayan statistical system is quite complete and relatively well-structured, which speaks in favor of its inclusion. Another relevant issue is the need for this information from the viewpoint of the macro-economic approach.

Last, it has to be added that the personal relationships between some high officials of some of these organisations

Table 1

ANCAP	Oil refinery, alcohol distillery and cement factory
ANTEL	Telecommunications agency
BCU	Central Bank (monetary authority)
BHU	Housing and mortgage bank
BPS	Social security bank
BROU	National bank (loans, deposits and import/exports)
CONAPROLE	Dairy production and trading cooperative
DGEC	National bureau of statistics
DGI	Taxes bureau
IMM	Municipality of Montevideo (capital of Uruguay)
Primaria	Primary education authority
TGN	Treasury bureau
UTE	Electric energy agency

and the direction of the project has had a considerable weight on the conformity to participate in the project.

It is also fundamental to point out that the degree of access and the working relationship with the organisation under consideration was also part of the selection criterion, as well as the organisation's internal structure regarding the handling of its own information systems.

According to the elements considered, the following is the list of organisations included in the first stage of the project:

((take in table 1, folio 5))

3.2 Guiding Ideas

The ideas guiding the organisational survey are described in this section.

Organisational Model

First we refer to the selection of Prof. Stafford Beer's cybernetic organisational model called VSM (Viable System Model). This model was important as a tool for the description of most of the agencies considered. With this model we established our conceptual approach for reference once the agency to be analyzed has been tackled. It also serves to keep a common language in the internal and external representation of the organisation.

Participation concept

As we pointed out above, a general element emerging from the existing situation was the lack of information sending, with continuity, accuracy and with the least possible delay. This situation encouraged the low confidence on the effective and efficient sending from the different agencies. In order to lessen that fear, it was essential to use approaches to meet the expectations and needs of the different participants in the system. That is why participation is regarded as a fundamental part of the system.

Evolutionary Prototype

This feature was fundamental as a guideline for the project as a whole and therefore, also in this area in particular. It was always agreed to achieve a concrete result within a definite time, leaving some refinement for future versions.

3.3 Application of the Guiding Ideas

VSM—URUCIB's systemic approach

The VSM model turned out to be a very powerful tool for the description of each of the organisations participating in the system. It is important for an observer external to the organisation to have a valid representation from which to locate vital sectors and areas. Once these areas have been located, through a detailed inspection, the basic indicators to be monitored may be inferred.

The selection of the set of indicators to be monitored was the result of a combination of different views. Inasmuch as possible, we analysed the needs and specific and personal characteristics of our user: the President of the Republic.

Our application of the model was also important. One of its essential concepts refers to the different recursion levels in every system, which facilitates the location of important indicators at different levels of relevance. The model has some techniques where through iconic diagrams, it is possible to visualise procedures, volumes, values, thus being able to identify indexes to be incorporated into the system.

The results of the implementation of the participating approach were also valuable. The willingness to listen to and to allow the participation of the different members of the participating organisations permitted a more thorough understanding and knowledge of the activities carried out and consequently the determination of variables essential to the system.

The traditional macro-economic approach was basically used for those organisations supplying mainly statistical information.

Once the preliminary survey had been carried out, an initial listing of the series to be monitored in each agency based on the above-mentioned guidelines was elaborated. As from this listing, each agency fixed its position regarding the final listing and the operating stage started. In this stage, the internal infrastructure required to provide the system with relevant information was gathered and created.

The final listing corresponding to each agency in this first stage, was gradually broadened and modified with flexibility through the participation of the parties involved. Once the final listing had been defined, 5 series were selected in each agency so as to start collection and sending of the same. With this, the test and learning stage of this area of the project was carried out.

The information comprises quantitative and qualitative data presented in several ways: values, forms with contextual and explanatory elements of each series together

with the methodology of collection, flow and other types of charts.

Participation: Organisational Contribution and Counterparts

In view of the need to implement mechanisms for the management of the project in this area, a decision was made to determine a specific counterpart with internal representation within each organisation and designated by the same agency.

The appointment of counterparts was an element envisaged in the early stages of the project, but it took a substantial form as the contacts with the different agencies were defined. It is symptomatic that it was in those agencies where the counterparts were more diffusely established that the major problems arose on seeking the steady information sending. Moreover, in most cases, once the counterpart was established, the sending became considerably more efficient.

The importance of establishing a counterpart has to be stressed to really allow the participation of the agencies. The establishment of counterparts is not an automatic process, but a process requiring the political will within the agency and which takes place through iterative stages. It is important that the members of the counterpart be located in some key areas depending upon the specific characteristics of each organisation. It is also necessary that the members of the counterpart fulfill functions and roles enabling them to have suitable knowledge, internal representation and time within the organisation.

The need for direct contacts with the different managerial levels, through meetings with the Board of Directors or general directions of each agency was also taken into account. In a first instance, the project was presented: identifying its purposes, the guiding ideas, and the need for the joint work of the project team and the agencies.

It was essential to obtain the political support within each agency. This task was hindered because internal information systems projects had been started within some agencies and it was difficult to distinguish the different scopes of both systems.

Later on, meetings were held at high and medium management levels making those levels familiar with the system and putting forward the possible participation terms. Then, once the counterpart with decision-making and operational powers had been defined, there was a

sequence of interactions where the activities and elements to be achieved in each agency were determined and implemented.

Once URUCIB was completed at the presidential level, meetings were held with the Board of Directors and the counterparts from all the participating agencies to present the final product and to suggest the possibility of implementing the system to be used internally within each organisation. In terms of VSM, this means the transfer of the developed technology to the second level of recursion under consideration.

This transfer process has already started to operate.

4. Statistical Domain

The intervention of Statistics in the URUCIB system arises from Prof. S. Beer's suggestion to include Harrison and Stevens' linear growth model to design an early warning system regarding the behaviour of the trend of the time series.

The initial objective of the statistical treatment sector was to filter the time series to detect those changing in their average function. This was broadened to include other essential elements to fulfill this primary objective and extend its field of action. It was an action and reaction process that has been an essential feature in the system elaboration throughout the project.

4.1 Requirements

There follows a detail of the requirements guiding the statistical treatment established for this project area:

- Change detection in the structure of the time series.
- Time series transformation facilities.
- Automatic information storage and processing.
- Facilities for the description and initial analysis of time series.

4.2 Guiding Ideas

With an aim to meet the above-mentioned requirements, all the statistical domain was built in compliance with the following ideas:

- Automatic control of data remote entry.
- A statistical model easily and automatically detecting changes in the trend of a time series, likely to be applied to a reasonable set of series.
- Automatic generation of new series as data arrive.

4.3 Implementation

The Filter

The statistical model used is the Multiprocess Dynamic

Linear Growth Model, which considers the possible transitory or permanent modifications in the structure of the time series. When we speak of extreme points isolated due to accidental causes, we are referring to transitory modifications that do not affect the future course of the series (strike, weather accident, noting error). We speak of more or less permanent modifications when we refer to changes that produce jumps at the time series level or in its slope. For instance, the entry of products in a stock control or the more or less controlled price increase.

Obviously, not all the time series are apt for this model, and we do not intend to make an indiscriminate use of the model. But the literature in general mentions the capacity of the model to predict changes in the trend function of a time series and to follow them, adapting itself to them. Unlike the Holt model for the trend function, whose constants are fixed in time, the Harrison and Stevens model is adaptable, producing a step by step estimation of the expected value of the series mean function.

It is important to point out the salient characteristics of the dynamic linear model employed:

- the step by step estimation of the mean function, requiring only the last result of the model application and of the present value of the series.
- the facility of calculations and their automation.

These properties are due to the use of the Kalman filter to update the model's parameters. The model and the estimation method fulfill one of the basic requirements to be used by the URUCIB system: facility of implementation and automation. We must realize that there are a great number of series processed by the system every day, and that to recalculate with all the series values the value of the estimation for each new observation would make the introduction of a traditional estimation scheme inviable.

Decision Scheme

The kernel made up of the statistical model was enlarged with a Decision Scheme allowing to detect changes automatically, without inspecting the probability values resulting from the model's application.

Prefilters

The need to automatically transform data upon their arrival at the system was subsequently perceived, in order

to be able to apply the model to them and also to improve the possibilities of visualising and understanding those data. The necessity thus arose to count within the system with the so-called Prefilters: transformations of data such as accumulations, differences, linear combinations, deflation, seasonal estimation, moving average, etc.

We know that what we call prefilters are filters by definition, but owing to a historical reason related to the project development, they were called prefilters because they preceded the application of the statistical model, which we call filter.

Prefilters act upon one or more series and may be successively applied without limitation (for instance, the variation of a previously defined series which is in its turn an addition of others).

Validation

The remote data entry and its automatic processing, compelled to implement controls within the system to detect errors in the sending of codes, dates and values. In particular, a simple method was established to detect extreme points due to digitization errors.

Up to now, we have described the basic elements of one of the activities of the URUCIB system: the processing with its necessary frequency of the arriving information, which goes through the stages of Validation, Prefiltering, Filtering and Decision Scheme.

Tools

In order to carry out this automatic processing, there is a previous task that must be undertaken, for which the system provides the necessary tools: a data base management system especially designed for time series, the possibility of a descriptive analysis of the properties of the time series (basic statistics, graphs, periodicity), the definition of prefilters and the previous tuning of the statistical model parameters.

The data base stores the observation of the time series, i.e., date and value, identifying them with a code. This same code links the qualitative information on the series as well as the initial parameters of the statistical model. The definition of prefilters, including the code of the constituting series and the parameters employed in the calculation, also appears in the data base.

Once the values have been entered, the data analyst

carries out a study by means of the description facilities (basic statistics, box-plot, seasonal-plot, autocorrelation and partial autocorrelation functions); he decides on whether to transform the data or not, and whether to apply the statistical model or not.

The analyst defines the initial parameters of the statistical model, executes the model and analyses results through a graphic presentation of probabilities, and visualises the decision scheme. If he agrees with the News produced by the model, he releases the initial parameters of the model for their automatic use by the system.

5. Systems Integration Domain

This is the system engineering area where the hardware, software, communications, and ergonomics requirements were analysed, establishing also the solution criteria, the development strategy and the implementation. Everything required has been acquired or implemented and assembled to work as a whole in an evolutionary way.

5.1 Operational components required

- A communications network through which the Presidency may receive, in real time and automatically, the information sent by the agencies. It should also allow data exchanges between agencies.
- A data base of time series, of different periodicity and with qualitative information, for a multiuser environment. The data extraction should be swift and interactive and its updating, deferred. It should also be transportable to the standard operational systems of the market.
- A set of programs providing the statistical processing of the information received in real time, generating warnings of incipient changes which are called News.
- A new interactive environment for group decision-making called Management Centre. It should be possible to visualise chronological data in graphic form together with contextual information.

5.2 Guiding ideas for development

There was no known similar system available—implemented at the government level—to be used as reference. Owing to it, we have always considered that we were facing the challenge of a pilot experience that, depending on its good results, could subsequently evolve and be multiplied in the organisations providing the information, as beneficiaries of the project.

As in every pilot system, we have borne in mind its risks: neglect in quality owing to the need of obtaining rapid results; the possibility of freezing designs that might hinder

the response to future requirements or the evolutionary implementation; considering as pilots elements which are components of the system and not the system as a whole. In this sense, open and flexible methodologies of implementation were sought, together with the market standard tools guaranteeing reliability, compatibility and facility of acquisition.

The development environment adopted the characteristics of a test laboratory of hardware and software integration which, although tested abroad, was uncommon in our country. For instance, for the design, projection and graphic impression of high resolution in colour; for the intensive utilisation of amplifications and accessories of personal computers; for communication and remote control.

The construction of a prototype model facilitated the knowledge of our own system, the definition of its requirements, its limitations, its scope and the communicatión of ideas between the multidisciplinary teams. With this working schedule and to achieve rapid results, we tried "not to reinvent the wheel", assembling software packages and tools adequate for our purpose.

Another guiding idea has been to always allow a high degree of portability to different machines and operational systems.

Software was elaborated from "inside to outside". The starting point referred to that which would be most invariant (the data base and its statistical processing), and which would support the rest (visualisation).

Concerning the interface with the user, probably the most important architectural guideline has been to isolate it as cleanly as possible from the rest of the system, so that any improvement or change in the data base, for instance, does not require the change of a single code line in the visualisation programs, and vice versa.

5.3 The implementation of operational components

In Uruguay, the possibility of "going round the corner" to test one hardware (or software) or another and decide whether it is useful or not, does not exist: everything is in the Northern Hemisphere. Owing to it, the gathering of information was carried out through reviews and advertisements in specialised publications, consulting by mail, fax or telephone. Afterwards, it had to be acquired, awaited, and finally installed, so as to determine, only then, whether the choice had been the correct one. As it is logical, for tools involving higher expense and a greater implementation effort, direct knowledge was sought.

By way of example: in the first year of operation, approximately 140 letters were sent requesting commercial information of foreign suppliers, and 80 per cent of the consultations were answered (a percentage that has been maintained up to now); the acquisitions time elapsed—between the request to the financial agency and the installation of the equipment—varied between three and six months; only 3 per cent of the total amount spent on hardware and software corresponded to equipment that has not been utilised for it did not meet the requirements.

Initially, the external consultantship suggested to subcontract the development of software abroad with a foreign firm. But this implied an excessive investment and would have had negative effects because of the split of the working group in different geographical locations. Finally, the project's direction, with the discrepancy of the external consultancy, decided to develop the software in Uruguay with national staff. Concerning the specific training for the development of the systems, only one of the team's professionals had completed previous postgraduate studies abroad, and the others extended their training as development needs evolved.

Communications Network

Since in 1986 there was no public data network in Uruguay, the implementation of the communications network was subcontracted with a specialised national firm. The small information volume to be sent by each agency in each transfer towards the Presidency, the security, the privacy and the installation cost were key factors for the selection of a private telex sub-network (by private we mean that it excludes any communication to or from the national public telex network).

Each agency connected to one of its micros a telex converter, that allows it to send its data to the Presidency or to any other agency subscribed to the sub-network, register by register or in file form. At the Presidency, a data node made up of a small telex exchange and a micro was installed, which monitors the network by means of software developed in Unix, storing the information received in a data base and simultaneously allowing operations to be carried out with the same.

It should be pointed out that information was obtained through other channels in addition to telex, according to the characteristics of the agency or of the information sent, such as: diskettes, forms, electronic transfer from a mainframe already connected to the Planning and Budget Office or simply, a daily telephone call.

Data base and software

The first stage of the prototype was implemented in Fortran and Pascal. Later, absolutely all the software was written in C language; therefore, the selected data base design has been such as to allow an adequate handling from C, both under UNIX and DOS.

Management Centre

The Management Centre is like the tip of the iceberg of the whole executive information system, i.e., its visible part. It is located in a room on the 7th floor of the Libertad Building where the President, by himself or accompanied by some of his Ministers and collaborators, frequently sits to watch the national reality assisted by URUCIB.

The British Embassy in Uruguay facilitated the direct knowledge of this type of technology existing in Great Britain.

The Management Centre is another of the fundamental ideas of Prof. Stafford Beer. Its origin may be traced as far back as the "Cabinet War Room" used by Winston Churchill during the German air raids on London in World War II.

In this operational environment, the emphasis is placed on ergonomics, on the facility of use and learning of the man-machine dialogue, and on the graphic representation of quantified facts, owing to the qualitative value it adds with reference to decision-making (it reveals the maximum information in the least time and space).

It is based on a personal computer—remotely operated by an infrared numerical keyboard—that controls, from an adjacent room, the display of information on two giant screens: one of them corresponding to its monitor, which notifies instabilities and shows graphs, values and descriptions of any indicator; and another screen corresponding to a slide projector that shows contextual information in the form of diagrams, photographs and flowcharts. Here, the support technology is beyond visual reach and paper becomes unnecessary.

6. Problems

In the development of the URUCIB project, as well as in that of any other project, there have been considerably problematic elements and areas. Basically, many of these subjects are focussed on the fact of having undertaken non-structured tasks and objectives with respect to which

there was, a priori, little experience in similar contexts.

- Given the multi and interdisciplinary character of the project, there have been frictions originated by the different approaches to reality on the part of persons coming from various disciplines. This implied the passage through different phases with highly diffuse objectives and scarce real communication between the parties. This was solved to a great extent through the determination of concrete working areas and the fixing of mechanisms for the management of the project. These mechanisms provided an open environment for the improvement of communications between all the members of the project team, trying to get everybody acquainted with the undertakings of everybody else, and with the impact produced on each one's work by the work of the others. This has been valid both for generic participation activities and for those restricted to only one sector of the development team, and it brought about a substantial improvement in the inner coordination of tasks.
- Considerable delays in equipment deliveries. Problems related to import steps. National enterprises maintaining a very limited stock of products.
- Post office and communications services strikes.
- Confrontation with bureaucratic structures which are not very efficient in general.
- Lack of stable secretarial staff of their own throughout the development of the project.

Eight months before the inauguration of the system, the resistance to URUCIB at the high managerial levels of State agencies reached its peak. Dismissing an authoritarian approach, in which the Presidency ordered the sending of a certain information, we chose another in which we dialogued, and each party expressed its viewpoints, so that by way of synthesis, discrepancies, fears, uncertainties and doubts could be elicited, and the relationship between URUCIB and the agencies providing information to the system was established on very solid and legitimate bases vis-à-vis the political level.

7. Summary and Conclusion

This article briefly describes the development project of an executive information system called URUCIB. The objective of the same is to contribute elements of this particular experience so that it may serve for the development of similar projects. By way of summary, we can mention the following characteristics that we consider peculiar to URUCIB:

- The importance of considering a certain methodological framework as the guide of a project having such semi-structured characteristics. The adoption of this framework should be established as a flexible referential tool and not as a rigid and strict element.
- The learning by the members of the project group, of situations that are progressively visualised as the system develops. We must bear in mind the inexistence of former similar experiences.
- The need to establish communication mechanisms between individuals coming from different disciplines and the creation of interaction environments allowing said heterogeneity of approaching conceptions.
- The creation of a common language for the communication between different agencies and also, with the central administration.
- The importance of the learning stage of the decision-making process itself on the part of the user. This is obvious in each presentation of the system to executive users.

It would be dangerous to establish final conclusions owing to the short time of implementation of the system. However, we may identify the following points:

- The URUCIB system has completed its primary scope as pilot system. The same is in operation on the 7th floor of the Libertad Building, the seat of the national Executive Power, since October 1988.
- The result has been quite satisfactory. This includes both the stage of system learning on the part of the user and the continuous and efficient sending of the information to be monitored.
- We have been consulted about the system and its application by several executive agencies belonging to different countries of the region, that are analysing its possible uses.
- At present we are at the stage of transferring the system to some of the agencies supplying the information. This is in accordance with the methodological framework adopted. At the same time, we continue with the stage of maintenance and evolution of the system. The maintenance stage, in spite of being very important and somewhat boring, is not very complex, and we may say that we have lessened the different fears expressed concerning the fluid transfer of information from the agencies.
- On the basis of the system use up to now, we may

consider as successful the guidelines established to provide the final user with a tool for use and learning which is extremely easy and fast to handle, as well as with all the instrumentalised mechanisms assuring absolute confidentiality to the executive information system.

References

1. Beer, S. (1979) "Heart of Enterprise", John Wiley and Sons.
2. Beer, S. (1982) "Brain of the Firm", John Wiley and Sons, 2nd ed.
3. Beer, S. (1985) "Diagnosing The System for Organisation", John Wiley and Sons.
4. Harrison, P.J., Stevens C.F. (1971) "A Bayesian Approach to Short Term Forecasting", Operations Research, *22*, pp. 341–362.
5. Harrison, P.J., Stevens C.F. (1976) "Bayesian Forecasting (with discussion)", JRSS, Ser. B, *38*, pp. 205–247.

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ETHIOPIA: Ethiopian National Agency for Unesco, PO Box 2996, ADDIS ABABA.

GAMBIA: Gambia National Commission for Unesco, Ministry of Education, Bedford Place Building, BANJUL.

GHANA: Ghana National Commission for Unesco, Ministry of Education, PO Box 2739, ACCRA.

GUYANA: United Nations Development Programme in Guyana, PO Box 10960, GEORGETOWN.

HUNGARY: Commission nationale hongroise pour l'Unesco, Magyar Unesco Bizottság, Müvelödesi Minister̈ium (Ministére de la Culture), Szalay u. 10–14, 1884 BUDAPEST Pf, 1.

INDIA: Indian National Commission for Co-Operation with Unesco, Ministry of Human Resource Development, Department of Education – Government of India, Room 203, 'C' Wing, Shastri Bhavan, NEW DELHI 110001.

IRAN: Iranian National Commission for Unesco, 1188 Enghelab avenue (Rostam Building), PO Box 11365-4498 – Zip code 13158, TEHRAN.

IRAQ: Iraqi National Commission for Unesco, Ministry of Education, BAGHDAD.

JAMAICA: Jamaica National Commission for Unesco, 25 Dominica Drive, PO Box 202, KINGSTON 5.

KENYA: Kenya National Commission for Unesco, Ministry of Education, Commerce House (4th Floor) – Moi avenue, PO Box 30040, NAIROBI.

KOREA: Korea Exchange Bank, I.P.O. 2924, SEOUL.

MADAGASCAR: Commission nationale malgache pour l'Unesco, 11, Naka Rabemanantsoa – Behoririka, Boîte postale 331, TANANARIVE – ANTANANARIVO (101).

MALAWI: Malawi National Commission for Unesco, Taurus House – PO Box 30278, Capital City, LILONGWE 3.

MOROCCO: Commission nationale marocaine pour l'éducation, la science et la culture, 24, rue de Sénégal-Océan – Boîte postale 420, RABAT.

MOZAMBIQUE: Mozambique national Commission for Unesco, Ministry of Education and Culture, 45 rua Dr Egas Monis, PO Box 3674, MAPUTO.

NEPAL: Nepalese National Commission for Unesco, Ministry of Education, Kaiser Mahal, Kantipath, KATHMANDU.

NICARAGUA: United Nations Development Programme, Apartado postal 3260, MANAGUA.

NIGERIA: Nigerian National Commission for Unesco, Federal Ministry of Education, 14 Broad Street, PMB 2823 LAGOS.

PAKISTAN: Pakistan National Commission for Unesco, Plot No. 30 Sector H-8, Unesco House, ISLAMABAD.

PERU: ITINTEC, Apartado 145, LIMA.

PHILIPPINES: United Nations Development Programme in the Philippines, P.O.B. 7285 ADC, Mia Rd. Pasay City, METRO MANILA.

POLAND: Commission nationale polonaise pour l'Unesco, Palac Kultury i Nauki (17 pietro), 00-901 VARSOVIE.

RUMANIA: Commission nationale de la République socialiste de Roumanie pour l'Unesco, Soseau Kiseleff No. 47 – B.P. 71268, BUCAREST.

SIERRA LEONE: Sierra Leone National Commission for Unesco, Ministry of Education, Cultural Affair & Sports, New England, FREETOWN.

SOMALIA: Somali National Commission for Unesco, Ministry of Culture and Higher Education, PO Box 1182, MOGADISCIO.

SRI LANKA: Sri Lanka National Commission for Unesco, Ministry of Justice, Transworks House – Lower Chatham Street, COLOMBO 01.

SUDAN: United Nations Development Programme in the Sudan, PO Box 913, KHARTOUM.

SYRIAN A R: Centre d'études et de recherches scientifiques, Boîte postale 4470, DAMAS.

TANZANIA: Unesco National Commission of the United Republic of Tanzania, Jengo la Umnoja wa Vijana, Morogoro Road, PO Box 20384, DAR-ES-SALAAM.

TUNISIA: Commission nationale tunisienne pour l'éducation, la science et la culture, Ministére de l'éducation, de l'éducation, de l'enseignement et de la recherche scientifique, 22 rur d'Angleterre, B.P. 1280 R.P., 1000 R.P. TUNIS.

UGANDA: Ministry of Finance Planning and Economic Development, PO Box 7086, KAMPALA.

URUGUAY: C.O.N.I.C.Y.T., Sarandy 444, p.4, Casilla de correo 1869, MONTEVIDEO.

YUGOSLAVIA: Commission yougoslave pour l'Unesco, Mose Pijade 8 (6éme étage), BELGRADE.

ZAIRE: Commission nationale zaïroise pour l'Unesco, Commissariat d'État chargé, de l'enseignement primaire et secondaire, Boîte postale 3163, KINSHASA – Gombe.

ZAMBIA: Zambia National Commission for Unesco, Ministry of Higher Education, PO Box 50619, LUSAKA.

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