A Windows Based User Interface and CAPI Information System

Vesa Kuusela, Statistics Finland

1. Introduction

In the first quarter of year 2001, the whole CAPI information system at Statistics Finland was changed from a DOS based system to a completely Windows based system, including the latest Blaise 4 Windows (B4W) version. The change was put in effect at the same time when interviewers received new laptops. Up to that point, the part of the system that resided in interviewers' laptop was still entirely DOS based. The office software was largely Windows based already but it was in 16 bit architecture and therefore it was rewritten.

The new operating system and graphical user interface provide many new facilities, which did not exist in a DOS based system. Actually, the graphical user interface and the fact that the screen size of the interviewers' new laptops increased considerably (1024*780 pixels) led to new design of the interviewer interface. The basic structure of the interface was tried to keep as close to the previous one as possible, to keep learning to use the new system easy. However, from the very beginning it became obvious that the layout of the interface had to be designed on a different basis. Also in a smaller screen (800*600 pixels) the previous layout had been inappropriate. Though the layout of the interface had to be redesigned, its functionality was retained.

On the other hand, there was no need to introduce major changes the basic architecture and basic principles of the previous system, even though the change in the visible part of the system was considerable. The infrastructure of the CAPI information system was designed and installed in mid 90's and it has been functioning well. The infrastructure and design principles were described at IBUC 1995 (see Kuusela, 1995) and IBUC 1997 (see Kuusela and Parviainen, 1997). Basic idea has been so-called object-based design which has proved to be reliable and flexible. Visual Basic was used as the software tool, as in earlier versions. Now only Visual Basic version 6 was used, instead of three different versions like before.

Modern programming tools enable a lot of new solutions and provide many new features. On the other hand, programming in Windows environment is full of pitfalls and the system needed much more testing than in the DOS era. Introducing

modern new features makes the system more complicated and by that more vulnerable. Design and programming proved to be much more demanding than before. Especially the use of concurrent forms brought up situations which compelled to test carefully the system.

This paper describes the system and interfaces as they are now and tries to explain why certain decisions were made.

2. Basic structure of a CAPI system

From the users' point of view, a CAPI information system may be seen to be composed of two user interfaces[1], interviewers' interface and supervisor's interface, and a communication channel between them (see figure 1). Usually the communication channel is composed of a modem connection and telecommunications software but it could be done with other methods, as well.
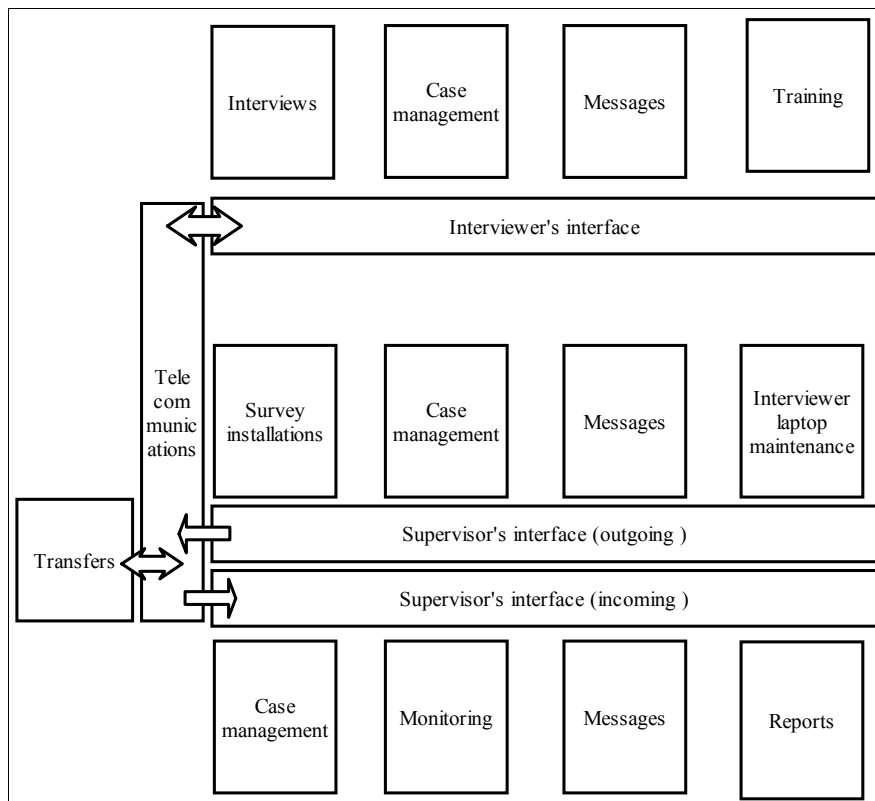

Figure 1: A schematic display of user interfaces of a CAPI system.

Several different tasks are embedded in both interfaces. Most of the tasks have a counterpart in the other interface and a task should be able to communicate with the corresponding task in the other interface. For instance, a message from supervisor should end in an interviewer's message box in a readable format.

The main function of the interviewer's user interface is to support

---

[1] An interface, or an user interface, is a piece of software that connects users to an information system, like a dashboard.

interviewing and to take care of the local case management tasks. Ideally the case management should be a transparent part of a transparent interviewer interface, which should facilitate the interviewer's work (rather than make it more difficult). An objective of the design should be to free interviewers to concentrate on their actual work.

Supervisor's interface has two parts: for outgoing activities, like installation of new surveys; and for incoming activities, like assembling a single data file from interviewer files. In fact, there are several important, even critical, functions in the supervisor's interface, besides case management, because whole information system is controlled by that.

The user interfaces are connected to the information system, which also has two different but equally important components. On the other hand, the information system has only one infrastructure that makes it function as expected, and that keeps it together as an integrated whole. Case management is the major task of the information system but there are also many different tasks, which the information system is supposed to handle (see also Nicholls and Kindell, 1993).

2.1. Interfaces

Interfaces, in general, should be designed according to different standards to different types of users, especially if they have to carry out different tasks, or if they have different capabilities to use computers. A key concept in the design of user interfaces is usability. A lot of research has been done on this area, but also usability testing is needed in each specific application. Typically, the interface which is designed for interviewers should be well thought out because interviewers are selected to manage as interviewers, not as computer specialists, and the techniques should help them. On the other hand, one can expect much more computer skills from the personnel in a statistical office.

Interviewer interface

The first idea was to keep basic structures of the interfaces as close to the previous interface as reasonable, but the graphical user interface, large screen size of the laptops and the possibility to use the mouse compelled to redesign of the interviewer interface. Only the functionality was tried to keep similar as it was. Supervisors' interfaces, on the other hand, did nor change much because they were Windows based already.

In the new interface version an interviewer is able to manage practically all situations by two different displays: one where the descriptions, status and samples of the active surveys are shown (see figure 2); and one where is displayed all
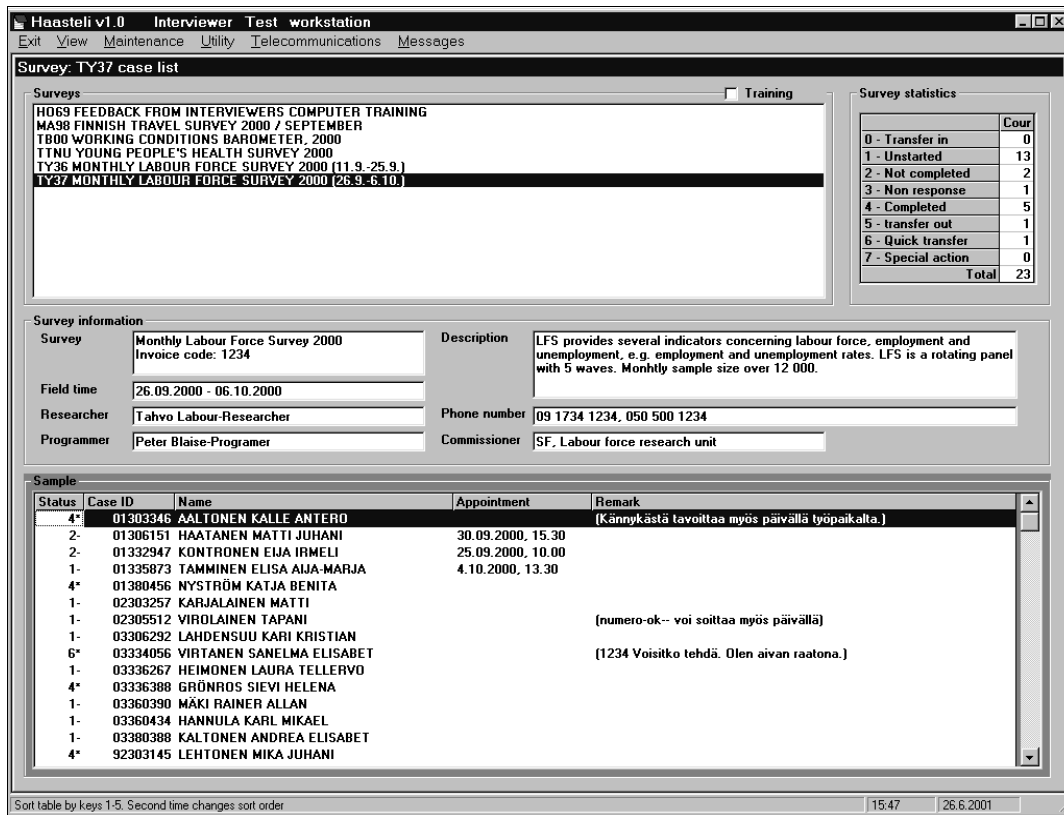

Figure 2: The main view of interviewer's interface. At the upper left corner are the active surveys and beside them is statistics of the selected survey. Below is the sample of the selected survey and in the middle some information of it

available information about the selected case (see figure 3). All operations can be done either by the mouse or by the keyboard.

The main view of the interfaces can be changed to two other views: in one view, only the cases of a selected survey are displayed without other information of the survey; in the other view, all cases of all surveys are displayed. In all the three different views, the case list
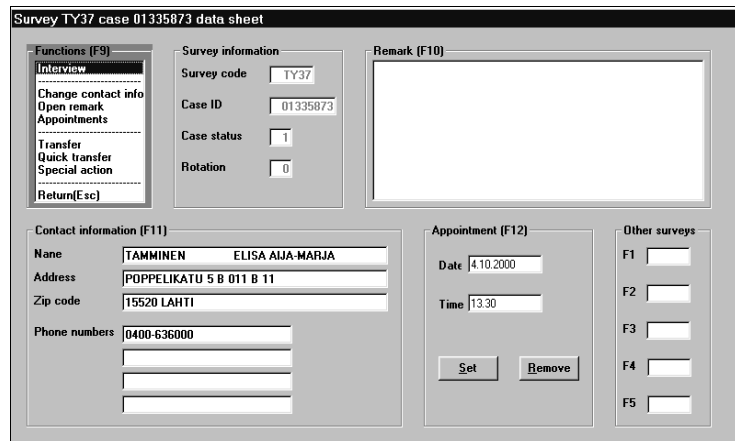

Figure 3: Data sheet of a selected case.

may be sorted according to all fields in it (i.e., status, ID, name, appointment etc.).

All the functions which an interviewer can apply to a case are shown in the case data sheet (see figure 3), including appointment and remarks. Interviews are started here and after an interview control returns here and the status of the case has to be updated before the interviewer can continue. After that, the completed cases are moved automatically in the out queue.

In designing a large screen a new problem emerged: how much and what kind of information is reasonable to place in one display. Much more information could have been placed in each screen but the result had been incoherent and tangled. The screens shown here are compromises.

Blaise screen design and display standards.

The default screen layout of B4W, and the large screen of the laptops, made also the Blaise screen design necessary. In addition the facts that there were much more possibilities to design the screen layout in Windows Blaise that in Blaise III supported this. The default screen layout in Blaise 4 Windows is applicable in 800*600 screens but not in 1024*780 screens, because the font is too small and the horizontal division makes two wide and low sub screens which make question text hard to read. We must bear in mind that illumination conditions between and during interviews may vary considerably - and interviewers are mainly middle aged.

The wealth of design possibilities in Blaise brought up the need of standardization of the screen layouts, in order the questionnaires to have similar appearance in all surveys, and also to give support to standardized interviewing. If every author was allowed to select the colors and fonts and maybe even the general layout of the screen freely, questionnaires would probably become very different which in turn would be very confusing and detracting for the interviewers.

However, the standardization of questionnaire screen layouts appeared to be more difficult a task than anticipated, and final standard has not been set up to this point. Some alternative standards have been tested but all of them have encountered some criticism. An agreement has been achieved only about the font (Lucida sans unicode, 11 points), and the about dividing the screen vertically. Obviously, some research and some planing and a lot of usability testing will be required before an optimal and ergonomically effective layout standard can be reached.

Supervisor Interfaces

Supervisors have many different tasks and they need several interfaces to take care of their job. For instance in Statistics Finland there are more than ten different interfaces in daily use. In figure 4 is shown one, so-called Survey Starter. This is needed when a survey is installed on the field. Actually Survey Starter is a collection of buttons which launch other programs and the arrows indicate in which order one should proceed. The results of Survey Starter are packets for interviewers including the questionnaire, the sample, background information for the sample and all the necessary tools for the interviewer interface to do the installation. Each interviewer will get her packet during the next telecommunications session.
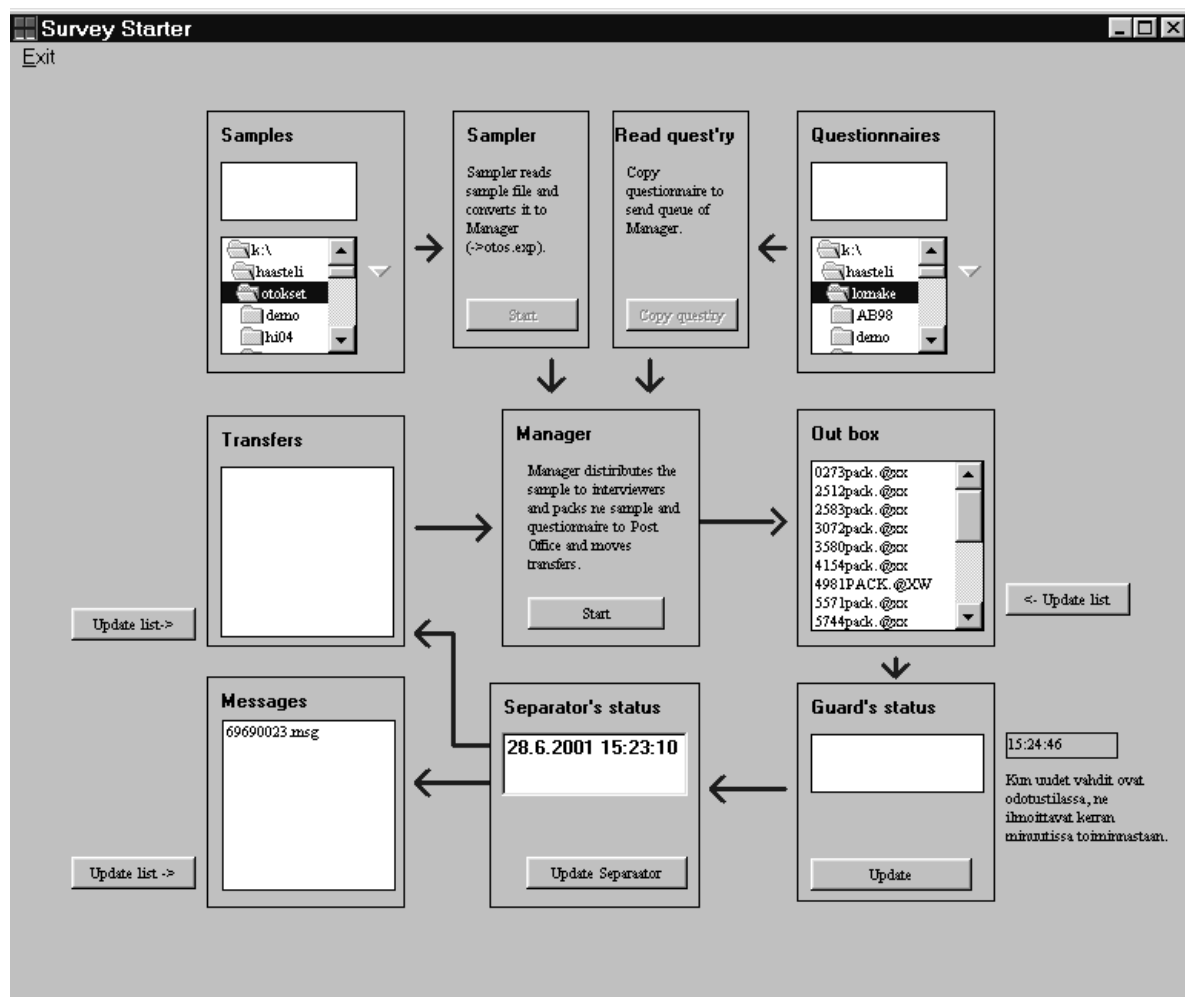

Figure 4: The surpervisor's interface by which a survey is installed. Actually this is a collection of buttons which launch other programs and the output are the packets for interviewers in the out box.

2.2. Information system

Apart from interviewing, the software in interviewer laptop has to perform several critical tasks, e.g., installation and maintenance of surveys, telecommunications, case management, some laptop maintenance. Most of the tasks should be automatic so that they do not require interviewers to intervene in the processing. If the operations would require complicated computer tasks from interviewers, it would increase substantially the liability on malfunctions in the system. And to be able to concentrate on their main duty interviewers should not be loaded with additional tasks on which they not trained for. To achieve this goal the interviewer interface was designed as a platform where surveys are installed and which is partly operated by supervisors.

Case management

Case management in a CAPI system means the logic of the flow how the sample points, cases, go through the system. That involves several tasks: exclusive and exhaustive distribution of the sample to selected interviewers, delivery of the sample to interviewers; forwarding the case to the CAI software to be interviewed; maintenance of the status of each case; management of the case transfers from one interviewer to another in all stages of the survey; gathering of cases back to office; assembling one data file from the slivered sample; enable the monitoring of field work and reporting.

Roughly speaking there are two major approaches to design the case management for a CAPI system: a data base -based information system and an object-based system.

In the data base -based approach a file, a part of the master database, containing all sample points for a particular interviewer is sent to his/her laptop. A data base -based system involves some difficulties and dangers which need careful design: e.g., maintenance of the integrity of the database; how many interviews are lost if the database is corrupted; maintenance of the status of the cases; at what point and how the cases are sent back to the office.

In the object-based system, each sample point constitutes a single object. That is, all the necessary information to conduct an interview is encapsulated in one file. An object may contain an unique identification, status, sample data to contact the interviewee or household, additional data of the sample point to be used in the

questionnaire, messages, etc. When the object is returned, it includes updated data (e.g., status) and the answers to the questionnaire attached.

The object-based approach provides many assets compared to data base -based approach (see Gray, 1995 and also Rumbaugh, et. al, 1991). For instance, the assignment of cases to interviewers becomes fairly straightforward and there is no danger that the same sample point goes to two interviewers; and case transfers from one interviewer to another may be handled reliably. If one data file is corrupted only one case is lost in the object-based system.

Once the object-based approach is adopted, it also makes the activities of CAI system, rather straightforward. Moreover, in the office system, each case may be processed separately in a so-called 'flow basis' (see Gray and Anderson, 1996) almost immediately it has arrived and hence interviews and office editing may overlap.

Already in the previous version of the CAPI information system of Statistics Finland object-based architecture had been adopted. There was no need to change it, especially because some changes in Blaise have facilitated its usage. Technically the infrastructure of the information system follows loosely the ISO-OSI network protocol where the communicating parts are CAI server and the interviewer workstation although they are not hierarchically ordered. The mental image in the design of the data flow was the operation of post offices and mail delivery. For instance, in the work station there are boxes (dictionaries) for incoming and outgoing mail, and in the CAI server there are mailboxes for each interviewer and survey.

Telecommunications

Completely new software was designed for telecommunications. Also here the functionality was kept close to previous one but the result was quite different. Basically, there is now only one telecommunications program that has two instances communicating with each other: one in interviewers' laptops and one in a telecommunication server (called Guard). The part running on a telecommunications server is like a postman getting packets from interviewer works station and delivering packets from interviewer's mail box (in CAI server) to a workstation. The part running on interviewer's workstation is passive only performing commands coming from the server.

In the telecommunications server also another program is running constantly: so-called Separator unzips and delivers incoming objects in correct folders. There are several different objects in the system (and new objects can be defined without difficulty), which can be discerned by the extension of the file name. Therefore, Separator does not need to open the objects.

Naming convention

One of the corner stones of the system is the naming of the files (i.e., objects). The file name of the sample point indicates both the interviewer and the respondent. The extension of the file name indicates the type of all objects.

The naming convention has two objectives: first the appropriate handling rules and methods can be applied to the objects; and secondly the basic statistics concerning field work can be produced from the file names without opening the files

Several different objects have been defined in the system. For instance, one object type is a batch file, which contains commands which are known by operating system. The interviewer interface reacts immediately if it notices a batch object and launches it. With the batch object, greatest part of laptop maintenance can be taken care of.

3. Other development

Interviewers' laptops were furnished also with Internet access, and each interviewer was provided also with an email address. The rationale for the Internet access was that telephone numbers and street addresses may be obtained via Internet. In the future, Internet will be utilized much more, for instance interviewers can get instructions and survey results from the web. There are many different plans on where Internet and email could be used. However, before anything decisive can be done, all interviewers must have adequate Internet skills. In the beginning, some 25% of interviewers had great difficulties.

The message system embedded in the CAPI information system and the ordinary email do not replace each other. The old message system is needed to inform interviewers about issues closely related to data collection. The ordinary email will be used in less critical information.

4. Discussion

The functionality of B4W is close to that of Blaise III and therefore interviewers could learn it easily. Also the functionality of the new user interface was reasonably close the previous one and therefore easy to learn. The most difficult part for some interviewers was the new Windows environment, that is, a graphical user interface and the use of the mouse. Many of those interviewers who had not used Windows before, experienced great difficulty using the mouse both in pointing an item and clicking mouse buttons (see also Chou and Torn, 2000).

The new operating system and graphical user interface brought up many new facilities which did not exist in DOS based systems. However, the recent advances of computers and in software technology do not affect much the classical ADP problems like data structures and system architecture. The major changes can be seen on screen designs (which actually did not exist previously) and in the problems of programming which are related to the graphical and concurrent window type user interface. The system becomes easily very complicated and vulnerable. Design and programming can be very demanding.

In some respects, the change from DOS based system to Windows based system appeared to be as great a change as it was to start with the DOS based system eight years earlier.

In Windows environment the usability issues are much more difficult to solve than they were in DOS environment, due to the vast number of alternative features and their combinations. Also, the use of concurrent forms on a single display may be difficult to handle. Usability of the interviewer interface needs special attention especially because all interviewers are not well in with Windows environment. In a CAPI system, usability is a major issue, as emphasized also by Bushnell (2000) and Hansen et.la. (1997).

According to one definition, usability means that people who use the software (and the computer) are able to work productively to achieve their goals without difficulty, in their own physical and social environment. In other words, usability should produce such additional value that the users notice it. Achieving this in a CAPI system running in Windows environment is a challenge.

References

Bushnell D.: From Dos to Windows: Usability issues for Interviewers. *Presented at 6th International Blaise Users Conference, Kinsale, Ireland, 2000.*

Hansen S.E., Fuchs M., Couper M.P..: CAI Instrument Usability Testing. *Presented at the annual of the American Association of Public Opinion Research, Norfolk, USA, 1997.*

Gray J.: An Object Based Approach for the Handling of Survey Data. In Kuusela V. (ed.): *Essays on Blaise 1995*. Statistics Finland, 1995.

Gray J., Anderson S.: The Data Pipeline - Processing Survey Data on a Flow Basis. In Banks R., Fairgrieve J., Gerrard L., Orchard T., Payne C., Westlake A. (eds.): *Survey and Statistical Computing, 1996*. Association for Survey Computing, 1996.

Kuusela V. Interviewer Interface of the CAPI-system of Statistics Finland. In Kuusela V. (ed.): *Essays on Blaise 1995*. Statistics Finland, 1995.

Kuusela V., Parviainen,a. An Object-Oriented Case Management System for CAPI Surveys. *Actes de la 4é Conférences Internationale des Utilitisateurs de Blaise*. INSEE, 1997.

Nicholls W.L., Kindell K.K.: Case management and communications for Computer Assisted Interviewing. *Journal of Official Statistics*. 1993, 9, pp. 623-639.

Rumbaum J., Blaha M., Premerlani W., Eddy F., Lorensen W.: Object-Oriented Modelling and Design. Prentice Hall, 1991

Schou R, Dorn T..: NASS Conversion to Blaise 4 Windows with a Visual Basic Interface. *Presented at 6th International Blaise Users Conference, Kinsale, Ireland, 2000.*