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**THE BUSINESS STATISTICAL PORTAL: A NEW WAY OF
ORGANIZING AND MANAGING DATA COLLECTION PROCESSES
FOR BUSINESS SURVEYS IN ISTAT**

Working Paper

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I. Introduction

1. A broad shift of the social and technological context requires ISTAT to modify the way data are collected in order to improve the efficiency in producing timely estimates and, at the same time, to increase or at least maintain the level of data quality, while reducing respondent burden. All of this, within a climate of general budgets cuts.
2. In 2010, as a way to deal with these challenges, a medium-long term project was launched (Stat2015), envisaging the gradual standardisation and industrialisation of the entire cycle of ISTAT statistical processes, according to a model based on a metadata-driven, service-oriented architecture. With regard to data collection, as well for the other production phases, Stat2015 aims at outlining strong enterprise architecture standards.
3. A first step along these lines was to develop a comprehensive set of requirements according to which select, design or further develop the IT tools supporting data collection. The requirements encompassed four areas, covering the main functions of the entire (data collection) process: *i*) Survey unit management, *ii*) Data collection management, *iii*) Questionnaire, *iv*) Communication facilities.
4. A significant contribution to the definition and implementation of these requirements came with the development of the new ISTAT Business Statistical Portal, a single entry point for Web-based data collection from enterprises, which is at the same time an attempt to streamline the organization and management of business surveys as a whole. The system was designed acknowledging the guidelines set out in the European Commission communication to the European Parliament and Council (COM 2009 - 404 final). The document, laying out future directions for the development of production methods of EU statistics, strongly urges to set aside the legacy stovepipe production model, clearly no longer sustainable, in favour of a closer integration of discrete processes, both at national and ESS level. As an effect of this paradigm shift, the production of statistics is no more expected to operate through single independent processes, one for each domain, thereby raising costs and inefficiencies, but rather as a single, consistent and integrated pool of non-redundant building blocks (enterprise-

centred model). The adoption of this new organisational pattern, that is now made possible by the rapid development of new ICT tools, has emerged as the best viable solution to meet the growing information demand as well as to reduce response burden and operating costs.

5. In this paper the expected impact of the Business Statistical Portal on both NSI and enterprise sides will be described. As a frame of reference and in the context of the need for common tools within the ESS, we will discuss the requirements for a generalised data collection system. The services and functions provided by the ISTAT Business Portal will be detailed with particular attention to their compliance with the stated requirements, thereby highlighting the benefits envisioned in adopting this infrastructure. Also, results will be presented of a pilot test designed to assess the functionalities of the Portal as well as the effect of the new organisation on existing survey processes.

II. Requirements for a generalised IT tool for data collection

6. The medium/long-term project for the standardisation and industrialisation of the entire cycle of ISTAT statistical processes (Stat2015) has, among his objectives, to set up and promote enterprise architecture standards for data collection. At the end of 2012, a first key move towards this end was made, as an ISTAT workgroup identified and outlined a set of functional and non-functional requirements to be met by data collections tools, arranged in four macro-areas:

- **Survey unit management** - Tools for managing the information required to contact the respondents and to logically represent them as users in the system: name, address, phone, email, username and password etc.
- **Data collection management** - Real-time administrative tools for conducting and monitoring the data collection process: management of user grants, first validation tools, questionnaire tracking systems, reporting tools, etc.
- **Communication facilities**: - Tools for sharing information with survey respondents: helpdesk system, content management system, automatic reminders management, etc.
- **Electronic questionnaire**: - Tools for the collection of survey microdata.

7. At last year UNECE Seminar on New Frontiers for Statistical Data Collection, ISTAT presented a paper describing requirements applying to the Electronic Questionnaire area only. Since then, the workgroup completed the definition of requirements for the remaining areas. They will be described in detail in this paper, while those pertaining to the electronic questionnaire will only be summarily listed. Full details can be found in the aforementioned paper (Murgia M., Nunnari A. 2012)

A. Frame for the definition of requirements

8. Requirements have been defined in the strict frame of generalisation. In other words, they have been developed on the strong assumption that IT tools should not rely on ad hoc procedures, as this approach, while usually effective in responding to immediate needs, in the long run may prove to be highly inefficient in terms of maintainability and reusability. Technically speaking, a software component can be defined as generalised if it dynamically manages changes in the environment through parameterisation (Murgia M., Nunnari A. 2012). Taking this definition as a starting point, a wider perspective was developed, constructed across three main dimensions: data collection mode, classes of respondents and hardware-software platform. This implies that, in order to be considered as generalised, a data collection system should: *i*) be able to implement any kind of mode-specific questionnaires (CAPI, CATI, CAWI etc.), *ii*) be able to adapt surveys to specific features of different target population (households/individuals, enterprises and institutions), *iii*) properly work on the wider possible range of software and hardware platform.
9. Apart from their level of generalisation, tools should also be evaluated by their compliance with some quality constraints (both general and process-specific), classically referred to as non-functional requirements, of which the main ones are: usability, flexibility, modularity, reduction of response burden, standardisation of data and metadata representation or compliance with recognised standards,

processes integration as opposite to stovepipe organisation, independence from proprietary systems and maximisation of “degrees of freedom” for statisticians using the IT tools (no need of IT experts).

B. The set of functional and non-functional requirements

1. Survey unit management area

10. This area includes specifications for IT tools dedicated to the management of units’ master data, information necessary to contact respondents and user profiling. Therefore in this area, IT tool has to be able to *i)* collect and manage master data (i.e. deleting, inserting and updating unit records), *ii)* create and manage authentication procedures through user IDs and passwords, *iii)* integrate survey data with internal administrative or base registers storing master data.
11. More specifically, the data collection system should allow loading of lists of survey units and of all bodies involved in the data collection phase (chambers of commerce, regional statistical offices, local supervisors, etc) to the survey database. It should also provide survey managers with functions to update or to modify the uploaded lists at any point of a survey wave.
12. In addition, to reduce response burden, it is necessary to ensure data integration between the collection system and any base or administrative registers managed inside the NSI and used as input or output source of the data collection process. Consistency among data sources is reached if the system implements functions that provide or receive information on data variation to and from the in-house centralised registers. Therefore these functions should allow to *i)* timely update the survey database according to changes of the centralised registers variables (i.e. changes of an enterprise address, number of employees, etc. that are notified by the register administration system), *ii)* report in real time to the centralised data sources that some records need to be updated according to users’ feedback.
13. Furthermore the system has to provide tools for management of user credentials. For each survey unit or any bodies involved in the data collection process, like, for instance, local supervisors, the system has to provide unique credentials in order to guarantee proper user identification. Usually this is ensured by creating a user ID and a randomly-generated temporary password, which must be changed by the user on first authentication. Easily accessible facilities for the management of credentials (for example retrieval of lost passwords) must be provided to all the actors in the system (respondents, supervisors, survey managers, etc.).

2. Data collection management area

14. This area groups requirements for real-time data collection management and monitoring tools. These tools should enable survey managers *i)* to track and manage the questionnaire completion and processing status (not answered, draft, completed, completed and validated, completed but not yet validated, etc.); *ii)* to access and manage relevant process data as, for example, registrations, accesses to the system, etc.; *iii)* to manage sub-sets of users and their assigned roles (administrator, supervisor, etc.); *iv)* to error-check each completed questionnaire through first-level validation; *v)* to produce custom reports to keep track of critical aspects of the collection process: contact results (interviews, refusals, appointments, registrations, etc), trend of key survey variables, interviewers’ productivity etc.; *vi)* to manage mixed-mode surveys. This involves that the microdata, metadata and status information related to different, mode-specific questionnaires should be modelled and possibly stored in a way that ensures data interoperability and integrated management. Also mode-switching techniques must be supported. A questionnaire should be administered with any available technique according to the respondent choice or to any established rules for managing the questionnaire’s status (for example, total non responses from the CAWI mode could have been set as a condition for switching to CATI interviews). This flexibility requires, where applicable, employing data capture facilities (data entry for data collected through PAPI, for instance, or OCR acquisition of questionnaires acquired by email- or fax-server).

15. A key feature of a generalised system is the ability to manage data collection as an integrated process, where integration applies in terms of i) functions provided, ii) actors of the data collection process and iii) survey modes:
- **Functions:** all the instruments have to be made available inside the same environment, in order to simplify the workflow and to better control the data collection activity.
 - **Actors of the data collection process:** the system has to be able to represent all the bodies involved in the process and to provide them with role-specific functions. The profiling system must be as flexible as to manage both flat and hierarchical structures. At its extreme range of complexity, it should be possible for survey managers to choose the criteria by which permissions over the management and monitoring activities are given and inherited throughout the user role hierarchy (for example, if a geographic criterion is chosen, it would mean that to, say, a regional supervisor permissions will be granted to only access and modify data collected from the municipalities belonging to his/her regional area.
 - **Survey modes:** micro and process data should be represented and accessed in the same system, through common metadata. This is a key requirement in scenarios where mixed-mode is used, since the representation of data coming from the different modes in a common modelling framework is vital for the questionnaire tracking as well as for the application of mode-switching techniques.
16. Finally, the system should allow users to create customised reports in order to monitor data collection according to the specific survey needs. It should also provide content management functions (CMS) to make administrators of CAWI surveys able to freely and timely update the front-end content (documentation, notices, graphs, etc.)
17. The implementation of all requirements that fall within the scope of this area would lead to a fully fledged survey back end, providing dedicate instruments and functions for the management and the real-time monitoring of the front-end activities and the whole data capture process. Specified classes of back-end users should be able to audit process data as they flow in the system, thus gathering relevant intelligence that will help identify problems and elicit actionable insights, hopefully leading to corrective actions (re-activating already closed electronic questionnaires, scheduling follow-ups, sending reminders, applying mode-switching techniques, updating or improving the information available to respondents, etc.).

3. Communication facilities area

18. This third macro-area contains requirements relative to those tools – administrative as well as informative – necessary to manage any kind of information exchange with respondents. In more detail these instruments include: *i*) a centralised help desk system that would allow an integrated management of any kind of respondents’ requests – technical questions as well as information needs – that can come from different communication channels like, for instance, toll-free numbers, email, SMS, etc. Furthermore, a centralised help desk would also permit to control whether respondents requests are correctly and timely answered; *ii*) a real-time access to survey’s paradata to improve the help desk management and to enable real-time troubleshooting; *iii*) links to external sources of statistical information where respondents, if they wish, can get more insights about the survey; *iv*) emails, telephone numbers of survey and IT managers; *v*) instructions on how to fill in the questionnaire that respondents can download, print or read on video; *vi*) FAQ (Frequent Asked Questions); *vii*) management of invitations for respondents to cooperate with the survey - Invitations can be sent by paper or by regular or certified email, depending on the national legislation system; *viii*) management of paper questionnaires to be sent by fax-server, e-mail, post; *ix*) CATI scheduler; *x*) CAPI agenda system.
19. The above tools give the back-end users the ability to interact with respondents, when different needs for information arise from either side. Interactions with respondents can have different informative content:

- **Information** - all the information content in support of the survey has to be uploaded on the system and made available to users via dissemination channels dependent on the chosen data collection technique. These information can contain *i)* instructions for completing the questionnaire as well for the use of the technological tools necessary for the task (desktop application, Web site, etc.), *ii)* legal and/or methodological documentation about the survey, *iii)* contact of statistical and technical survey referents.
- **Communication** - the system must contain notification functions to inform about and to manage any changes of the respondents' status during the data collection. The system should enable distributing multi-channel invitations to the survey - that is, survey managers has to be able to load, mail-merge and disseminate the invitation letter by any media available (fax-server transmission, certified email, letter post). By the same token, it should be possible to manage status by sending reminders to non-respondents or to those not registering on the Website and by sending receipts to those that have received the questionnaire and/or that completed it. Also tools to manage the contact results during the entire data collection period should be made available, such as a CATI scheduler or a CAPI agenda, depending on the data collection mode.
- **Assistance** – a paperless help desk system has to be implemented in order to: *i)* create, manage and monitor requests from respondents (tickets); *ii)* manage multi-channel tickets. For example, the system should allow the digitalisation of paper or telephone requests as well to automatically load queries sent by e-mail or fax in the database; *iii)* manage a knowledge base: it has to be possible to store in the system issues commonly submitted by respondents and their relative solutions. Any knowledge base record flagged as publishable in the back end, would be accordingly released at the front end as a public FAQ list item; *iv)* real-time look up of paradata in order to monitor and to solve any potential problems.

4. Electronic questionnaire area

20. This last macro-area consists of requirements for the electronic questionnaire. As earlier mentioned, they have been extensively discussed in a previous paper, so they will only listed without going in further detail: *i)* usability, *ii)* flexibility, *iii)* completeness of functions, *iv)* generalisation of functions, *v)* independence from proprietary systems, *vi)* cross-browser compatibility, *vii)* platform compatibility, *viii)* modularity of functions, *ix)* logical and semantic abstraction, *x)* integration with XML data representation model in order to reach compliance with recognised standards for data and metadata description. Full details can be found at the following link: <http://www.unece.org/fileadmin/DAM/stats/documents/ece/ces/ge.44/2012/mtg2/WP22.pdf>

III. The Business Statistical Portal

A. Objectives

21. The Italian Business Statistical Portal is the outcome of a project started in October 2010, following the Memorandum of Understanding signed in May 2010 between ISTAT, the National Ministry for Public Administration and Innovation and the Italian Union of Chambers of Commerce (Unioncamere) for the development of a platform dedicated to the acquisition of statistical information from enterprises. The portal has entered the testing phase in June 2013, involving a purposive sample of about 70 enterprises across a subset of representative surveys of economic statistics. It will be fully operational in early 2014, and will gradually host nearly all ISTAT economic surveys and their related survey units.
22. The portal set itself as a flexible and innovative system, fitting with the changes taking place in the areas of regulation, statistics and technology. The project has been developed taking into account the Fundamental Principles of Official Statistics, the strategy proposed by the Regulation of the European Parliament and of the Council on the European statistical program 2013-2017 and the new

Code of Digital Administration (CAD¹), in accordance with the following objectives: *i*) simplify the way data are collected from the business sector; *ii*) reduce the costs the enterprises incur to comply with their statistical obligations; *iii*) reduce the statistical burden on enterprises; *iv*) optimize the processes of delivery of public services for enterprises; *v*) streamline the statistical data collection; *vi*) increase the overall information potential of business statistics; *vii*) return information to businesses; *viii*) act as a driving force for the progressive, gradual and inevitable overcoming of the vertical production pattern of business statistics in favour of an integrated horizontal model.

23. The proposal for a Regulation of the European Parliament and of the Council on the European statistical program 2013-2017, which aims at moving away from the current "stovepipe" organisation, points out a new, more efficient and flexible method of production of European statistics. The whole process of production of business statistics is, in fact, generally based on a vertical model, in which each "stovepipe" identifies a specific field of statistics and its corresponding production system. For each sector, every stage of the statistical process (from survey design to collection, processing and dissemination of data) takes place in an autonomous and independent line of production, set apart from the others. As matter of fact, every sector usually has its own data providers and consumers. (See fig.1a)

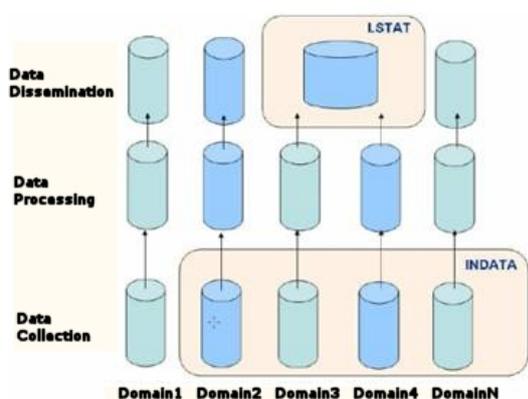


Fig.1a – Legacy “stovepipe” architecture of ISTAT business statistics.

(For reference: I.Stat and INDATA are, respectively, ISTAT’s enterprise data warehouse and standard Web data collection platform).

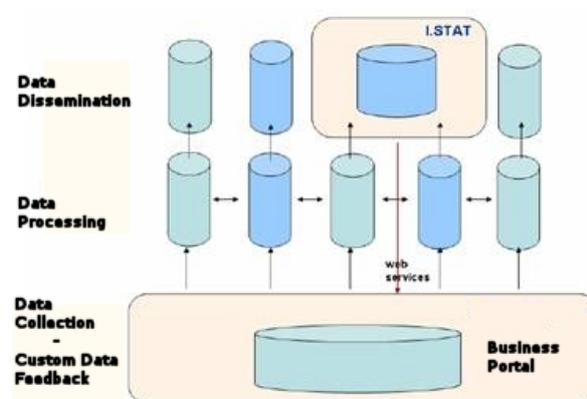


Fig.1b – Horizontally integrated architecture of ISTAT’s new Business Statistical Portal

24. With the launch of the Portal, ISTAT embarks on a process of rationalization of information content, elimination of duplications and redundancies, and harmonisation of definitions and concepts in the business statistics area. The new architecture (fig. 1b) implies a strong impact on the structure of internal processes, contributing to the organisational reshaping of the whole sector of economic statistics, based on a rationale of integration of processes and services for the enterprise and the pursuit for a greater efficiency in the collection, processing and estimation phases of official statistics.
25. The Portal set itself as a hub coordinating the web-based information flows and ensuring their punctuality, timeliness, completeness and mutual intelligibility. The standardization and sharing of a vast array of processes, tools and methods through a centralized platform, together with the integration of data and metadata via a common modelling, allows for the interoperability of different production systems, within an environment that is easily accessible to businesses and provides appropriate facilities for the exchange of data and information derived from administrative and statistical sources.

¹ The new Code of Digital Administration (CAD) clarifies the use of information and communication technologies in the relationship between government and business, and in supporting the rationalization and simplification of administrative processes, including through the use of certified email and the National Charter of Services for authentication.

26. The enterprise-centred communication model sets the enterprise at the very core of the process of acquisition and restitution of statistical information. The model features some unique aspects: i) single entry point; ii) data collection adjusted to the organizational lay-out of the enterprise; iii) provision of services that facilitate the response through an up-to-date report on the status of fulfilment of statistical obligations; iv) feedback of custom statistical information to respondents.

B. Functions and compliance to the requisites

27. The Portal is composed of a front-end and a back-office. The back-office supports all the users participating in the survey network: survey managers, interviewers, data analysts, representatives of administrative registers, supervisors and data reviewers, help desk operators. It enables integrated, harmonized and centralized management of all survey stages for all areas of production, allowing shared access to information and data, acting on a role-based user profile system.

28. The Portal exhibits strong compliance with core functional and non-functional requirements:

- **Survey unit management**

- Management of authentication procedures through smart card or user IDs and passwords;
- Management of lists of survey units and of all bodies involved;
- Management of business master data (business name, address, fiscal code, type of company, NACE description, number of employees, etc.) extracted directly from ISTAT's business register (ASIA). Real-time update is provided upon request for some variables;

- **Data collection management**

- Management of contact results;
- Back-office monitoring tools (standard and customized reports in order to monitor data collection and relevant process data) ;
- Content management functions to update the front-end content

- **Communication**

- Centralized help desk;
- Tools for exchanging information with survey respondents;

- **Electronic questionnaire area**

- Questionnaire authoring tool based on XML standard

In general the system is structurally designed to reduce burden on respondents and redundancies in the statistical process through:

- **Interoperability** - Sharing of data and metadata on the basis of a common data modelling;
- **Centralised governance** - Integrated management of the data collection processes according to businesses' needs (such as single sign-on, business-managed profiling system);
- **Rationalisation** - Inter-process sharing and re-use of data that are already available in the statistical system or among the various public administrations;
- **Standardisation** – Use of metadata standard representation (XML);
- **Data reciprocation** - Feedback to business: macro and micro benchmark with data supplied by ISTAT data warehouse (I.Stat);

C. GX – A survey design tool

29. There are several off-the-shelf solutions available for authoring Web questionnaires, however they usually offers functions operating at such a level of generalization that they can rarely be used without give in to any, sometimes substantial, compromises. But it stands to reason that a NSI data collection process must abide by highly specific, uncompromising quality standards, as only delivering quality data that can be trusted and confidently used, makes for a reliable and robust official statistics. It's the typical cost-quality trade-off we have come to expect when dealing with IT technology, as the opposite scenario is also true: ad-hoc software, developed in strict adherence to customer requirements, delivers as expected all of the specified functionalities but at significantly higher unit cost. Not to mention the prospective costs of adjusting the software to potential new needs or to different domains of application.
30. At the same time we must recognize that, due to the rapid growth of technology, it is now possible to achieve what seemed barely possible in the recent past. The world of official statistics itself is today facing a challenge for its very survival, and has no option than to submit to the imperative of innovating, streamlining and industrializing their processes to keep pace with an increasingly fierce competition. The GX project comes at the intersection of these challenges, trying to strike a balance between the need for organizational innovation and the opportunities that technology offers, without overlooking the specific and real needs coming from statistical production areas.
31. GX, which stands for "Generalised Italian (Data) Collection System XML", is an IT system specifically designed for Web-based data collection and processing in ISTAT. GX supports the qualified statistician throughout the entire life cycle of a survey: from questionnaire design, to monitoring and reviewing of the collected data. It offers a secure, visually appealing and highly efficient Web environment. It was planned and developed as part of the Business Portal project, but due to its specific XML-based implementation, is not confined to the use within a specific platform. It is currently in its pre-testing phase.

1. GX and the GSBPM model

32. The Generic Statistical Business Process Model (GSBPM) provides a basis for the definition and description of a set of processes needed to produce official statistics. It's a flexible frame of reference that enables statistical organizations to agree on a common terminology in order to make easier the sharing of tools and processes.
33. GX, as a generalized design system for Web-base surveys, find its natural place between the "Design" and the "Process" phases of the GSBPM model. More specifically it covers or is part of the following sub-processes: **3.1** Build data collection instrument **4.1** Select sample **4.2** Set up collection **4.3** Run collection **4.4** Finalize collection **5.2** Classify and code **5.3** Review, validate and edit **5.7** Calculate aggregates.

2. Survey management with GX

34. As mentioned, a generalized system is based on one main concept: informative content should be decoupled from the system using it, in other words, from its instantiations. In the GX system, XML is the language used to represent the main survey's contents: survey metadata, survey variables, questionnaire structure, check plan and skipping rules.
35. Why adopting XML? XML is the format of choice for both human-and-machine-readable document marking, and allows for easier interpretation of the information represented (metadata, data, checks, rules of administration) ensuring interoperability. It also would make easier to comply with standards such as SDMX, DDI.
36. One of XML's strongest points is the enormous semantic flexibility it achieves if used together with XSLT: XSLT allows translating the same XML file in different formats. In the GX project, XML is

the starting point to create the DB structure and both the server- and client-side applications (Oracle DDL and store procedures, PHP and JavaScript/jQuery)².

37. The Portal, where GX is perfectly integrated, was developed with three distinct classes of users in mind: enterprises, statisticians and IT people. It allows the statistician to almost self-sufficiently set up a new survey, from the design to the test of the production system. Although not strictly necessary, cooperation with an IT analyst is desirable in order to make the most of system's potential and obtain the best performance. Once set-up and activated, the survey will become part of the integrated business survey system and automatically published on the Portal. The statistical users who has been granted access to Portal's back-office, will be enabled to use the integrated GX tools, to perform various monitoring tasks on the data collection process, including: validation checks according to the compatibility plan; data entry; on-line edits; trend reports grouped by business domain, interviewers or rules laid down in the compatibility plan; monitoring of logged users. On the front end, the businesses will be able to verify their involvement in the survey, the deadline, the state of completion, any reminders or warnings received and will be provided with a standard graphical interface to perform data collection duties. For their part, IT people inside the organization (both the Portal and GX are fully designed and developed in-house) are being facilitated as far as possible in performing maintenance and evolutionary development of the software.

D. Pilot test

38. Since last July 13, the portal is operational on a pilot test basis involving a limited number of enterprises. The screening of the eligible subset of respondents was conducted through a process of rational sample selection, conditioned by overlapping constraints on the overall size of enterprises, the number of surveys in which they are involved and the time schedule of the production processes.

39. This procedure led to the identification of a subset of 69 companies, which at the moment are regularly carrying out the planned statistical fulfillments required by three surveys: a survey that provides statistics on the production of manufactured goods (PRODCOM), a short-term survey on turnover and orders in industry (FATT) and a structural business survey on information and communication technologies in enterprises (ICT), included as a case study of interest aimed at achieving optimal experimentation. PRODCOM involves a sample of about 42,000 industrial enterprises, and involves as survey units also production plants. It's an annual survey, as ICT is, whereas FATT has a monthly frequency.

40. As can be told by the small number of selected companies, the main objective of the pilot trial was not to stress-test the Portal (the first test runs showed the system can safely manage more than 50 contemporary users) but to evaluate the different management procedures and functions in a real-world setting, to have a first feedback from companies and, above all, to get the organisation ready for painlessly migrating from a vertical to an integrated model.

41. To carry forward this change in the organisation, ISTAT's Department for Business Statistics and National Accounts is expanding a centralized office to plan and manage the rationalisation of processes and the sharing of information among different surveys and processes. The Portal is proving to be an extraordinary support for transformative action.

42. At the end of July, ISTAT introduced the Portal to experts of foreign trade of some medium- and large-sized companies with high exposure to international markets, as the first of a series of scheduled meetings with companies of different sectorial and geographical reach. The Portal has gathered appreciation from the businesses present at the meeting, as well as ideas and suggestions on possible improvements of the system for returning statistical information offered by the Portal.

² A user interface is working in progress. It will follow the WYSIWYG ("what you see is what you get") paradigm in order to enable non-IT people to create their own survey from scratch.

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