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the quality of goods and services and also of new products on the market. At the same time this improved version helps in the review, analysis and documentation of the collected information on prices and items, ensures better supervision of events taking place on the market and of the work of price collectors, and the possibility of fulfilling various requests relating to the harmonization of price indices.

I. Introduction

The Statistical Office of the Republic of Slovenia (SORS) began monitoring prices and calculating indices in the 1950s, when the first methodological basis was laid down. In the years that followed various causes in one way or another altered the contents of the chosen basket of goods and services and the number and type of outlets and locations, and development influenced the methods of work.

Today we monitor prices for around 500 selected representative items at about 500 sales points (shops, markets, workshops, etc.) in four of Slovenia's major towns. Each month we determine about 9,000 prices, which are then used for calculating the consumer and retail price indices as well as for some other purposes.

SORS does not have regional statistical offices; data collection and entry are done by permanently employed collectors who also live in the places where the surveys are being conducted. All other functions, including data control, are done centrally, which gives us the advantage of having an overview and practical experience of all phases of the "creation" of the index.

At the beginning of 1996 the common working method with pencil and paper was augmented by an electronic version of price monitoring supported by laptops and modems. We will explain this transition to the new working method below, especially the one currently in use.

II. Development of computer technologies and price monitoring

The recent development of computers and software has introduced innovations in statistics as well. The new Blaise[1] program package emerged. This is an integrated program system (combined from several modules), designed for the computer support of statistical research, which works on a local network (LAN) or individual PCs using DOS, Windows NT or Windows 95/98 operating systems.

[1] Blaise was developed by a group of Dutch experts on statistics from a prototype method. In fact this means that they tested each part of system at their statistical offices and then introduced new ideas and improvements based on the results.

The basis of the system is the Blaise program language, on the basis of which it is possible to create a formal specification of the structure and contents of the questionnaire or form. This specification represents an information base in which the system finds all the necessary means for automatically generating various programmes for data entry and processing. The system is adjusted for use at departments where the contents of the research are studied, and gives the user the possibility of designing the data entry and processing procedure, and of simultaneous control of all phases of the research process.

These characteristics of the program were one of the main reasons why SORS began considering whether and how it could be used in its retail price monitoring, especially in field work, and thus ease the work of the collectors, speed it up and improve data quality.

Blaise I Program Package

The preparation of an appropriate application, i.e. writing the instructions and program requirements, designing the data entry form and defining the remaining accompanying work phases, initial tests and later final presentation of the program to authorised persons, was started in 1994. In practice the experimental realisation of the idea was initiated in 1995 when price collectors started entering data for a selected group of about 100 items. The project was finally completed in 1996, when the data entry application for all data on retail prices collected in the field by price collectors was put to regular use.

Laptops[1] with installed modems, programs and the prepared application were purchased for the collectors. From the start the working process, which completes one cycle a month, runs more or less according to the following order. At the beginning of the month the price collectors take over the “precursors”[2] via modems. They then collect the required data and enter it in the computer forms. In the final phase they send it to SORS again via their modems, where it is reviewed and prepared for final processing, and converted to tables using the Cobol programming language (see Supplement 1).

[1] We are currently using Toshiba laptops (486 DX, Pentium 100 Mhz, 8200 KB memory, 11" monitor, 3 kg weight). Before purchasing the first laptops we considered the use of PSION calculators, which had already been purchased and proved inadequate in initial tests.

[2] Precursors are material (prices and descriptions of items) from the preceding month which serve as the base and help for data entry in the current month.

Supplement 1: Work Phase (main menu)

========== *BLAISE - MANAGER * * * Select option* ==========

PRICES

1. Beginning of work in the new month (defining precursors)
2. Work in the current month
   * entry and review of the data
   * adding the entries received by modem (done only at the department)
3. Generation of a printout of the data (for review purposes)
4. Completion of the work for the current month and the forwarding of data
5. Preparation of data for processing (generating a new special file)
6. Exit from the program

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III. Continuing the path – the main reasons for upgrading the program

⇨ The first application (Blaise I) was conceived fairly simply. It was used for collecting and saving only basic data (price, short descriptions) on the chosen items. For this reason, the later analysis of movements on the market and the overseeing of the conduct of the price collectors in problematic situations[1] (missing observations, change in products or outlets, etc.) were impossible due to the inadequacy of the data; nor did the application contain any other automatic control procedures.

⇨ Discussions with the price collectors proved that they had various additional information, not only concerning the goods and services which they regularly monitored but also about other items on the market and market trends. The price collectors used some of this micro-information internally for their own use (when the products changed, for example), but the major part of the information remained unused by the centre. This part of the information could have been used somehow, or at least stored.

⇨ Emphasising the significance of innovations and changes resulting from technological development, which are manifested on a daily basis through new products or improvements to existing ones, as well as growing public and professional criticism concerning the negligence of such products and their exclusion from the representative “basket”, demanded a search for new solutions for their detection.

⇨ The profession also requires that the selected price indices measure only the "pure changes in prices" and not changes resulting from changes in quality. The share of the latter should, by some method (best using appropriate methods of quality adjustment), be evaluated and eliminated from the general change in the price of an item. The procedures for such methods should, at least to some extent, be already integrated in the program.

⇨ Finally, the very positive experience with the new working method and the fact that "Nothing can be made so well that it couldn't be improved", as the saying goes, encouraged us to modernise and upgrade the existing application.

IV. New application for data entry – Blaise II

Our main concerns in conceiving a new computer application[2] were primarily the following:

I. ***To establish broader and better control of field work*** – with the new form we tried to collect the greatest possible amount of information about events in the field (changes in the market, changes in products, decisions made by price collectors, etc.), to document and store them, and to insert some control mechanism into the program.

II. ***To ensure and establish a database and appropriate documentation*** which will be a source in the event of later analysis and also serve to improve the methodology and fulfil Eurostat requirements (regulations concerning the process of harmonizing price indices).

III. ***To keep the program simple for users*** and to preserve as many of the old elements as possible, make certain procedures automatic (e.g. the automatic calculation of some of the data and the transfer of data which appears repeatedly), and not make the application too complicated for the user.

1) Type and source of data

The goods and services for which prices are monitored on a regular monthly basis are, with regard to their properties and descriptions, divided into agricultural products, manufactured foodstuffs and manufactured non-food products and services. They are equipped with a serial number, code, detailed description and measurement unit; together, these form their specifications *(the designation)*. The designation is also, in essence, a special file which is a component of the program and presents an important source of information upon data entry. Much of the data is automatically transcribed on to the

[1] A series of regulations were accepted in connection with calculating the Harmonized Index of Consumer Prices. The Commission Regulations (EC) No. 1749/96 contains the requirements and specifies the procedures concerning: newly significant goods and services; quality adjustment procedures; missing observations, etc.

[2] The new application is done in an improved version in the Blaise III computer language, version 1.18.

forms. The designation also shows for which item prices should be observed, while the brand, type, model, producer, number and type of outlets and other important characteristics are chosen and determined by the price collectors themselves, in agreement with responsible persons at the department. The specifications are readjusted at the end of the year when the corrections are entered. The list of items for the following year is determined from it.

2) Basic form – outlook of the new application

At first glance the new application differs from the old mainly in terms of the **basic form** (see Supplement 2) which serves for data entry, is much more comprehensive than the older version and, as we shall later see, also contains various tools (e.g. description codes, numerical limits), while almost all the remaining accompanying procedures (data transfers, beginning of work, final phase) have remained unchanged.

An important difference between the two applications lies in their outlook. In the new version the descriptions and definitions about the active field in the form (field into which we intend to enter the data) are always displayed at the top of the screen, while the form itself is on the bottom half.

The form is conceived equally for all items, except for some criteria for the agricultural products group, which are defined differently (less precisely, since this group is influenced by the seasons much more than others). It is divided into two components:

I. "SUMMARY FORM" is a sort of introductory part of the form. By entering the relevant data into fields - *place, form, serial number* and *date*, it defines the item, the town, and the month to which the data entered in the continuation (second part) will apply. The summary data on the *total average price* and the *total chain index* give an overview of which prices have, on average, been collected at each outlet for a chosen item during a particular month, and their movements during the current month in relation to the preceding one.

II. "OUTLET FORM " is the second part of the form. It contains data on a selected product at a particular outlet, not only for the current month (*specification_1, price_1, quantity_1*) but also for the preceding month and base month (*specification and price for the preceding month or the base month*) and, in individual cases, data on another, usually very similar product (*specification_2, price_2, qunatity_2*). With the new form we can simultaneously monitor two prices or two varieties from one description; these are the chosen product and a back-up product (substitute). The data from the latter can be partly or fully used when the first chosen product is no longer on the market.

Supplement 2: design and type of forms

The fields in the forms have been ranked into five groups with regard to their characteristics or the type of data to be entered. They are as follows:

1 - Mandatory entry of the appropriate data without which continuation to the next field is not possible.

2 - The data is entered only in specific cases or if the requirements are met.

3 -The data has already been entered (it is taken from the designation or from precursors).

4 -The data is automatically calculated on the basis of a defined formula.

5 - Accessory field.

I – SUMMARY FORM

Forms: 71 - agricultural products
51 - food products
52 - non-food products
80 - services

Towns: 17 - Koper
25 - Ljubljana
31 - Maribor
38 - Novo Mesto

1	***Town***	***25***
1	***Form***	***52***
1	***Num_item***	***122***

3	***Form***	*52*
3	***Town***	*25*
1	***Year_Month***	***9906***
3	***Num_item***	*122*
3	***Code***	*62310*
3	***Item***	*Dishwasher, 5-8 programs, for 12 covers, with safety valve*
4	***Avg1***	*92646.75*
4	***IndexP***	*100.0*

II – OUTLET FORM

Enter:
1 - product unchanged
2 - substitution
3 - carry-forward price
4 - imputed price
5 - base price
6 - base - corrections

Remarks:
100 - no changes
101 - product price increase
102 - product price drop
103 - changed trade conditions
104 - effect of time changes
105 - changed elements of the price
106 - rounding
107 – seasonal sales
108 – change of packaging
109 – seasonal product
201 - same producer's other product
202 - other producer
203 - changes to the product
301 - product temporarily unavailable
401 - discontinued production of a particular product
402 - outlet abandoned
299 - unknown reason

3	***Sales point***	*3*
3	***Num_item***	*122*
3	***Code***	*62310*
1	***Enter***	*3*
2	***X***	*0*
3	***Description_base***	*Candy CDW 575*
3	***Price_base***	*115000.00*
3	***Unit***	*piece*
3	***Description_PM***	*Candy CDW 575*
3	***Price_PM***	*117840.00*
3	***Ratio_PM***	
1	***Description1_TM***	*Candy CDW 575*
2	***Quantity_1***	
1	***Price1_TM***	*117840.00*

4	***Index***	*100,0*
1	***Remark***	*100*
1	***CorrectF***	*1,00*
2	***Y***	
5	***Desc.2tmx***	
2	***Description2_TM***	*Candy CDW 586S*
5	***Quant.2x***	
2	***Quantity_2***	
5	***Price2tmx***	
2	***Price2_TM***	*115080.00*
2	***K2***	
5	***Ratiotmx***	
4	***Ratio_TM***	*0.98*
4	***Avg_price***	*92646.75*

3) Control mechanisms

The application has a number of control mechanisms in some of the fields of the form which can be inter-linked. Thus the characteristic of most of the fields - the exceptions being those into which the descriptions of the items (specifications) and prices are entered - is that it is possible to enter only previously defined data, or else the program will warn of the error and prevent further entry. With the use of individual codes, some of the data is automatically entered, and in some cases changes or even access are denied.

The first such field is the **Enter** field. In this field the price collectors specify, with a code number, the movements in the current month concerning the monitored products or varieties, and what type of data will be entered. They can choose from six options:

① **Product unchanged** means that, this month, the same product was monitored as the previous month and only the price has been changed. By selecting code no. 1, the specification for the product for the current month is automatically printed or transcribed, and it is the same as for the previous month.

② **Substitution** is used when, in a specific month, the data for the initially selected product cannot be located and we have the data for another product from the same outlet which had been monitored during the preceding month (condition). This data can be used fully or partly (corrected) since, with the use of code number 2, it is automatically transcribed from fields *specification_2* and *price_2* into fields *specification_1* and *price_1*.

Carry-forward price presents a possibility in cases where there is no data available during the current month either for the initially monitored article or for the substitute. With the use of this code the data from the fields, with the events of the preceding month (*specification_PM* and *price_PM*), is automatically transcribed ("carry-forward") to the appropriate fields, which are intended for the entry of equivalent data for the current month. This data also cannot be altered.

Imputation enables the automatic calculation of a missing price based on the latest known price registered at the same outlet, and the data for the same product during the current month collected at other outlets (the old price is indexed). The code is used in cases where, for example, the outlet was abandoned or the chosen product is no longer produced and there is no corresponding substitute.

Base price serves for data entry relating to the basic period and can be used only at the beginning of the year. Through it the data can only be entered into two fields (*specification_base* and *price_base*).

Correction of the base serves for the entry of any later corrections of the base data.

After this, other reasons for or causes of changes can be briefly explained in the **REMARKS field,** where the code which best explains the reasons for changes to the indicated price can be chosen and entered, with regard to the calculation of the index value (previous field). Individual remarks can be used only in specific cases, e.g. code number 100 only if the index is 100, code numbers from 201 to 203 only if code number 2 was used in the “entry” field, etc. A more detailed list of the codes, and their descriptions, is given in Supplement 2. If the chosen remark does not give sufficient explanation, the price collector can use a special command to open a new field, where he can write a more comprehensive explanation about the events on the market or relating to the specific item.

The CF (Correction Factor) field is a special field with an important role primarily in cases where it was assessed that a change in the product led to a change in quality. This would mean that the price of the variety chosen during the base period can no longer be directly compared to the price of the newly chosen one, since the latter is not of the same quality. In a way this means that a new base price must be set, and this field allows this with the entry of appropriate data which will correct the old price shown in the *base price* field. The data indirectly shows an evaluation of how much the new product is of a higher or lower quality than the previous one.

A special feature is the **RATIO field**. The data in it is processed only in cases where two prices are monitored simultaneously at the same outlet and for the same item. The calculated data shows by how much the price of the substitute product differs from the price of the initially chosen product, and also serves as important information for determining the correction factor.

We have presented you some of the fields in the form. We have highlighted mainly the fields which can give us a good deal of additional information with the entry of appropriate data and through which we can influence the data in other fields. The form also contains some fields which could ease and simplify the work, such as e.g. *the QUANTITY field*, where we enter the monitored quantity (packages) of the product from which the price per unit is calculated.

4) Printouts and storage of data

A great deal of information about monitored goods and services, market events and the like is collected in the course of each month. Some of this information is fresh, while some has been transferred from previous periods. However, none of this information is much help in the long run unless it can be stored in a suitable form. In order to ensure maximum usefulness of the collected data, we must define the output form of the data - that is, which data will later be needed and which will not. The type and form of output data for which we have opted is shown in Supplement 3. For preparing the printout, the application has a special command by which a file containing

the desired data is created and can be stored or transferred to an Excel program for various analyses.

V. Conclusion – advantages and disadvantages

A great deal of anxiety concerning the new working method emerged with the decision to use and subsequent transition (in 1996) to laptops. Despite years of experience in price monitoring (10 to 15 years on average), the price collectors had little knowledge of using computers at the beginning of the one-year transitional and test period, and during the practical presentations of the program, its functioning and the applications. Yet they soon adjusted to the new working method and successfully mastered it so that it no longer presents a major problem.

In 1999 we started using a new improved version of the computer application for data entry which, extended with the information on some market events, offers easier execution of the procedures concerning missing observations, changes to products and alterations in product quality. All the results and effects cannot be evaluated at present, since they have been in use for only a few months, but first impressions are optimistic.

Among the advantages of the presented working method, we would like to mention the following:

1. The work proceeds more rapidly and satisfactorily since the data and final results are available sooner
   ⇒ use of modems
   ⇒ the entire work process takes place at only two locations – the price collectors' and the department
2. Reduced probability of error
   ⇒ the data is entered by the same people who collected it
   ⇒ a series of integrated controls and automatic procedures in the application make contextual control easier
3. Better overview of price collectors' work and collected data
   ⇒ control of the material is done directly at the department and by persons responsible for preparing the final results
   ⇒ more direct information about the events and changes on the market and about the products
4. The collected material is documented, stored and prepared for further processing.

Unfortunately, laptops still cannot be used directly in the field because of their weight, battery capacity and the scattered outlets, and also for several other reasons. This, together with periodical technical problems with the computers, the malfunctioning of modem connections, and the increased scope of work at the department (data control) and partly at the price outlets, is one of the major setbacks of this working method.

Supplement 3: An example of a data printout for a chosen item (dishwasher)

Town	Num.	Product code	Selling point	Description of the product - base period	Base Price	Enter	Description 1 - current month (t)	Current price 1	Index $P1_t/P1_{t-1}$	Remark	CF	Description 2 - current month	Current price 2	Ratio P2/P1
17	122	62310	1	ZANUSSI PVS 684	79901.00	1	ZANUSSI PVS 684	79901.00	100.0	100	1.00			
17	122	62310	2	Candy 376 S	101070.00	1	Candy 376 S	101650.00	100.0	100	1.00			
17	122	62310	3	GORENJE PMS 604B	88729.80	2	GORENJE PMS 505	85990.00	98.0	201	1.00			
17	122	62310	4	Candy CDW 254 S	97186.00	1	Candy CDW 254 S	97186.00	100.0	100	1.00			
17 Average			2.5		91721.70			91181.75	100.0					
25	122	62310	1	G PMS45S	83352.00	1	G PMS45S	83352.00	100.0	100	1.00			
25	122	62310	2	G PMS60S	87492.00	1	G PMS60S	87492.00	100.0	100	1.00			
25	122	62310	3	CDW575	115000.00	3	CDW575	117840.00	100.0	100	1.00	Candy CDW 586S	115080.00	0.98
25	122	62310	4	G PMS45	81903.00	1	G PMS45	81903.00	100.0	100	1.00			
25 Average			2.5		91936.75			92646.75	100.0					
31	122	62310	1	CANDY CDW 470 S	108840.00	1	CANDY CDW 470 S	108840.00	100.0	100	1.00			
31	122	62310	2	CANDY CDW 470	104161.00	1	CANDY CDW 470	103060.00	97.8	102	1.00			
31	122	62310	3	CANDY CDW 470	101520.00	1	CANDY CDW 470	101520.00	100.0	100	1.00			
31	122	62310	4	Candy CDW 376 s	107880.00	1	Candy CDW 376 s	107880.00	100.0	100	1.00			
31	122	62310	5	GORENJE PMS 60 SB	87491.00	1	GORENJE PMS 60 SB	87491.00	100.0	100	1.00			
31	122	62310	6	CANDY CDW 575 S	115080.00	1	CANDY CDW 575 S	117480.00	102.3	101	1.00			
31	122	62310	7	CANDY 575 S NX	108192.00	3	CANDY 575 S NX	108192.00	100.0	100	1.00	Candy CDW 586 S	124572.60	1.15
31 Average			4		104737.71			104923.29	100.0					
38	122	62310	1	Candy 575	115080.00	1	Candy 575	115080.00	100.0	100	1.00			
38	122	62310	2	Candy 470	108840.00	3	Candy 470	108840.00	100.0	100	1.00	CDW 484s	111240.00	1.02
38	122	62310	3	cdw 470 s	108840.00	1	cdw 470 s	108840.00	100.0	100	1.00			
38	122	62310	4	Candy 575 s	104166.00	3	Candy 575 s	104166.00	100.0	100	1.00	C gvi 682	107856.00	1.04
38	122	62310	5	Candy 470	108840.00	1	Candy 470	108840.00	100.0	100	1.00			
38	122	62310	6	cdw 575 s	115080.00	3	cdw 575 s	115080.00	100.0	100	1.00	C 586 s	17480.00	0.15
38 Average			3.5		110141.00			110141.00	100.0					
