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Topic (ii): Challenges and opportunities for statistical offices working in a network environment

REPORT FROM ISRAEL

Submitted by the Central Bureau of Statistics, Israel ¹

CONTRIBUTED PAPER

I. INTRODUCTION

1. Communications network technologies, which are developing at a very high speed, occupy a most important position in the world of computers. With their offer of challenges and opportunities to the IT manager, these technologies have changed the whole approach to information processing which, in the past, was beyond the bounds of imagination.

2. Only a few years ago, most of the processing was carried out on a central computer in a more or less standardized work environment. (A central data bank served the entire organization, using a small number of programming languages. etc.)

3. In that environment, which went hand-in-hand with a relatively slow rate of change, the IT personnel could answer most end-user demands. These were naturally rather limited. In the day-to-day work routine, the end-user was dependent on the programmer. As a result, he had no notion of the

¹ Prepared by Israel Wiener.

computer possibilities at his disposal.

4. With the introduction of the PC, each end-user has at his fingertips a powerful computer with a very considerable processing capacity. Communications networks capable of transmitting millions of bytes per second and, of course, the Internet, result in the end-user being increasingly involved in the computer [computerized] process, with far-reaching consequences.

5. In parallel with the great increase in computer power, programs were developed and off-the-shelf software became available. This change allowed end-users to develop processing tools to serve their own specific needs and to reduce their dependence on the programmers. Bringing the information closer to the end-user in each subject-matter department has led to a real improvement in the processing work and to shorter project timetables.

6. Statistics offices are unique in the wide range of subjects they deal with, while having to accommodate themselves to changes in programs resulting from constraints placed upon the system by external factors. This situation mandates intensive use of computer systems at all stages of statistical work.

7. Technological developments present IT managers with new challenges. However, the IT manager must also deal with the new problems that have arisen: technological progress in all facets of computing has accelerated the current trend towards decentralization of the processing operations. At the statistical office, the term “decentralization” has a somewhat different connotation than the accepted meaning. In other frameworks, it is considered to mean the decentralization of computing operations, but in the statistical office, decentralization begins at the developmental stage.

8. In 1999, the Central Bureau of Statistics in Israel moved from its old site to a new building. The move has afforded the Bureau IT manager the opportunity to utilize the latest technology in infrastructure and communications networks, bringing the area of computers at the Central Bureau of Statistics in Israel forward by a full technological generation.

II. COMPUTERIZATION AT THE STATISTICS OFFICE

9. Computerization in the field of statistics work can be classified under three main headings.

II.1 Data collection

10. Data collection is carried out using a variety of means: questionnaires on paper, telephone interviews (CATI), interviews aided by portable computer (CAPI), administrative system files, etc. Data collection is a lengthy process and is a major factor in determining how long it will take to complete a survey. Every attempt must be made to shorten the process as much as possible and to improve data quality at the time of collection.

II.2 Data processing

11. Processing the raw data received from the field is a multi-stage process involving different factors, including the relevant subject-matter department, the Statistical Methodologies Department, IT and others.

II.3 Information dissemination

12. Rapid transition from paper to use of the Internet and other computerized means of communication.

13. The IT manager at the statistics office faces a dilemma. Newly developed technologies are appearing with metronomic regularity. How can they be utilized to improve statistical work and make it more efficient in each of the three areas mentioned above? Without a doubt, the tools which the new technologies have provided for the IT manager create multiple opportunities for improving work in statistics, making it possible to carry out computing operations that were inconceivable in the past.

III. THE CHALLENGES AND OPPORTUNITIES FACING THE IT MANAGER AT THE STATISTICAL OFFICE

14. In addition to the overall advantages already mentioned, there are further benefits of particular importance for the work carried out by the statistics office:

- ◆ Miniaturization of storage media, along with increased computer power, allows processing of files of enormous size which, in the past, were beyond even mainframe capacity. Combined with communications systems, this makes it possible to set up a decentralized data warehouse that contains both individual and aggregative files at a high level of availability.
- ◆ The reduced cost of data storage and the increased storage space available together make it possible to equip the interviewers with portable computers. Information received can thus be entered directly into the computer during the survey.
- ◆ Fast communications networks facilitate the transfer of data between the decentralized data banks, solving the end-users' need to work independently. Survey results, collected in the field and stored in the portable computer, can be transferred directly from the interviewee's home to the collection center.
- ◆ Access to the world of the Internet has given the statistics office an unrestricted, open channel of communications to other statistics offices around the world. The establishment of direct and immediate communications between the offices is a formidable contribution to the work of each individual office. The Internet has opened up a brave new world in the field of communication with centers of statistical and other information, the distribution of publications and more.
- ◆ The possibility of receiving information through the communications network permits the interviewer to receive data from the collection center, and to transfer the survey data collected by him directly to the center. The communications network thus helps to shorten the process of data processing and production.
- ◆ The ability to communicate between different organizations means that there is direct access to administrative system files that are of interest to the official statistics system in Israel.
- ◆ Advances in mobile phone communications now facilitate the transfer of data using this link. Beyond the fact that this is yet another means by which data can be transferred between the interviewer and the data collection center, it is now possible to collect information from the interviewee's home using the Internet.

IV. PROBLEMS THAT DEMAND CREATIVE SOLUTIONS FROM THE IT MANAGER

15. The advantages listed above have created many opportunities to improve the work of the statistics office. At the same time, new problems have appeared with which the IT manager must cope.

- ◆ Remote management and monitoring: remote management of operating systems, denial of unauthorized access to programs, version updating, problem identification and resolution.
- ◆ Data protection and the right to privacy: creation of a system that is protected against outside infiltration of databases, while at the same time allowing end-users to access external networks and the Internet.
- ◆ System integration: on the one hand, there is a multiplicity of decentralized data banks. On the other hand, there is the need to supply information to interested parties. Inevitably, this raises the issue of integration between the data banks.
- ◆ The need for real time support: real time support has to be on hand for users spread out over many locations, including, of course, the interviewers.
- ◆ The need for personnel that is conversant with the latest technologies: the constant chase after the very latest technological developments while still using specialist programs such as BLAISE means that the Central Bureau of Statistics in Israel has to maintain its own in-house team.
- ◆ The need for data quality control: the decentralization of the databases and the large number of end-users who are also involved in applications development means that the IT manager must maintain constant quality control.
- ◆ Redundancy prevention: duplication of programs and data files is the corollary of working with physically separate, decentralized systems. The systems must thus be synchronized.
- ◆ Metadata: on a daily basis, the IT manager has to handle the transfer of information existing in one unit to end-users in a different unit. Cross-referencing the information is an almost Sisyphean task, because much of the metadata is stored in the mind of the “proprietor” of that information.
- ◆ Constant rise in costs: new technologies, or new software versions, appear with a frequency that prevents the full utilization of any particular product before it becomes obsolete. This is the source of rising costs. The IT manager must take the middle course between the aspiration to maintain technological standards and the constraints imposed by budget and timetable.
- ◆ The IT manager’s professional expertise: the great degree of specialization required today, in particular in communications networks, poses a serious problem for those working in computing. The IT manager, who in the past had an intimate understanding of every detail of the systems, must rely today on experts in each of the different computer fields.
- ◆ The role of the IT manager: the IT manager must adjust to the changes taking place in the computer management field. If, in the past, the role of IT managers was defined in professional terms, today, management and marketing assignments take up a substantial proportion of their time.

V. THE IT MANAGER AND THE COMMUNICATIONS ENVIRONMENT IN THE CENTRAL BUREAU OF STATISTICS IN ISRAEL²

16. Until October 1999, the offices of the Central Bureau of Statistics in Israel were housed in a number of old, prefabricated concrete buildings that left much to be desired in terms of their suitability for data communications. The communications infrastructure between the buildings was built up, layer upon layer, which caused communication problems between the networks. A large number of the computers were not even connected to a network. Most of the work was carried out on a mainframe. PC computers were connected to the mainframe by emulation of the local network or via a coaxial cable.

17. In 1997, construction work started on a new, 8-story building designed specifically for the Central Bureau of Statistics. The design of the communications infrastructure for the new building was assigned to the IT manager. Behind this decision was the wish to profit as much as possible from the experience and expertise that he had acquired, in order to satisfy other needs of the Bureau. These included the establishment of a National Data Collection Center at the main office, with the object of reducing data collection and processing time, cutting costs and improving data quality. At the same time, the Bureau Directorate made a strategic decision to decentralize the in-house computing operations. Department heads were given a free hand to choose their own *modus operandi*. Questions on data protection and the right to privacy became extremely important issues on the computer agenda. The Bureau Directorate decided that information protection would receive top priority.

18. It should be pointed out that the task of designing the complete communications network of a new building destined to serve an organization the size of the Bureau of Statistics is a once-in-a-lifetime opportunity that rarely, if ever, falls to the lot of an IT manager.

VI. CREATION OF THE COMPUTING INFRASTRUCTURE AND THE MOVE TO THE NEW BUILDING

19. The IT manager had to deal with complicated tasks on a variety of topics:

- ◆ Establishing a passive infrastructure which would remain contemporary several years ahead. A great deal of imagination had to be employed in order to forecast the computing and communications needs for the predictable future.
- ◆ Choosing the active infrastructure design appropriate for a volume of communications traffic that rises in a geometric progression from year to year.
- ◆ Setting up interlinked departmental networks, which would allow **every** end-user access to **all** the data banks they need in order to perform their jobs, while denying data access to anyone **without** the prerequisite authorization.
- ◆ Providing access to the Internet, or other outside institutions, from every workstation that needs it. This access must not compromise authorization and information protection procedures.
- ◆ Establishing a Support Center. The mission of the center is to provide end-users with rapid, professional responses during all the hours that the Bureau is active and thereby improve the service.
- ◆ Establishing a 7/24 communications network.

² See computing system and communications network descriptions in appendix.

20. We note that the Bureau Director determined that the move to the new building would take place while normal work continued as usual. This decision formed the basis for planning the move. In fact, the transfer to the new building was carried out in parallel with normal work operations, and downtime caused by the move was kept at a minimum. (Actual downtime: less than 72 hours.)

VII. OPERATING DECISIONS

21. Installed at each workstation in the new building: 4 copper wire communications ports and one fiber-optic line. At this stage, the fiber-optic line was not in use. It was installed to provide fast communications services in the future.

22. The copper lines serve several purposes:

- ◆ Telephone line.
- ◆ Internal communications network physically detached from all other networks.
- ◆ External and Internet communications.
- ◆ An additional line for external communications that have no contact with the internal system, mainly for information protection considerations.

23. The objective in installing this configuration was to achieve maximum flexibility and avoid the necessity of opening walls at some time in the future to install extra lines.

24. Standardized infrastructure is used for all the lines, opening up the possibility for different configurations at each workstation. For example: two telephones and two internal lines, etc.

- ◆ The need to provide real time support (hardware and software) to all the users of the system led to the establishment of the Support Center. Earlier, I mentioned the multiplicity of specialized statistical systems. In addition, support must be provided for the field workers conducting surveys at unconventional hours. Outsourcing support to the support centers of commercial companies cannot satisfy these needs, and so it proved necessary to establish an in-house center.
- ◆ Establishment of the National Data Collection Center is currently under way. The collection center has already started collecting data via telephone interviews (CATI), for four surveys which are very important to the Bureau (Employment, Construction, Industrial Indices and Health Services). Concurrently, work has begun on a pilot survey based on one-on-one interviews supported by portable computer (CAPI).
- ◆ Both CATI and CAPI operations are carried out using the BLAISE software of the Central Bureau of Statistics in the Netherlands. The program underwent localization to Hebrew (writing from right to left).
- ◆ Standardized wiring was used for all the computer and telephone communications systems to reduce maintenance and cost. All the wires are multi-purpose (they can be used for either data communications or telephone.)
- ◆ A central servers unit was established, connected to all eight floors of the building and channeling all the external communications lines.
- ◆ Two communications centers are sited on each floor. Each center is an independent logical network, enhancing network operations.

VIII. SUMMARY

25. Without a doubt, communications systems and PC servers are less reliable than the tried and trusted central computer. However, today we cannot relinquish the many advantages gained through using the communications networks.

26. The communications system in the new Bureau of Statistics building has brought the Bureau's work forward by at least a full technological generation. All the end-users have at their fingertips a computing system that enables them to communicate with each other while sharing files. The command and control system is a tool that the support manager has on hand for real time intervention and problem solving.

27. Communications, important as they may be, are a means for developing computing systems. The IT manager must devote a great deal of his time to communications, but he must pay no less attention to his roles in developing systems, giving advice, managing and marketing the unit.

28. The following are the great challenges now faced by the IT manager in the Central Bureau of Statistics in Israel (as in every other statistics office):

- ◆ To develop organization-wide systems.
- ◆ To maintain the communications system at a high level of excellence.
- ◆ To introduce data collection via portable computers in direct communication with the data collection center.
- ◆ To integrate new technologies into the computing array.