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**EDITING AND IMPUTATION IN CROSS-SECTIONAL BUSINESS SURVEYS:
RECOMMENDED PRACTICES FROM THE EDIMBUS PROJECT[1]**

Supporting Paper

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I.   INTRODUCTION

1.   From January 2006 to June 2007 a project to develop 'Recommended Practices for Editing and Imputation in Cross-Sectional Business Surveys *(EDIMBUS)*' was carried out with the partial financial support of Eurostat. The project (edimbus.istat.it) was coordinated by the Italian National Statistical Institute (ISTAT) and involved the participation, as partners, of the Centraal Bureau voor de Statistiek Netherlands (CBS), and the Swiss Federal Statistical Office (SFSO)[2].

2.   The project was launched as one of the initiatives for the implementation of the recommendations of the Leadership Expert Group (LEG) on Quality (LEG on Quality, 2001). The LEG on Quality stated that Recommended Practices (RPs) can be considered a highly effective harmonization method which can, at the same time, provide to NSIs the necessary flexibility for using the "best" methods in their respective national context.

3.   There are different reasons why the development of an RP manual (RPM) at European level has been proposed in the area of E&I in business surveys. First of all, European National Statistical Institutes (NSIs) have different experiences and different views on the problem of error identification and treatment. As a consequence, a high level of heterogeneity exists among European NSIs in terms of strategies, practices and methods for E&I. Also at National level, business statistics are characterized by high variability of E&I strategies which only in part reflects the heterogeneity of surveys in terms of scope and process characteristics. For these reasons, comparisons of data from different statistical institutions in the ESS may be difficult. Besides comparability, a higher level of harmonization of E&I activities could produce a cost reduction and to shorten the time from data collection to publication of results without affecting the quality.

4.   Furthermore, RPs have been preferred to other types of standard manuals in the area of E&I due to the complexity of this survey phase, and the continuous methodological developments in this area, which make more difficult to define *current best methods* at European and National level. A set of good practices

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[2] The members of the project were: Orietta Luzi, Marco Di Zio, Ugo Guarnera, Antonia Manzari and Giorgio Della Rocca for ISTAT; Ton De Waal, Jeroen Pannekoek, Caren Tempelman, and Jeffrey Hoogland for CBS, Beat Hulliger and Daniel Kilchmann for SFSO.

mainly focusing on *what to do* and *which elements to consider* when designing and managing E&I activities, has been considered appropriate in this area.

5.   In effect, a Recommended Practice Manual (RPM) describes a collection of proven good methods for performing statistical operations and their respective attributes. In the case of EDIMBUS, the purpose is to support survey managers not only in selecting the most appropriate methods to be used to deal with non-sampling errors under the specific survey conditions, but also for designing more efficient E&I process, or for re-engineering E&I activities, for testing new E&I processes or E&I processes already in use that have not been appropriately tested before, and for documenting E&I activities and their impact on data.
Though the focus of the RP is on cross-sectional business surveys, there are many elements of it which can be applied in longitudinal business surveys and in other types of surveys like household surveys.

6.   The EDIMBUS-RPM (Luzi *et al.*, 2007a; Luzi *et al.* 2006; Luzi, *et al.,* 2007b) can also be viewed as a tool available to support survey managers and E&I specialists in addition to other types of standard documentation, like Eurostat deregulations and manuals possibly developed at NSIs level. Concerning the latter, examples of such tools are the Current Best Methods developed by Statistics Sweden (Granquist, 1997; Statistics Sweden, 2002), and Quality Guidelines (Statistics Finland, 2002, Statistics Canada, 2003).

7.   In this paper the overall structure and the main aspects of the EDIMBUS-RPM are illustrated. The underlying philosophy and basic concepts are illustrated. Finally, the recommended activities for an effective use of the manual at European are summarized. The initiatives started at ISTAT to facilitate the dissemination and the internal use of the RPM are also described.

II.   THE EDIMBUS-RPM

9.   As expected, one of the main difficulties encountered in developing the EDIMBUS-RPM was how to take into account the different views on E&I of the partners Institutions and of other European Countries. As already mentioned, high heterogeneity exists in the different survey contexts not only at European, but also at national level. This situation also has an effect on the terminology and definitions adopted. As an example, the notion "editing" often includes changes to the data, other times it is restricted to checks on the data for error identification, excluding all data changes like imputations, re-interview, etc. For this reason, one of the first problems encountered has been to agree on basic concepts and definitions, identifying those which were more suitable in the context of the EDIMBUS-RPM, and develop a specific glossary.

10.   For analogous reasons, a lot of discussion was needed to agree on a suitable reference scheme for the E&I process and data flow, which could be considered general enough to be representative of E&I processes in cross-sectional business surveys. Given the complexity and the wide range of existing E&I strategies, it was difficult to identify a possible high-level prototype process flow.

11.   Since the project's partners were aware that only the interaction between methodologists and survey specialists from different National contexts could facilitate the development of a useful tool, it was decided to involve as many other Countries as possible in the project activities.

12.   At the preliminary project's stage, a state-of-the-art survey (see Luzi et al., 2007a, *Appendix A*) has been performed at European and overseas Countries[3], aiming at gathering information not only about current practices in different National contexts, but also on the adopted definitions and concepts, on costs and on the level of standardization of E&I processes inside each NSI (presence of standards or guidelines, need for formal approval for E&I strategies, level of process documentation). 70 questionnaires have been filled in by 21 different NSIs, 39 of these responses came from 18 different non partner NSIs, the remaining 31 other responses were obtained at the three partner NSIs.

13.   At a later stage, a validation process on the preliminary version of the RPM has been performed by external referees (mainly specialists in the area of E&I) in highly developed NSIs. This contributed to the

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[3] including Statistics Canada, U.S. Bureau of the Census, Statistics New Zealand.

improvement of the structure and readability of the handbook, highlighted some under developed issues, allowed the integration in the RPM of different views.

14.   It is important to underline that the RPM focuses on the E&I activities done once the data are available in electronic format, including macro or output editing activities (i.e. validation activities performed before estimation for verifying that no important errors are left in the data). E&I activities performed in the previous survey stages (data collection, data capturing, data entry etc.), are excluded from the discussion. However, the importance of the interactions between this stage and other survey phases are highlighted in the handbook, and the need of managing information flows between the E&I activities performed at the post-data capturing stage, with those performed at other stages of the survey process, and with other survey aspects, is pointed out. Also the role of E&I deriving from its ability to provide information about the survey process, forming the basis for future improvements of the survey vehicle (Granquist and Kovar, 1997) is pointed out in the RPM.

15.   It is straightforward to note that the reader of the RPM is assumed to have basic theoretical and practical knowledge on E&I in business surveys. In effect, the good practices and recommendations given in the manual will not all apply in the same way to all survey contexts: their relevance and actual applicability in each specific process are to be carefully evaluated by subject matter experts and editing designers, taking into account the survey objectives, organization and constraints.

16.   Furthermore, besides the request coming from Eurostat of a manual having a maximum length of 40 pages, it has been deemed important to develop a short and easy to read tool, also to facilitate future updates and integrations. For this reason, more space has been given to issues relating to process design and control than that reserved to theoretical aspects, already available in specialized literature. Also examples, which are in general useful to better understand concepts, were very limited.

17.   On August 2007, the handbook has been released to Eurostat. Despite the efforts made, it is straightforward to note that in order to be actually used at Statistical Agencies, the released manual needs to be deeply revised, discussed, and tailored on the specific National context. This issue is discussed in general in section III, also with respect to the ISTAT context.

A.   Structure and overall contents of the EDIMBUS-RPM

18.   The EDIMBUS-RPM discusses the following main topics in the area of cross-sectional business surveys:

- How to design E&I strategies.
- How to test and monitor E&I processes.
- Recommended approaches for error detection (by type of error, see below) and error treatment (manual editing, imputation).
- How to perform data analysis and estimation in presence of imputation, missing data and outliers.
- How to document E&I processes.

19.   Concerning the design of E&I strategies, it is underlined that at this stage all the links and the information flows between E&I activities performed at the different stages of the survey process are to be efficiently integrated and harmonized. Appropriate resource allocation has to be planned also taking into account information coming from previous surveys and the knowledge of the main survey's problem areas.

20.   When designing E&I, great attention has to be given to the issues of controlling the process, archiving for data and process monitoring, and balancing between quality dimensions (accuracy, costs, timeliness, respondent burden, resources allocation), controlling the process and making it efficient. Particularly in business surveys, more efficiently designed processes may contribute to the reduction of phenomena like respondent burden and creative editing, e.g. by limiting manual editing and follow-up to the most important errors. The saved resources could better be re-allocated into activities having a higher pay-off in terms of data quality, such as the analysis of error sources aiming at preventing errors in next survey repetitions.

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21.   A prototype E&I data and process flow is provided, as reported in Figure 1.

Figure 1: High-level prototype of an E&I process flow in cross-sectional business surveys
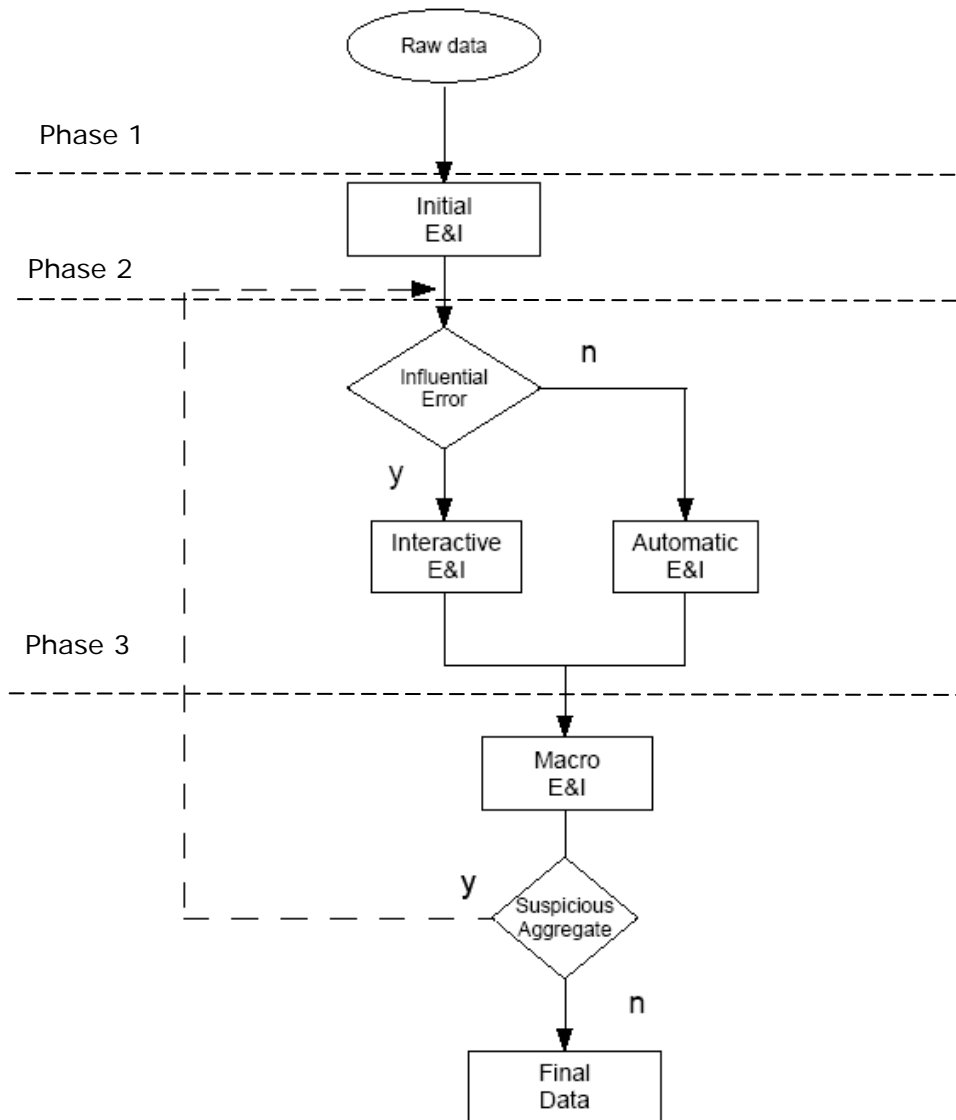
22.   The proposed prototype assumes an error classification which tries to take into account the error source (e.g. definitions, questionnaire, interviewers, and so on), their nature (either *systematic* or *random*), the error's impact on target parameters (*influential* or *not influential*), and how errors appear in data (*outlier*, *missing values*, and so on). Since all these aspects overlap, in the RPM any specific perspective has been chosen, but a compromise has been adopted as described in the following of this section.

23.   In the prototype, three main phases can be identified, mainly based on the error nature and their relevance in terms of potential impact on target estimates: in phase 1, systematic errors and errors having a known origin are dealt with. Phase 2 is strictly related to the problem of the identification of critical and non

critical streams in a selective editing perspective. In phase 3, a preliminary analysis of survey estimates in a macro-editing perspective is performed, aiming at identifying further critical data problems.

24.   However, since actual E&I strategies may differ even deeply from the above prototype due to a number of elements (e.g. the survey characteristics, the survey objectives, the available auxiliary information, the available resources), recommendations concerning which elements to consider when designing complex integrated E&I processes are also given.

25.   A specific section of the first handbook's Chapters is devoted to methods and recommendations on how to test E&I processes. In order to continuously improve E&I, evaluation studies should be performed in a systematic way, so that the most appropriate approaches for each specific context and error problem are identified, the selected approaches are properly integrated and the appropriate resources are allocated on all the E&I sub-phases. Indicators supporting survey specialists in this phase are also suggested.

26.   Two RPM's sections deal with methods for error detection and error treatment. The section on error detection is structured following the above mentioned *mixed* error classification. This choice follows the theoretical and operational properties of methods for error detection and treatment, which in general refer to overlapping error classifications. The EDIMBUS-RPM discusses different classes of methods: automatic and interactive approaches, micro and macro techniques. Concerning interactive approaches, it is remarked that methods who require the human intervention (including *manual editing* and *follow-up*) have to be adopted with great caution in order to avoid biasing effects, respondent burden, and over-editing (over-editing occurs when the resources and the time spent for editing are not justified by the resulting improvements in data quality). It is underlined that, even if under certain conditions, interactive methods may be considered accurate enough to deal with errors, these approaches can be very costly and, in some situations, they may introduce variability and bias and even new errors. If well managed, follow-up can help gathering new original information, otherwise it may originate additional respondent burden and does not guarantee better data quality.

27.   In the class of micro-editing approaches, where the detection and treatment of errors is done at the record or questionnaire level, in isolation from other responses in the current survey, *selective editing* is emphasized for the identification of potentially influential errors. Since E&I is cost and time consuming, an "optimal" trade-off between data accuracy and resources spent for E&I should be identified in each specific survey context, in particular resources should be focused on the most relevant errors. Selective editing directs relevant errors to the best available treatment. Often the best treatment is also more expensive and should not be applied to less important errors, or to errors that can be resolved with less expensive automatic treatment.

28.   The importance of graphical editing is also remarked. It is observed that, in general, "*an experienced statistician, who does a careful analysis of the data by means of exploratory techniques in combination with other E&I methods, usually will obtain better results than those which can be obtained by any fully automatic method*".

29.   Problems relating to data analysis and estimation in presence of imputation, missing data and outliers are also discussed in the EDIMBUS-RPM. It is well known that the additional uncertainty and bias due to E&I has to be taken into account on subsequent data analysis and inferences to avoid invalid conclusions. Despite the amount of literature and the continuous advancements in this area, methods for measuring the impact of E&I on estimation and successive analyses are not widely adopted in the current practice of NSIs, for a number of operational and/or theoretical problems. In the handbook some basic recommendations are provided in this area.

30.   The handbook also underlines the importance of documenting E&I for both external users and data producers. Documentation may refer to technological, methodological, or data quality aspects. As an example, information on the quality of the data (e.g. error types) should be provided to users to allow them to properly use such data in their analyses. Furthermore, information should be produced to allow the evaluation of the E&I process in terms of impact on survey data and on survey outcomes (e.g. through the production of diagnostics, quality indicators and impact measures). Starting from the wide range of possible indicators, including those explicitly required by Eurostat, a set of measures are provided in the RPM. These

measures can be used not only to document E&I activities and/or their impact on the data, but also for monitoring the data and the E&I process along time and/or for comparing the effects of different survey processes. Also documentation about costs and time for E&I should be provided on a sufficiently detailed basis to allow for the process optimization.

31.   It has to be remarked that for each treated topic few methodological details are provided in the EDIMBUS-RPM, given the length constraints (40 pages at the maximum), taking into account the extensive and highly specialized existing literature, and in order to improve readability. Some methodological details, together with the list of indicators for testing, monitoring and documenting E&I, and the Glossary, have been moved to final Annexes. For each topic, the most relevant references are also provided.

III. IMPLEMENTING THE EDIMBUS-RPM

32.   Notwithstanding the efforts made to incorporate different views on editing, the EDIMBUS-RPM mainly reflects the partner's view on the E&I phase. Consequently, for the handbook to be effective at the different European Statistical Agencies, a subsequent revision at each NSI is recommended taking into account the specific organization's view on E&I.

33.   Some discussion was carried out at the project's end in order to identify some of the activities aiming not only at the manual dissemination in the ESS, but also at encouraging European NSI's in proceeding with the internal dissemination, tailoring, adoption and continuous update of the RPM. A set of suggestions in these directions have been provided, separately by kind of activity, as resumed in next subsection.

A.   Recommended activities

34.   In the following, some activities suggested to Eurostat by the EDIMBUS project's partners for the actual adoption of the RPM in the ESS are summarized, by scope.

- *Dissemination and knowledge circulation.*
  It has been suggested that the electronic version of the EDIMBUS-RPM is be made available on the Eurostat website, in order to facilitate access and guarantee better dissemination. Knowledge about the availability of the RPM should also be disseminated through Eurostat reviews and/or newsletters. Finally, the publication of the RPM as a paper publication on a publication series devoted to this kind of manuals and standards has been suggested.

- *Revision, application and monitoring of the RPM*
  The EDIMBUS group suggested that a periodic feedback from NSIs to Eurostat should be promoted for monitoring and evaluating the state-of-the-art in the ESS with respect to the analysis, development and actual applications of tools based on the EDIMBUS-RPM.

- *Further research*
  Although the RPM applies in general to business surveys, it contains elements which are useful for other types of surveys: similar manuals should be developed for other specific areas, like longitudinal business surveys and household surveys, e.g. through specific projects focusing on these areas.

- *Training*
  It has been also suggested that training courses, seminars or short courses on the EDIMBUS-RPM are included in the Eurostat training program, e.g. in the context of more general courses dealing with tools for the standardization of statistical processes.

35.   The EDIMBUS group also formulated a number of suggestions about possible activities that could be performed at National level to facilitate the dissemination, future developments, and use of the RPM.

- *Dissemination and knowledge circulation.*
  The partners of the EDIMBUS project should promote the dissemination of the RPM internally to their Institutes. This could also be done by publishing the RPM on internal Journals or Methodological Series, by organizing specific seminars, by sending copies of the RPM to selected groups of methodologists and survey managers.

- *Revision, application and monitoring of the RPM*
  The views expressed in the handbook should be analysed discussed at National level. This means that, as already mentioned, the EDIMBUS-RPM should be tailored to each specific National context. The use of the revised handbook on pilot surveys should be promoted and carried on. A centralized, specialized staff should be identified for managing the RPM adoption. The group should be in charge of first applications of the RPM , including the identification of the (set of) pilot surveys, the monitoring of the results, the indication of proposals for further improvements. Strategies for planning or re-engineering E&I procedures should be formalized and adopted at each NSI, and procedures to be internally followed to obtain formal approval to E&I processes should be developed.

- *Further research*
  At each NSI, it is suggested that a group of experts be in charge of the periodic update of the RPM from a methodological point of view. In effect, since the handbook recommends methods and practices which have been considered effective at the moment the RPM has been developed, given the continuous developments in the area of E&I, periodic updates of the RPM's content should be carried on. This implies that a continuous activity is supported at NSI level, aiming at monitoring the state-of-the-art and at periodically producing new releases of the handbook.

- *Training*
  Appropriate training courses should be given periodically for survey managers/editing specialists to disseminate knowledge about E&I in general, E&I methodologies in particular, and the RPM principles.

B.   State-of-the-art and current activities at ISTAT

36.   One of the first consequences of the EDIMBUS project activities at ISTAT has been a systematic analysis of the state-of-the-art in the area of E&I for business surveys. It has to be remarked that standard tools like CBM, Quality Guidelines and RPs for E&I have been not developed at ISTAT until now, neither in the household nor in the business statistics areas. However, household surveys conducted at ISTAT are characterized by an homogeneous situation from a methodological and technological point of view, also due to the massive use of the Fellegi-Holt approach through generalized software (SCIA, see Riccini *et al.*, 1995). The business area is more heterogeneous with respect to both aspects.

37.   The project experience represented a first occasion to try to identify the most urgent survey needs internally to ISTAT. In effect, the investigation carried out during the project allowed to gather lot of information about E&I practices and main problems within ISTAT. Information about the current approaches to testing, evaluating and documenting E&I processes were also collected, questions on the perceived costs of E&I were asked, and lot of additional information out of that directly asked in questionnaires was obtained due the adopted mode of data collection (face-to-face interviews with survey managers).

38.   The selection of the business surveys to be involved in the investigation has been performed by a group of subject matter experts involved in an internal ISTAT working group directly cooperating with the Italian team involved in the EDIMBUS project. All the 23 selected surveys filled in the questionnaire: 8 surveys in the area of Structural Business Statistics (SBS), 13 in that of Short-Term Statistics (STS), 2 economic Censuses.In the following some of the most interesting results are reported.

39.   Concerning the use of Computer Assisted Interviews, it has to be remarked that about 50% of the responding surveys makes use of some Computer Assisted data capturing techniques (including web), but it results that generally few checks are embedded in it for reducing respondent's burden and preserve response rates.

40.   As for the E&I approaches, in Table 1 the number and percentage of responding surveys using the different methods in their E&I procedure are reported. In the area of SBS, all surveys declare to make use of administrative and/or external and/or historical data in some stage of the E&I process. Furthermore, all these surveys make use of *deterministic checking* rules and of *manual review* and/or *follow-up*. *Macroediting* is used by 62.5% of surveys, while very few business surveys systematically adopt some form of *graphical editing* (only 2 surveys). It has to be noted that 3 surveys in the SBS area declare to make use of *selective editing* approaches: based on other information provided in questionnaire, it has been deducted that in this case respondents were referring to outlier detection approaches used to select potentially influential data. Concerning imputation, the most used technique is *deductive imputation* (87,5%). 5 surveys (62,5%) use *hot-deck imputation*. The same percentage of surveys uses *model-based* techniques.

41.   In the area of STS, the most used approaches are *deterministic checking rules* and *manual review/follow-up* (in 11 e 12 surveys out of the 13 responding ones, respectively). *Macroediting* is used as in SBS surveys (61,5%), and low percentages are also observed in the use of *selective editing* and *grafical editing*. The latter result highlights a problem area in the field of ISTAT STS, as the most part of surveys does not use an approach like *selective editing* which is recognised as particularly useful for this type of surveys. Concerning imputation, in the STS area the *model-based* techniques are the most used approaches (53,8%), while *hot-deck* is used only in 2 surveys (15,4%). Only 5 surveys (38,5%) adopt *deductive imputation*.

42.   Concerning the use of testing activities before adopting an E&I method, only 15 surveys out of the 23 responding ones (about 35%) do not perform this type of activities due to not available time (9 surveys) and/or resources (8 surveys) and/or other reasons (3 surveys).

Table 1 – Adopted approaches for type of survey

Method	CLASS OF SURVEY					
	CE		SBS		STS	
	N	%	N	%	N	%
Deductive imputation	1	50,0	7	87,5	5	38,5
Deterministic checking rules	2	100,0	8	100,0	11	84,6
Graphical editing	0	0,0	2	25,0	3	23,1
Hot-deck imputation	1	50,0	5	62,5	2	15,4
Macro-editing	2	100,0	5	62,5	8	61,5
Manual review / follow-up	2	100,0	8	100,0	12	92,3
Minimum change error localisation	0	0,0	4	50,0	0	0,0
Model-based imputation	0	0,0	5	62,5	7	53,8
Robust estimation / re-weighting	0	0,0	1	12,5	1	7,7
Selective editing	0	0,0	3	37,5	4	30,8
Use of other sources / historical data	2	100,0	8	100,0	12	92,3

43.   On the contrary, 74% of surveys declares to have some type of documentation of the adopted E&I methods: 10 surveys (43% with respect to the total of responding surveys) produce methodological reports , 12 produce technical documentation (52%), 7 produce *Quality Reports* for Eurostat (30%), 2 produce other types of documentation (less than 1%).

44.   Also the percentage of surveys producing some type of documentation on the E&I results is quite high (78%): 15 surveys (65%) also publish sets of indicators on the E&I effects on the observed data. While in general these results show the attention to the problem of E&I documentation at ISTAT, there is a problem concerning the low degree of standardization of the produced documentation, except for the Eurostat *Quality Reports*. This is due to the fact that guidelines or other standard tools supporting survey managers in preparing methodological and/or technical documentation for the E&I processes have not been developed at ISTAT. This problem also relates to the production of sets of "standard" indicators for

documenting E&I effects on data: in effect, even if large part of responding surveys produces the specific set of measures requested by the ISTAT System for Surveys Documentation (SIDI, Fortini et al., 2000), these measures cannot be considered homogeneous and satisfactory enough with respect to the potential needs of external and internal users.

45.   Relating to the evaluation of E&I costs, which is a difficult element to quantify due for example to the fact that usually E&I activities are performed at different stages of the survey process, including data capturing, survey managers were asked to approximately indicate the percentage of overall survey resources devoted to E&I activities at the post data collection/data entry stage. In Table 2 the number and percentages of surveys reporting costs (*Workload*) in pre-defined intervals are reported. As it can be seen, only 7 out of the 22 surveys responding to this question (32%) declare to spend less than 40% of available resources for data E&I. About 64% declares to spend more than 60% of available resources. Taking into account all the possible elements affecting these results, including the tentative of respondents to highlight insufficient resources with respect to the survey characteristics and objectives, these results highlight the current need at ISTAT for the development of strategies aiming at optimizing the E&I processes in terms of costs and resources (re)allocation.

Table 2 – Percentage of surveys by amount of resources spent at the E&I stage

% resources	Frequency	Percentage	Cumulate F	Cumulate %
10-20%	1	4.55	1	4.55
20-30%	4	18.18	5	22.73
30-40%	2	9.09	7	31.82
40-50%	1	4.55	8	36.36
50-60%	1	4.55	9	40.91
60-70%	5	22.73	14	63.64
70-80%	1	4.55	15	68.18
80-90%	5	22.73	20	90.91
>90%	2	9.09	22	100.00

46.   A final result "quantifies" the current need at ISTAT for some type of guidelines or other type of standard documentation for designing, implementing and managing E&I. 13 ISTAT surveys (56%) declare to use some internal "manuals" as support tool for the design of the E&I procedure: in practice, they mainly refer to papers published on ISTAT internal reviews. 10 surveys (43%) declare to use standards and guidelines developed by other NSI's: in most cases, these documents correspond either to Eurostat manuals developed for specific surveys, e.g. the Community Innovation Survey and the Survey on Information and Communication Technologies, or to methodological manuals for classes of surveys, e.g. the Methodological Manual for Short-Term Statistics on Turnover and Other Services, the Council and Commission Regulation applicable to the Statistics relating to the Trading of Goods between Member States, the Methodology of Short-Term Business Statistics-Interpretation and Guidelines.

47.   Based on the investigation's results, some elements resulted as particularly critical: 1) differences in definitions and terminology, 2) different (sometimes, any) approach to the systematic design of E&I processes, 3) poor testing activities, and 3) low standardization of methodological and technical documentation.

48.   Starting from this situation, a number of initiatives have been started at ISTAT not only for the internal dissemination of the actual version of the EDIMBUS-RPM, but also for stimulating the internal discussion about current needs and possible developments of the handbook. In the following these initiatives are reported by kind of activity.

- *Dissemination and knowledge circulation*
  The EDIMBUS-RPM has been internally distributed via e-mail to the Directors of the Business Departments and to the heads of methodological units at these Departments. Furthermore, knowledge about the handbook has been internally disseminated by a seminar where the RPM has been officially

presented to all the ISTAT personnel. High management has been involved in the seminar in order to let the audience realize that the handbook has the official approval of the Institute. Finally, some of the fundamental principles provided in the RPM have been properly translated into evaluation rules concerning E&I processes for those surveys subject to internal audit.

- *Revision, application and monitoring of the RPM*
   During the project, the ISTAT working group related to the EDIMBUS project started discussing the suitability of the principles expressed in the EDIMBUS-RPM with respect to the ISTAT context. In the next future, the group should be renewed and integrated with other methodologists and survey managers, in order to propose updates for developing an RPM version tailored on the ISTAT context, possibly supported by "experimental" applications.
   As starting activities in this direction, the group has organized two internal seminars, in order to stimulate the discussion about the current situation at ISTAT. One seminar was devoted to the STS area, the other one to the SBS area. In both occasions, the E&I procedures of some of the most relevant ISTAT business surveys were presented. The main objective has been to highlight common methodological and/or technological problems, and problem areas. One of the main results of the seminars has been the papers containing the documentation of current E&I processes, prepared by survey managers for the seminars: in some cases, these reports represent the first structured documentation on the current error detection and treatment activities adopted in the corresponding surveys.
   Also in these circumstances, the Directors of the business Departments were involved in the organization and coordination of the seminars in order to give them a more official relevance.

- *Training*
   Recommended practices and its fundamental principles are currently part of the training courses on E&I methods and practices internally conducted for ISTAT researchers and subject matter experts two times each year.

IV.   FINAL CONSIDERATIONS

49.   The EDIMBUS project can be considered a successful experience in terms of integrating research and experiences on methods for E&I in a specific survey area, as well as for sharing knowledge about E&I concepts, strategies, methods and practices. In this sense, the EDIMBUS-RPM is mainly the result of the cooperation of the partners NSIs. However, the manual also takes into consideration information gathered in different NSIs in the ESS and in not European Countries through a state-of-the-art survey in the area of E&I. Furthermore, the integration of the manual with highly specialized comments and views was the result of a validation process performed by external referees, mainly specialists in the area of E&I.

50.   The EDIMBUS-RPM is intended as a guide for survey managers and editing designers for planning, testing and documenting their E&I process, or to re-engineer E&I activities. The manual should support the selection of the most appropriate method to be used to deal with non-sampling errors under the specific survey conditions. Furthermore, the manual is meant to disseminate a systematic approach for testing new E&I processes or E&I processes already in use that have not been appropriately tested before. Though the focus of the RP is on cross-sectional business surveys, there are many elements of it which can be applied in longitudinal business surveys and in other types of surveys like household surveys.

51.   The EDIMBUS-RPM is expected to have a significant impact on the harmonization of E&I concepts and strategies, as well as on the comparability of data quality in the ESS. To this aim, recommendations for dissemination, the application and the update of the handbook have been provided to Eurostat and to NSIs as supplementary information.

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