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MEASURING INNOVATION
IN SERVICES

Rinaldo Evangelista,
Giorgio Sirilli
and Keith Smith

Rinaldo Evangelista and Giorgio Sirilli are researchers at Institute for Studies on Scientific Research and Documentation, National Research Council of Italy, Via C. De Lollis, 12, 00185 Roma, Italy. Tel. +39-6-448791; Fax +39-6-4463836. Email: evangel@www.isrds.rm.cnr.it, sirilli@www.isrds.rm.cnr.it. Keith Smith is research director at STEP Group, Storgaten 1, N-0155 Oslo, Norway. Email: keith.smith@step.no

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ABSTRACT

This report discusses some of the most problematic issues concerning the measurement of innovation activities in the service sector. The paper seeks to give a brief outline of some of the core issues in understanding the diversity of innovation practices and outputs in the service sector. It then turns to the applicability to the service sector of the definitions and methodologies set out in the OECD “Oslo Manual” on the statistical measurement of technological innovation which was used in the recent European Community Innovation Survey (CIS) on the manufacturing sector. The results of a pilot survey carried in Italy and of other surveys are compared and a set of suggestions for the design of a questionnaire to be used in the service sector are put forward.

The paper suggests that the “Oslo Manual” framework can be used to collect innovation data in the service sector with some changes in the definition of innovation and in the list of innovation expenditure items. The economic impact of technological and organisational innovation within services, though considered to be a crucial issue, still appears not to be amenable to statistical measurement.

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INTRODUCTION

The aim of this report is to explore the economic and technological significance of service industries, and the indicator problems which arise in any attempt to quantify innovation activity and innovation outputs across the heterogeneous activities which make up the service sector.

The service sector is nowadays a major component of modern industrialised countries: in 1992 it accounted for almost two thirds of jobs in OECD countries. The highest concentration of employment in service activities occurs in North America (72.6%) and Oceania (70.2%), with EU (61.9%) and EFTA (65.3%) regions showing a middle ranking (OECD, 1994a). Private services - in particular finance and insurance, retail and wholesale trade, transport, utilities and communications - are the largest part of services as a whole. They make up 59% of US GDP and 56% of total employment.¹ These figures are broadly comparable with other advanced economies. Among the private service sectors, the more dynamic components over the last 20 years have been financial and business services along with community, social and personal services. These are the services branches which have contributed to partially offset the heavy losses of jobs occurred in the manufacturing sector. Conversely, more traditional services such as wholesale and retail trade, restaurants and hotels, transport storage and communications, have not increased their relative importance.

The quantitative importance of the service sector contrasts with its role of public RTD policies. Public-sector research policies, in all advanced countries, are overwhelmingly concentrated on two research-performing sectors: manufacturing industry, and the university sector. From both economic and social point of view, this focus is very problematical, because it is not obvious that these sectors are in fact central either to economic performance, or to social welfare, or to the development of new forms of knowledge. In quantitative terms (measured either in terms of output or employment), by far the largest sectors in all OECD economies are *private services* (such as transport or finance) and *public services* (such as health and education). The role of these sectors in

¹ See J.B. Quinn, "Technology in services. Past myths and future challenges", *Technological Forecasting and Social Change*, Vol 34 No 4, 1988, p.329

the creation and diffusion of new technologies is seriously neglected in research policies at the present time.

The concentration on manufacturing and universities by public research agencies derives from two ideas which deserve to be reconsidered. The first is that, in the production sector of the economy, manufacturing is somehow of primary importance in the growth of productivity and the process of technological change. The second is the idea is that science-based knowledge is central to technological change.

There are three basic reasons why more attention to the service sector is justified. The first two are straightforwardly economic:

- that the service sector is large and growing, both in terms of income and employment
- that is central to processes of structural change at the present time

But there is a third reason, which is to do with the process of technology creation which drives the value-creation process. This is that:

- the service sector is an important contributor to, and site of, innovation and technological change.

New technologies and innovation are increasingly used and generated within the service sector. In particular the diffusion of information technologies (IT) in the service sector is revolutionizing the ways most of "traditional" services are produced and delivered as well as is offering great opportunities for the generation of new ones: electronic money, cash dispensers, telecommunication systems such as mobile phones, fax machines and on-line transmission of data, multimedia technologies etc..

The increasing economic and technological importance of the service sector in modern societies calls for a more systematic collection of data on innovation activities in such industry. International statistical organizations, such as EUROSTAT as well as national statistical offices, are moving in this direction, improving the definitions, classifications and the statistical procedures for data collection.

In this paper we deal with the measurement of innovation in the service sector drawing on the experience of the manufacturing sector. More particularly, we focus on the definition of innovation, the measurement of its cost and its economic impact.

There are many unresolved problems concerning our knowledge of the operation and importance of services. We still know relatively little about how private service industries develop and diffuse technology, and about the forms which technological competition takes within such industries. The major unresolved problems include the following:

- What are the main forms which service-sector innovative activity takes? How important is R&D within the service sector? What are the principal sources of innovative ideas?
- How do the various service-sector industries relate to the process of technological change within other industries? What are the organisational and market links through which service sector innovation is diffused? How significant in quantitative terms are the inter-industry linkages?
- How do service sector industries appropriate the benefits of innovation? Are there appropriability problems which are specific to services, and what are the policy implications?
- How does service sector innovation relate to the basic research effort of the public sector? What other public policy measures are relevant to service sector activity: in particular, what are the implications of service-sector innovation activity for tax policy, regulatory practices, infrastructure development, education policy and policy relating to property rights?²
- How important is innovative activity to the competitive performance of services industries, especially in traded goods sectors?

The next section deals with some characteristic features of innovation in the service sector which have direct implications for the measurement of innovation activities in such sector. In section 3 we examine the concept and definitions set by the OECD “Manual for the

²For a brief discussion of some of these issues, see T.L.Doorley and J.B Quinn, "Key Policy Issues Posed by Services", *Technological Forecasting and Social Change*, Vol 34 No 4, 1988, pp.405-423.

measurement of technological innovation - Oslo Manual” and used in the recent European Community Innovation Survey (CIS). The results and suggestions provided by recent pilot innovation surveys carried out in several countries are described in section 4, while section 5 presents the results of a pilot survey carried in Italy. Section 6 sets forth some conclusions based on the various experiences and puts forward some proposals for future work.

INNOVATION ACTIVITIES IN THE SERVICE SECTOR

In contrast with a common view which sees service industries as technologically backward, and despite the numerous caveats still existing in the service classification and statistics, there is an increasing amount of evidence of service sector playing a substantial role in the generation and use of innovations. Our discussion here rests on two primary points. The first is that any understanding of the service sector, and of its role in technology creation and diffusion, must start from a recognition of the complexity of the sector. In statistical classifications, such as ISIC or NACE, the service sector is essentially a residual class: it is composed of activities producing intangible outputs which do not fit into either primary or manufacturing sectors. In fact, of course, the service sector is not one sector at all; it is comprised of extremely heterogeneous activities, which play a very diverse role in overall economic performance. Understanding the service sector is, in large part, a problem of gaining a better conceptual and empirical understanding of this complexity and its implications.

According to recent OECD estimates, service industries have performed in 1991 24.8% of total Business enterprise R&D, compared to a share of 4.2% in 1981. It is however difficult to say how much of this increase is due to the changes in the classifications and coverage of R&D statistics, and the extent to which it is due to a real increase of the R&D innovative efforts of service firms.³ On the other hand, the actual involvement of service firms in the process of generation and development of knowledge might be underestimated by R&D statistics, whose definition does not explicitly take into account all activities of generation and development of software.⁴

³ Furthermore, in interpreting these trends there are other spurious aspects which have to be taken into account such as the re-classification of some R&D companies formerly part of manufacturing operations (externalisation).

⁴ All these methodological problems reduce the scope for using R&D statistics as an indicator of service technological activities as well as to make comparison between service and manufacturing industries.

Furthermore, it is well known that R&D does not capture all the efforts in technology development, and that diffusion is an integral part of the innovation process whereby firms successfully apply and modify technologies developed somewhere else. Also in this respect, the service sector does not seem to be backward with respect to the manufacturing industry. Service industries are heavy users of information technologies: the bulk of information technology investment is actually used by services - around 80% in the UK and USA (OECD, 1994a). Service sectors also heavily invest in training, and more generally in human resources, factors which are increasingly recognised as key competitive elements of firms' innovative strategies. In this respect a recent Italian survey has shown that firms' training expenditure (in relation to total wage costs) are higher in sectors such as insurance, banking, telecommunications, software than in manufacturing industries such as chemicals and pharmaceuticals, motor vehicles, and machinery (Del Santo, Forlani, 1995).⁵

The necessity to carry out a more systematic data collection on innovation activities in the service sector is nowadays widely recognized. This requires to identify the specific characteristics of innovation activities in the service industries. Over the last few years several studies have shed some light on the main technological typologies of service industries as well as on few characterizing features of the service sector as a whole.

Soete and Miozzo (1989) have built a taxonomy in which services industries are divided in four categories according to the relevance and nature of innovative activities. Following the Pavitt's taxonomy, they distinguish between *supplier dominated sectors*, which depend on technologies developed by other sectors; *production-intensive, scale-intensive service sectors and network sectors*, which involve large scale processes and innovation is concentrated on the introduction of IT to reduce costs; *specialised technology suppliers and science based sectors*, mainly consisting of business service sectors whose innovative activities consist of R&D, software development and large use of IT.

⁵ Also methodologies to collect data on the adoption of IT as well as on training activity, though providing confirmation of an increasing relevance of technology in the service sector, are still not fully developed and no international standardization on data-collection methodologies of and specific indicators to be used exists.

In proposing a sectoral distinction of the innovative patterns based on the "use" and "production" of innovations, and giving to them a clear technological content, this taxonomy seems to close the gap between the service and the manufacturing sector as far as role and nature of technological change is concerned.⁶ A key feature of the service sectors is however identified, i.e. the central role played by information technologies, seen as the main technological source and output in most of the service sectors.

Miles has discussed the definition of services starting from an analysis of the characteristics of the products, processes, organisations and markets of services (Miles, 1995). Among the features which are common to most of the service sectors he identifies the following: low levels of capital equipment, non continuous nature of production processes, key role played by the process of delivery of the services, limited role played by economies of scale, immaterial and information-intensive nature of the process and of the output, co-terminality of production and consumption in time and space, high regulated regimes of markets and products (Miles, 1995; see also Martin and Horne, 1994).⁷

The following features can thus be identified in the literature as typical of the service industries:

- i) close interaction between production and consumption (co-terminality);
- ii) the increasing information content of services and production activities;
- iii) the increasing role played by human resources as a key competitive factor,

⁶ This is also argued by Alic who points out that "technologies of the service industries and of manufacturing draw from much the same storehouse of knowledge, particularly when it comes to computer-based systems" (Alic, 1994, p. 1).

⁷ The features identified by Miles contain however a high degree of generalisation which contrasts with the heterogeneous nature of the service sector. For instance, sectors such as air, rail and pipeline transportation, communications, and public utilities have always been among the most capital-intensive sectors and where economies of scale play a crucial role (Quinn, 1987). Furthermore, there is evidence that some of these latter features are increasingly affecting the service industries (OECD, 1994a). A high level of heterogeneity in the skill level and profile of the labour force as well as in the model of industrial organisation has been also pointed out by Miles (1995), by several studies (1988, 1994a) and it emerges in a recent Italian survey on firms training activities (Del Santo and Forlani, 1995). In this respect the recent Job study has pointed out that "some rapidly growing service sector jobs are in information and knowledge occupations and have high skill requirements. At the same time, however, there is a wide range of personal services, which are likely to remain both relatively unaffected by the new technologies and relatively unskilled (, 1994, p. 164).

iv) the critical role played by organizational factors for firms' performance⁸.

The four characteristics mentioned above have implications for the conceptualization and definition of innovation in the service sector.

The co-terminality between production and consumption in the service sector blurs the distinction between products and processes, and consequently makes the distinction between product and process innovations less clear-cut when compared to the one used for the manufacturing sector (Miles, 1993, 1995). Due to the close interface between production and consumption of services, a large part of innovation activities in the service sectors is oriented to the adaptation-customisation of the services to the user's needs. In many cases these activities are "innovative" though incorporating a limited technological content.

The intangible and information based characteristics of "production processes" and output of services give to the generation and use of information technologies a central role in firms' innovation activities. This suggests that such dimension should clearly be included in both the definition of innovation and its expenditures.

The important role played by the human factor in the organization and delivery of services is associated with substantial investment in human resources. Despite the fact that training activities are not usually considered as innovative inputs, they should explicitly be regarded as one of the main channels to upgrade the technological capabilities of firms in the service sector. Additionally, the importance of the organizational factor in the service sector raises the issue of an enlargement of the concept of innovation in order to include organizational changes which can either linked to, or independent from, the introduction of technological innovations.

Technological change in the service sector has five basic dimensions:

1. It produces completely new forms of service sector products and outputs

⁸ The last three features are in fact common also to most manufacturing firms.

2. It changes the ways in which existing services are provided
3. It generates new forms of service organization
4. It changes the services dimensions of manufactured products
5. It reallocates activities between sectors

However the general relationship between technological change and service sector industries is complex, reflecting the very diverse character of the sector. In order to get a better grasp of this it is necessary to develop a further classification of different types of service sector activities, along several dimensions. Firstly, it is important to distinguish between different types of final markets for services: the basic distinction here is between services which produce final outputs for the consumption sector, and services which provide intermediate or capital inputs for other production sectors.

Against this background, services have a number of potential technological forms, which we can distinguish according to the kinds of knowledge-bases which are involved, the scale of operations, and the sources and use of technological knowledge. These characteristics also can be used as a dimension for classification.

➤ Firstly, there are services based on intensive use of manufactured technologies: such services include retailing, financial services, and repair and maintenance services. But these *capital-using* services include two further important groups. One of these is what we call *computation-intensive services*, especially the financial services sector. These should be distinguished from a further group of capital-intensive group services which we call *infrastructure intensive*: these include sea, air and land transport, and telecommunications. But other elements of the services sector increasingly involve more or less specialized advanced technologies: entertainment is particularly important here.

➤ Secondly, there are services based on creation of *specialized technological knowledge*: these include most forms of business consultancy services such as industrial design, engineering consultancy, software and systems development and so on. In some areas, these activities are also computation-intensive, in terms of the processes through which they generate results.

➤ Thirdly, there are services based on *codified professional skills*: these include legal services, accountancy, and so on.

➤ Finally, there are services based on *tacit skills* - these include person-dependent services such as haircutting, restaurants, fashion design, and so on.

Corresponding to the distinction between technology use and technology creation, we can understand the impact of technological change in services in terms of three processes: (a) change in technological characteristics of major inputs, leading to enhanced productivity and growth in service sector activities, (b) change in technologies generated by service sector activities, and (c) what we can call *interactive change*, where changes in knowledge-creation activities in services are driven by capital inputs from other sectors.

What are the primary areas of generic technological change which affect these three dimensions of service sector technologies at the present time? Two closely-related overall areas stand out:

1. Continued advance in information technology, both in terms of price/performance ratios in computing, but also the continued development of new software capabilities, and the dramatic expansion in network facilities and capabilities.
2. Changes in telecommunications infrastructures, with further deregulation; integration of space-based telecommunications with cable communications and computing.

What are the main dynamic effects of such technological change in service sector industries? Here we discuss, drawing heavily on Quinn's work, five main effects: changes in economies of scale, changes in niche opportunities, changes in economies of scope, changed capabilities in managing complexity, and changes in industry functions and competitive structure.

Economies of scale

The development of increasingly capital-intensive services has meant that in a number of fields where large fixed costs have become a feature, economies of scale are apparent. Within industry, this appears to be particularly marked in banking, transport and

financial services generally. There is rather wide evidence that concentration ratios in these industries (that is, the share of industry output being produced by the top five firms) have increased steadily in most OECD economies since 1975. Economies of scale are also apparent in technology-intensive parts of public services, particularly health care. One of the driving forces of hospital reorganisation at the present time, in a number of countries, is the fact that smaller hospitals do not have the level of patient demand necessary to support some types of advanced equipment.

Niche opportunities and changes

Scale economies often coexist with new niche functions, and this has also occurred in service sector industries. In financial services, for example, a major constraint for firms has been the need to maintain departments for account settlement. Firms therefore have therefore needed large trading volumes to justify the scale of the settlement systems. The development of electronic settlement systems has meant that much smaller players, specialised around specific financial products (such as derivatives of various kinds) have been able to enter the market, and this implies a countervailing trend to the concentration following from economies of scale.

Economies of scope

Economies of scope arise where assets and skills can be shared among production processes producing several products; the basic idea is that there is a form of spillover, so that acquiring a skill in one area means that the firm simultaneously acquire an advantage in some other field. An important example of this at the present time - from the manufacturing sector - is the impact of biotechnology: firms who use biotechnologies in food processing find that they are also acquiring capabilities in pharmaceuticals. This is leading to entry of food processing companies into the pharmaceutical industry, especially in Japan. Similar processes are occurring in services. Three examples:

- use of advanced booking systems mean that air travel, accommodation and car rental are more closely integrated, so there are strategic partnerships and even take-overs between airlines, hotel chains and car rental companies.
- changes in telecommunications technologies mean that companies supplying cable television are also able to enter activities for telephone, fax and e-mail services

► changes in IT applications mean that banks are more able to diversify into products such as insurance, stockbroking and so on; in general financial services appear to have strong economies of scope

Coping with complexity

One of the main impacts of high-performance IT equipment and software in services is that it enables some key service activities to engage in much more complex operations, and to extend the range of their activities. For example, development of computer aided design has meant that industrial designers can integrate elements of production engineering into the design process, while at the same time coping with much more complex design problems. Under some circumstances this means that test activities can be integrated with design.

Changes in industry functions and competitive structure

It should be noted that the above factors of scale, scope and complexity mean that activity divisions become much less clear. For example, in the travel business, the processes of ticketing, managing accommodation, car rental, and so on are increasingly integrated, and it is no longer clear what the notion of ‘core business’ means in such fields. This has led to rapid changes in company strategy, with very unclear results: for example SAS first tried a strategy based on integration of a wide range of services (the ‘partner’ concept), and then moved back to a focus on air travel, with sale of the related activities. In other service areas, particularly financial services, there has been such rapid entry into a range of areas that it is now somewhat difficult to distinguish between banks, insurance companies, mortgage providers, and stockbrokers. But it has also meant that manufacturing firms - such as automobile manufacturers - enter the sector via supply of financial services linked to purchases of cars.

THE MEASUREMENT OF INNOVATION IN THE OSLO MANUAL

How appropriate are existing innovation indicators with respect to service-sector challenges? In recent years innovation surveys have increasingly been recognised as a useful tool to provide information on innovation activities compared to traditional technological indicators such as R&D and patents. Concepts, definitions and

methodologies used for the collection of data on innovation were set out in 1989 in the OECD “Oslo Manual”. Since then, innovation surveys have been carried out in many OECD and non-OECD countries.⁹ However, the conceptual and methodological framework of the Oslo Manual is clearly focused on manufacturing industries. Service activities have remained in the background and need further development.

A key issue in this respect is whether the conceptual and methodological framework used for the manufacturing sector can be used in the service sector and, if this can be done, which changes or qualifications should be introduced in order to suit the specificities of the service sector.

In this section we analyse the extent to which the definitions of the Oslo Manual can be used in the measurement of innovation in the service sector taking into consideration the technological and economic specificities of service industries set out in the previous section. In particular we focus on three issues:

- The definition of innovation and the distinction between product and process innovation;
- The identification of the main components of innovation activities and their quantification in terms of "innovation expenditures";
- The measurement of the economic impact of innovation.

The definition of innovation

The Oslo Manual definition of technological innovation is the following:

Technological innovations comprise new products and processes and significant technological changes of products and processes. An innovation has been implemented if it has been introduced on the market (product innovation) or used within a production process (process innovation). Innovations therefore involve a

⁹ The underlying model of innovation has been basically the “chain-linked” model, which envisages that R&D may be only one of the driving forces of the process, and that innovation is a multifaceted phenomenon which takes place within the “national systems of innovation” which include firms, government laboratories, regulatory agencies, universities, funding organisations, the government (Kline and Rosenberg, 1986). The methodologies used and some analytical results are set out in various publications, in particular: OECD STI Review, (1995), OECD (1990), Archibugi et al. (1995).

series of scientific, technological, organisational, financial and commercial activities.

The Manual gives also the definitions of product and process innovations and distinguishes between major product innovation and incremental product innovation.

The definitions are the following:

Major product innovation is a product whose intended use, performance characteristics, attributes, design properties or use of materials and components differ significantly compared with previous manufactured products. Such innovations can involve radically new technologies, or can be based on combining existing technologies in new uses.

Incremental product innovation is an existing product whose performance has been significantly enhanced or upgraded. This again can take two forms. A simple product may be improved (in terms of improved performance or lower cost) through use of higher performance components or materials, or a complex product which consists of a number of integrated technical subsystems may be improved by partial changes to the one of the subsystems.

Process innovation is the adoption of new or significantly improved production methods. These methods may involve changes in equipment or production organisation or both. The methods may be intended to produce new or improved products, which cannot be produced using conventional plants or production methods, or essentially to increase the production efficiency of existing products (OECD, 1992).

The Manual also specifies what should not be included as an innovation that is, changes which are purely aesthetic or which simply involve product differentiation (that is, minor design or presentation changes which differentiate the product while leaving it technically unchanged in construction or performance).

Innovation activities and their measurement

In the Oslo Manual six main typologies of innovation activities are identified:

➡ R&D (distinguished between *intramural* and *extramural*)¹⁰;

¹⁰ In the Frascati Manual, R&D activities are distinguished in three main components i.e. basic research, applied research and experimental development.

Basic research is experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundation of phenomena and observable facts, without any particular application or use in view.

Applied research is also original investigation undertaken in order to acquire new knowledge. It is, however, directed primarily towards a specific, practical aim or objective.

- acquisition of disembodied technology (patents, non patented innovations, licences, know-how, trademarks, other technological services);
- product design (plans and drawings aimed at defining procedures, technical specifications and operational features of new products);
- trial production, training and tooling-up (in connection with manufacturing start-up);
- market analysis (launching of new products with the exclusion of building of distribution networks);
- investment in plants, machinery and equipment (connected to the introduction of innovations).

The list of the innovation items proposed by the Oslo Manual different from more readily to manufacturing than to services. The “physical” and “production” reference in most of the definitions of the non-R&D inputs is explicit. The issue here is to change the innovation items in order to better reflect the nature of innovative activities in the service sector.

The measurement of the economic impact of innovation

In the Oslo manual the issue concerning the measurement of the economic impact of innovation was also addressed. The proportion of firms’ sales due to new products was adopted as an indicator of the impact of innovative activities on economic output. In the CIS questionnaire firms were asked to estimate the share of sales and exports due to products subject to incremental changes and products significantly changed.

In many service industries the concept of output is very difficult to be defined and measured.¹¹ Furthermore, because of the intimate relationship between product and process innovation in the service sector, the actual percentage of sales linked to the

Experimental development is systematic work, drawing from existing knowledge gained from research and/or practical experience that is directed towards producing new materials, products or devices, to installing new processes, systems and services, or to improving substantially those already produced or installed (OECD, 1994b).

¹¹ On this point see the Mark Sherwood, 1993.

introduction of product and process innovation activities appear to be more difficult to be estimated for service firms than for manufacturing firms.

THE RESULTS OF SOME PILOT SURVEYS IN THE SERVICE SECTOR

In the last few years EUROSTAT (the statistical office of the European Union) and some other national statistical offices have launched pilot surveys in order to verify the feasibility of innovation surveys in the service sector.

EUROSTAT asked Statistics Netherlands and ZEW of Germany (Zentrum für Europäische Wirtschaftsforschung) in co-operation with Stifterverband in Germany to perform 20 interviews, 10 in each country, in order to investigate the extent to which the definitions used in the Oslo Manual should be changed to suit the service sector. The key areas of the questionnaire which have been tested are those related to the issues identified in the previous section, i.e. the definition of innovation to be used in the questionnaire, the use of the distinction of product and process innovation, the measurement of innovation costs and the economic impact of innovations.

On the basis of the results of these interviews EUROSTAT has put forward few suggestions to adapt the questionnaire used for the manufacturing industry to the service sector (EUROSTAT, 1995). These can be summarized as follows:

Definition of innovation to be used in the service sectors

The more general conclusion emerging from the EUROSTAT study is that “if the service sectors are going to be included in future innovation surveys, it is not possible to directly use the concepts, definitions and questions developed for the manufacturing sectors. The concepts and definitions need some modifications according to the specific characteristics of innovation in the service sectors” (EUROSTAT, 1995).

In particular it is suggested to introduce a definition of innovation slightly different from the one contained in the Oslo Manual.

Innovations in the service sectors comprise new services and new ways of producing or delivering services as well as significant changes in services or their production of delivering. An innovation has been implemented if it has been

introduced to the market (product innovation) or used in producing services (process innovation).

Product innovations are services whose intended use or performance characteristics differ significantly from those already produced. Innovations should be the result of the use of new or new combinations of technologies or other substantive investments in new knowledge.

Process innovations are new or significantly improved ways of producing or delivering services.

The definitions of product and process innovation adopted in the EUROSTAT model questionnaire have significantly broadened the concept of innovation when compared with the one proposed in the Oslo Manual. In particular, i) “delivery” innovations have been explicitly mentioned so as to capture an important dimension of innovation activities in the service sector; ii) the “technological requirement” of innovation has been considerably weakened, being mentioned only in the definition of product innovations; iii) investment in knowledge has become the qualifying criterion for innovation.

The suggestion to broadening the concept and definition of innovation in the service sector is, according to the authors of the EUROSTAT paper, also necessary because the difficulty to draw a distinction in the service sector between product differentiation and product (service) innovation. As stated in the EUROSTAT report, “some innovations reported in the interviews (development of new funds, derivatives, insurance, tickets, etc.) may first seem to be product differentiation, but if the general criteria for innovation (application of new technology or investments in new knowledge) are fulfilled they may be considered as innovations as well” (EUROSTAT, 1995).

The EUROSTAT exercise also suggests to enlarge the concept and definition of R&D activities so as to capture R&D-like activities which are believed to be less formalised in the service sectors than in the manufacturing sector. The results of the EUROSTAT survey show that “different kinds of informal working groups for specific defined development and strategic planning projects (classified as R&D or not) have a great importance in the service sector as contributors to innovation” (EUROSTAT, 1995).

A suggestion of broadening the concept and definition of innovation comes also from other studies. The Australian Bureau of Statistics has used a questionnaire for service

firms in which a very broad definition of innovation was also used (Australian Bureau of Statistics, 1994). The first question in the questionnaire was the following: “Did your business introduce any new services or significantly changed ways of delivering existing services during the period 1 July 1993 to 30 June 1994?” Also in this case the question did not mention technology and even new knowledge at all, broadening even more the concept of innovation with respect to the EUROSTAT definition.

Also Gault and Pattinson, from the Canadian and Australian statistical offices, have proposed a survey module adopting a definition of innovation which is essentially the same as the one adopted by the Australian Bureau of Statistics (Gault and Pattinson, 1994, 1995). In their survey of services in the Netherlands Brouwer and Kleinknecht, in order to ensure a maximum of comparability between manufacturing and service innovation data have used a questionnaire very similar to the CIS harmonised questionnaire. The authors have also completely omitted the word “technological” from the definition of innovation used in the survey of manufacturing industry (Brouwer and Kleinknecht, 1995).

Problems in measuring innovation expenditures and output in the service sector

The EUROSTAT pilot project has also included a second part with a specific emphasis on the measurement of innovation expenditure and innovation output.

As far as the measurement of innovation expenditures is concerned, the general result of the EUROSTAT interviews is that “information on total innovation expenditure according to Oslo definitions are generally not directly available. Difficulties to get this information seem to be bigger than in the manufacturing sector”. However it also states that there are some types of innovation expenditures which can be estimated. They are those connected to “training expenditure”, “some earmarked R&D funds”, “expenditure for marketing or market research”, “investments in information technology”. It is also argued that “the concept of investments in new knowledge in the general definition of innovation should be covered in the innovation expenditure” (EUROSTAT, 1995).

Finally, the EUROSTAT exercise seems quite sceptical about the possibility to get for the service sector reliable figures on the economic impact of innovation activities, at least when the latter is measured by the share of sales due to the introduction of product

innovation. In this respect the report states that “this proportion seems to be impossible to estimate reliably in many enterprises. One reason is the process related nature of many service innovations”. It is then suggested to develop and test some alternative measure of the output based on figures on “cost reductions due to service innovations” (EUROSTAT, 1995).

THE ITALIAN PILOT SURVEY: RESULTS AND SUGGESTIONS

A pilot innovation survey in the service sector was carried out by the authors of this article in Italy, with the aim of testing the same kind of issues addressed by the EUROSTAT exercise. A pilot questionnaire, similar to the one used by EUROSTAT, was administered in May-July 1995 through an in-person interview to nine service companies. The firms were selected with the aim of covering different sub-sectors: banking, financial services, insurance, waste disposal, power supply, telecommunications, market research.

The definition of innovation

The first objective of the Italian pilot survey was to verify the extent to which a definition of innovation drawn from the Oslo Manual was acceptable to service firms. A slightly modified version of the Oslo manual definition of innovation has been in fact used in the questionnaire:

Technological innovations in the service sector comprise the introduction of new or significantly improved services and/or new, or improved, ways of production and delivering of services. An innovation has been implemented if it has been introduced on the market (service innovation) or used in the production or delivery of services (process innovation).

Service innovation consists of a new or improved service which differs significantly from the previous services.

Process innovation consists of the introduction of a new or significantly improved production method or way of delivering services.

The *introduction of service and product technological innovations* implies the use of new technologies or technologies not used before. In any case, they consist of services and ways of producing/delivering services which significantly differ from the previous ones in terms of their qualitative characteristics and performance.

The definition of innovation used in the Italian questionnaire explicitly mentions the technological dimension in the definition of innovation. This approach is deliberately different from the one used by other colleagues in other countries who, as pointed out in the previous section, have decided to adopt a broader concept and definition of innovation.

The definition used in the interviews to the Italian service firms has been judged to be sufficiently clear and understandable. The general suggestion coming from the pilot survey is that it would be advisable that technology is mentioned in the definition. It clearly emerged that, adopting a broader definition of innovation, firms would have considered as innovation any changes in some of the qualitative characteristics of the services provided. With the definition adopted for instance by the Australian Bureau of Statistics, almost all interviewed firms would have resulted as innovative. In fact one of the basic characteristics of the service sector, which also emerged during the interviews, is the continuous introduction of changes both in the services provided and in the way they are delivered. Most of these changes do not require any substantial efforts in developing and using new knowledge or significantly upgrading firms' technological capabilities.

Interviewees gave on the contrary a number of examples which impinge on innovations with a clear technological nature. Among them, the most recurrent were the following: the acquisition of office automation, telecommunication equipment and networks, software, telemetering, etc. These kinds of innovation were recognised also by the firms interviewed as those requiring substantial investment in knowledge, deep organizational changes and an upgrading of the internal technological capabilities of the firm. When firms were asked about their innovations without any additional specification, in most of the cases they gave examples which clearly appeared as product differentiation with a marginal or not existent technological content.

The Italian results seem thus to show that if a broader definition of innovation is adopted, it would be necessary to link innovation to a substantial investment in knowledge, or activities aimed at increasing the technological capabilities of firms. In this case a quite relevant deviation from the Oslo Manual would be adopted, and the comparability of the two exercises would be undermined.

The definition of product and process innovation

The interviews conducted in Italy have also confirmed that product and process innovations are very closely inter-connected (more than in manufacturing). However, after interviewees were given more specific guidelines, then it was much easier for them to distinguish between services and processes. This was confirmed by the fact that during the interviews firms clearly identified two main dimensions of the innovative process: those aimed at increasing the overall efficiency of the firm (i.e. management control, devices enhancing the general performance of telecommunication and electronic networks, accounting procedures, etc.), and those consisting of the introduction of new services characterised mainly by their enhanced performances. New services have on the contrary more often to do with recombining existing services and the “value added” rests with a new way to answer customers’ needs. The great majority of interviewed firms were able to identify delivery innovations such as those concerning waste disposal, telemetering, phone banking etc., which are suggested to be grouped together with process innovations.

The conclusion is that the distinction between product and process innovation should be kept in the questionnaire, though with the inclusion of delivery innovations among process innovation and providing some additional guidelines and examples on how these concepts and definitions should be interpreted.

Measuring innovation expenditures

The categories used in the questionnaire, which were taken from the manufacturing survey, did not appear satisfactory. In particular items like patents, licences, trade-marks have not emerged at all relevant for most of the interviewees. Other activities like design, engineering, trial production have been found not be very typical of service firms.

On the contrary, R&D activities have emerged to play a role in firms' innovation strategies especially in sectors such as telecommunications, water and electricity, waste disposal. In the other sectors the connotations of R&D in services were confirmed to be quite different from manufacturing firms. In order to measure R&D in the service sector it seems appropriate to come back to the Frascati Manual definition and specify to what extent activities such as software design and service development should be dealt with.

Furthermore, in the definition which has been provided to interviewees R&D should be carried out on a continuous and systematic basis. Due to the characteristics of the service sector, such restrictive pre-condition could be released, so that the role played by teams set up on purpose and disbanded when the project is completed, typical of the service sector, is not overlooked.

Training was always considered as an important way of upgrading the innovation capabilities of the firms. All firms interviewed have declared to have spent substantial resources for training activities and qualification of the manpower.

In all cases the introduction of innovations required the acquisition of technologies and know-how through consultancy. It is suggested that innovation activities based on “outsourcing” are explicitly mentioned.

Taking into account all the suggestions received during the interviewees the following revised break-down of the innovation expenditure is suggested. The latter covers some of the main components of innovation activities for which, according to firms' opinion, estimates can be provided:

- R&D (software development should be included),
- acquisition of know-how and technical assistance through consultancy,
- design and test of new services and processes,
- software (acquisition, adaptation and maintenance),
- training,
- marketing,
- investment.

Measures of the economic impact of innovation

In the questionnaire firms were asked whether it would have been possible to break-down their sales by innovative and non-innovative products. This approach, which we have seen to be typical of manufacturing activities, does not seem to work with services. In particular, also in the Italian survey, interviews have confirmed that sales often are not an appropriate indicator of firms' economic performance. This clearly emerged in the case of banking, finance and telecommunication services, but it seems to be a much

more diffused characteristic of service output and performance. Furthermore almost all firms have added that it is very hard to distinguish to what extent single innovations affect the overall performance of the firm. This is particularly evident in the finance sector where a large part of innovation activities consist of back-office automation and the implementation of information networks.

At this stage it is therefore difficult to identify an indicator of the impact of innovation activities which has a sufficient degree of generality to be used for statistical data collection. In this regard, some firms suggested that some technical parameters might be taken into consideration. However, such parameters are not additive in quantitative terms, and therefore not suitable to construct statistical indicators. Looking at the current state of the art, the measurement of the impact of innovation on performance still remains the most untractable issue in innovation survey directed to service industries. An option might be including a qualitative question on the importance of technology vis-à-vis other firms' competitive factors (finance, organisation, marketing, etc.).

PROPOSALS FOR FUTURE INNOVATION MEASUREMENT IN THE SERVICE SECTOR

In this paper some of the most problematic issues concerning measurement of innovation in the service sector have been discussed on the basis of some interviews which, although small in number, have provided sufficiently reliable information¹². The objective was to find out to what extent the conceptual and methodological tools used for measuring innovation activities in the manufacturing sector can be used for the service sector.

The analysis of the literature and the results of our survey suggest the following recommendations for future work on data collection on innovation in the service sector:

¹² More efforts should be made before a statistical survey is conducted on services. A second round of interviews has been promoted by EUROSTAT and will be conducted by two teams in Italy and Sweden. Some 40 service firms will be interviewed on the basis of a revised version of the previous questionnaire which incorporates some of the suggestions proposed in this paper. The results are going to be used for the revision of the Oslo Manual which will be discussed at the in June 1996.

- The definition of innovation in the service sector should contain an explicit reference to technology: this is a necessary pre-requisite which avoids to cover service innovations which are based on other types of knowledge such as knowledge of markets, of customers' needs, of organisation. Moreover this allows for full comparability with data collected through the survey on manufacturing industry.

- The distinction between product (service) and process innovations (including delivery innovations), even if less clear-cut compared to manufacturing sector, is still useful in identifying different firms' innovative objectives and strategies.

- The innovation expenditure items used in the manufacturing questionnaire do not fully suit the peculiarities of the service sector and need modifications and specifications. In particular items like patents, licences, trade-marks design, engineering, trial production appear not fully appropriate. On the contrary, R&D does have a role in innovation activities though with different connotations. The definition of R&D should be reconsidered in order to explicitly provide for coverage of software design, as well as to include the work of temporary teams. Given the central role played by IT in the service sector, innovative activities consisting of the acquisition of software, hardware and telecommunication equipment should be clearly specified among innovation activities. Also training activities linked to innovation should be covered separately. It also emerged from interviews that quite often all or part of these inputs to the innovative effort are bought through consultancy.

- The share of sales connected to innovative services does not work as an indicator of economic impact of innovative activities: sales are often not an appropriate output indicator. It is suggested therefore that no specific question on this aspect is included in the questionnaire for service sectors.

- Firms interviewed have confirmed that there is an intimate linkage between organisational change and technological innovation. However, firms have also stated that organizational innovations are very difficult to measure as well as to relate to performance. It is thus suggested that, in view of the lack of a sufficiently developed theory which allows for an appropriate quantitative measurement of organizational

innovation, the only feasible option consists of including a qualitative question on the importance of organizational changes vis-à-vis technology for firms' performance.

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