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**TRAINING AND MODERN TECHNOLOGY IN A CPI FRAMEWORK**

Invited paper submitted by the Central Bureau of Statistics of Israel\*

**Summary**

ICBS is in the final stages of implementing an internal and integrated development project for the CPI. Training for use of modern technology within this framework is of utmost importance for the project to succeed. In a dynamic system (with ongoing changes and advancement of personnel and technology), creation of training standards, common terminology and analytic methods are required. Each and every product of the system must receive proper authorization in order to participate in a well-designed CPI. Trainers and trainees shall have the proper qualifications in order to operate (and survive) within the system. Training programs are required not only for teaching the different roles of the CPI but also for feedback and improvement. Based on in-depth analysis of current practices, the project has ensured that modern technology is put to practice in an efficient way. In addition, the project has brought about new modes of co-operation and correct working procedures. Analysis, planning, training and development of new technologies lead to advanced methodological analysis. The CPI project is a model of how ICBS feels it should go about research and development of official statistics.

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## **I. Introduction**

1. As we look forward to the next millenium it is both timely and necessary to review some of the recent developments in advanced technological usage in a CPI and its implication on training needs and procedures.

2. The modern CPI has to accommodate the adoption of multiple data collection methods and statistical analysis procedures. The Israeli Central Bureau of Statistics (ICBS) is of now under process of adopting computer assisted interviewing methods like CATI (computer assisted telephone interviews) and CAPI (computer assisted personal interviews with handheld computers). Additional data collection methods include FTP (file transfer protocols) and WWW (World Wide Web - Internet). Finally, the traditional DDE (direct data entry) is essential, as some of the CPI information is yet to be paperless.

3. The modern day demands and abilities of price statisticians must also be enhanced. Technological advances in data warehousing have opened up new possibilities in data exploitation and statistical analysis. ICBS has taken an integrated approach into CPI technological advancement and produced an information system where all participants in the CPI process are benefited. In this document we look at some of the training standards and tools within CPI information technology that lead, eventually, to a major improvement of the CPI. First and foremost, training plays a major role in the information system. However, training methods and procedures are only one of the components in the CPI and can not replace the daily efforts of production, implemented in a well-developed CPI program. In addition, successful training methods and procedures require a well-defined information system.

4. In this document we present some of the principles that were introduced in order to implement an integrated information system in the Israeli CPI. These shall be laid out in the following three sections: fundamental principles and terminology, the man-machine integration process, operational training methods and testing procedures.

## **II. Fundamental principles and terminology**

5. *System Users* - Participants of the CPI information system are to be divided into different categories based on statistical, technological and administrative capabilities. In the ICBS system we define three kinds of users:

- developers and programmers;
- methodologists and price statisticians;
- data collectors and other field work administrators.

The training methods must provide solutions for sophisticated users who can easily adapt to the use of obtaining data and process them according to their needs, and less sophisticated users who require a more structured system of screens adapted to their specific requirements.

6. *System complexity* - the CPI information sub-systems (and modules within each of these) have different levels of complexity. Our system can be divided into two major and connected sub-systems:

- a secure price compilation and index sub-system;
- a semi-secure collection sub-system.

Each sub-system must operate in harmonisation with the other, with respect to co-ordination control, comparability and training for these tasks. The price index sub-system maintains a higher level of complexity (algorithms of sampling, editing, compilation, CPI updates, etc.) whereas the data collection sub-system consists of many data tables with stable and less complex nature (price collectors, reporters, schedules, etc.)

7. *Life-cycles* - the consumer price index in Israel has three different life cycles:

- daily activities at a micro level (price observations);
- monthly activities (index compilation, outlet substitutions and other continuous procedures);
- yearly activities (re-weighting, sample design and other major procedures).

In reality, all three life cycles are handled on a day to day basis. Training procedures enable correct allocation of limited resources allowing execution of all activities by the CPI staff.

8. *Occupational analysis* - the integrated CPI information system in Israel is constructed on the basis of 23 main modules, divided into 5 groups:

- the planning group, comprising the item system, the system of outlets and other reporting units, the overall annual collection program, the detailed monthly production schedule and the weekly work programme;
- the data collection group, comprising CAPI, CATI, FTP, DDE, WWW and the integrated observation collection system;
- the process control group, comprising observation checks, statistical control and data archiving;

- the calculation group, comprising the computation of item indices, intermediate and final index calculation for various stages of the index pyramid, preparation for publication, dissemination and the computation simulator;
- the technological service group, including data security, linkage to general software capabilities (MS Office), tools for fieldwork coordination and for subject matter expert tasks, linkage to external administrative sources (e.g. establishment data bases) and to internal data sources (other price index programs, household expenditure surveys, etc.).

Each of these groups requires precise occupational analysis in order to determine professional capabilities and training procedures.

9. *General training plan* - such a plan is based on four basic elements:

- Fundamental training (how to collect data, edit data, compile data, code development, etc.);
- Continuous training (feedback from participants in the system and monthly meeting with relevant CPI staff for marginal changes and improvement);
- Professional training (computer technology, economics, psychology, etc.);
- Annual retreats and seminars (summary of the calendar year and new year program and planning, major changes in index methodology, weights, sample designs, basket of goods and services, etc.).

For each category several and different training procedures, means, methodologies and objectives were contemplated.

10. *On the job training* - the CPI, by nature, is a dynamic statistic. There is a tendency, therefore, for more experienced members of a CPI team to hastily complete the duties of junior staffers. In this form of training one must realize the experience accumulated by senior members of CPI staff and formulate an on the job training process in a methodological fashion. In this stage we build on part of the fundamental training and construct three more elements:

- office recruitment methods specially designed for CPI staff;
- permanent exercises and "check-ups";
- field coaching by CPI staff at all levels.

11. *Specialized training* - for each section, module, or specific duty of the CPI integrated system, a specialized training program shall be devised.

Examples may be quality adjustment procedures, handling of seasonality in clothing and footwear or fruits and vegetables; compilation of yearly services (like consumption groups in educational services).

### **III. The Man-Machine Integration Process**

12. Use of modern technology in the CPI framework requires analysis of precise integration amongst individuals and automated tools in the system. Far too often, the CPI information systems fail to achieve its objectives due to disparity between man and machine. Suitable training procedures can assist in overcoming this gap. Understanding the different kinds of technology within an information system and parameters for selection of the automated tools are also relevant for training procedures. In our CPI system, we acknowledged five categories of technology:

a) *Hardware*

- major hardware (servers, computers, etc.);
- data collection and field work hardware;
- office user hardware.

b) *Operating systems and databases*

- infrastructure (NT, Windows98, Windows CE etc.);
- production level (Oracle, Office, SAS, etc.);
- level of publication, dissemination and archives.

c) *Communications*

- local area networks;
- wide area networks;
- data security issues.

d) *Applications*

- "on the shelf" applications like Microsoft Office;
- customized applications for selected modules.

e) *Data layers*

- permanent tables;
- continuous data (like those associated with price observations);
- "flags", providing indicators on the flow of data through the system.

13. Implementation of the automated system is dependent on analysis of suitable participants. This is accomplished through psychoanalytic training methods that reveal the following information about each of the individuals:

a) *psychomotor capabilities* - the ability of the individual to operate the computer systems in a proper fashion, avoiding unwarranted entrance to certain areas, key punching and working simultaneously with multiple windows.

b) *dyslectic functionality* - revealing the correct colors, shades of color, understanding numeric and non-numeric data, representing the "correct" CPI status.

c) *attentiveness* - positive integration between interviewee and interviewer with handheld or personal computers.

d) *memory capabilities* - the ability to work in sequential and simultaneous stages, with standard or customized instructions vs. an improvisation mode.

14. All in all, the technology selection process and integration of individuals into the overall CPI information system, through proper training and psychoanalytic methods, will be dependent on the following criteria:

- the amount of resources available (financial and professional);
- the desire for a static or dynamic system;
- the amount and nature of data collection methods;
- the boundaries of the information system.

#### **IV. Operational Training Methods and Testing Procedures**

15. ICBS prepared a training program that included four stages:

- Training for operation of computers and other technological components;
- Specific training for each role within the system;
- Integration of the two above;
- Testing procedures.

16. In addition, a supportive network was designed to complement all training programs. The network included the following components:

- Written documentation for each lesson and/or component within the system;

- Coaching by direct superiors;
- A helpdesk for unique professional problems;
- Mini-automated feedback systems for the process, final product and particular role of individual;
- Selection process and profile creation for participants in each program;
- Uniformity among programs (especially creation of common terminology);
- Tools for self learning, improvement and mobility between programs;
- Investigative meetings to receive feedback on worker progress, software problems, system procedures, etc.

17. The scope of this document does not allow a too detailed design report of the three training programs mentioned above. However, an example of the three programs (and some of the testing procedures) will be laid out in this section.

18. **Program One** - Operation of computers and other technological components:

a) General understanding of computer operations

- Hardware;
- Operating system (Windows CE or Windows 95);
- Mouse, keypunching, etc;
- File managing, standardization, working with folders, etc.

b) World of Microsoft Office (the standard chosen for our system)

- Worksheets;
- Understanding cells;
- Connectivity of cells, worksheets and files;
- Use of menus;
- Automatic tools - functions, formulae, database, etc.

c) Communication layers

- Fundamentals of communications;
- File transfer protocols;
- Communication services (up to 40 different services).

d) Exercise in computer use and communications - create communication link between field computer and headquarter computer; precise use of FTP, exchange mail and WWW; transfer of price observations with folder creation and encryption of data.

19. **Program Two** - Specific training for each role within the system:

a) CPI and the computer system -

- system division and typology;
- architecture;
- roles and tasks to be handled by man or machine.

b) System data layout -

- motion of CPI items upward and downward within the CPI pyramid;
- connectivity between items and tables of the system (item and outlet, item and formula, item and collection method, etc.).

c) System timing and working procedures -

- daily procedures (file transfers, data editing, control features, etc.);
- monthly procedures (compilation, dissemination, etc.);
- yearly (or other extended periods) procedures (re-weighting, etc.).

d) Customised applications - data collection, sampling, statistical analysis, seasonal adjustment, other research and development features, etc.

e) System methodology - how to utilize the strengths of the system in order to prepare discussion papers, present graphs, balance sampling of items, outlets, etc.

20. **Program Three:** Integration of the two above: this stage is the specific training for each and every role within the system - parts accomplished by "human" and parts by "machine".

a) Office or laboratory simulation - complete occupational analysis and execution for each role in the system. For example, create an outlet with items to be priced and desired data known beforehand. The price collector integrates computer use with data collection skills and communication knowledge.

b) Physical (personal) training - each staff member is led, by integrating all steps mentioned above into his or her role, until independent work is authorized by the CPI director.

21. **Testing Procedures:** In order to evaluate the training programs, tests were devised for each of the following:

a) general ability of the worker to fill the his or her role in the CPI;

b) specific craftsmanship of personnel for certain, more sophisticated roles (leadership, statistical analysis, etc.);

c) Capabilities of the teacher, trainer, coach, etc;

d) Quality of the training programs based on the product and outcome of each part in the training process.

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