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Beyond technological innovation: trajectories and varieties of services innovation

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Technology is undoubtedly a core element of innovation in services. However in services more than anywhere else technology is not sufficient to take into account the whole innovation phenomena in services. The aim of this chapter is to present a set of works that share the goal of going beyond technological innovation without neglecting it. Their general purpose is to display the varieties of forms and trajectories of innovation in services. According to the analytical priority they focus on these works can be divided into two different categories¹ : *service based or service oriented* approaches, focusing on service specificities in the field of innovation ; and *integrated* approaches aiming at adopting a similar approach to the economic analysis of both goods and services. The latter notion is based on the observation that the boundary between goods and services is becoming increasingly less clear. Certain services are being "industrialised" and, conversely, the production of certain goods is being "tertiarised". These converging tendencies are often described in terms of the *goods-services continuum and functions*. I especially intend to try and enrich and operationalise these approaches by using a characteristics representation of the product drawn upon the work of Lancaster (1966) and Saviotti and Metcalfe (1984).

1. Service oriented approaches

The starting point for the less familiar approaches that we describe as "service-oriented" is the notion that innovation can exist where the "technologist" gaze perceives nothing. Without ignoring the technological dimension, these approaches focus on non-technological forms of innovation ; in this respect, they are following the precedent set by Schumpeter, whose definition of innovation was particularly broad and open.

1.1 Core and peripheral services approach

In this approach proposed by scholars in management science, especially marketing (Flipo, 1984 ; Shostack, 1984 ; Normann, 1984 ; Eiglier and Langeard, 1987 ; Jallat, 1992) services are defined as the bundling of two sets of activities : core services and peripheral ones. For a

¹ For a more comprehensive survey cf. C. Gallouj and F. Gallouj (1996), F. Gallouj (2002).

given core service, peripheral services make "product" differentiation possible, and are often at the basis of competitive edge.

Eiglier and Langeard (1987) for example make the following distinction between a new service and the extension of an existing service : a new service requires the design of a new core service whereas the extension of an existing service is mainly made possible by the addition of a new peripheral service. Although interesting, this approach applies more to consumer services than to business services especially the more knowledge intensive among them.

1.2 Financial services innovation theory

Analyses of financial innovation based on the demand for certain characteristics (Hardouin, 1973 ; Desai and Low, 1987) have developed independently with a view to providing a theory that applies solely to financial services. In that sense they can also be considered as service-oriented approaches. However in the approach we have adopted below (§3 : "A unified Model..."), these analyses constitute only one particular illustration of a general model that can be applied to all goods and services.

Hardouin (1973) formalises this analysis as follows. A monetary and financial instrument T_i can be defined a priori or a posteriori by a finite set of "n" characteristics and can therefore be written in the form of a vector with n dimensions in which the t_{ij} indicate the extent to which property j is incorporated in instrument i. $T_i = (t_{i1} \dots t_{ij} \dots t_{in})$. Thus if the instrument T_i does not have property j, $t_{ij} = 0$. Innovation appears in the following two cases : a variation in t_{ij} , i.e. a variation in the extent to which the existing property j is incorporated in the instrument (e.g. the instrument is more liquid), and the activation of a property that did not previously exist (transition from $t_{ij} = 0$ to $t_{ij} \neq 0$).

A first example is provided by Desai and Low (1987), who are concerned with financial assets and define them in terms of two characteristics, namely access (liquidity) (A) and return (yield)(R). The diagram thus constituted (Figure 1) makes it possible to locate and describe existing assets.

Figure 1 : Representation of financial products in a diagram of characteristics Source: After Desai and Low (1987)

Since reference assets A and B are characterised by a low return and high liquidity and a higher return and low liquidity respectively, Desai and Low consider the development of asset C as a "*trivial innovation*", since the distance between A and C in terms of characteristics, as measured by the angle (OA, OC), is small. On the other hand, asset D is an "*important innovation*", since it fills an "empty space" between the two reference assets.

Another example is provided by Niehans' analysis (1983). Assuming that any financial service, from the simplest to the most complex, can be represented by a given combination of the following three functions or characteristics: the exchange of current money against future money, the linking of borrowers and lenders, the making of payments in the name of a client, this author defines innovation as any new way of combining these three aspects.

Niehans also introduces an interesting distinction between irreversible combinations (innovations), which he describes as "*technological*" but which are not limited to material technologies since they include double-entry book-keeping, which was invented at the end of the Middle Ages, and those that are more reversible and cyclical, which he terms "*adaptive innovations*". Innovations in this latter category disappear as soon as the conditions that encouraged their development have themselves disappeared.

1.3 The commercial innovation school

Like specialists in the financial services industry, students of retailing have sought to develop "local" theories of innovation adapted to their particular field. In consequence, this review of "services oriented" approaches seeks to give an account of these various theories.

The most important of these relate to the dynamic of shop formats, which are conceived of in terms of life cycle. Thus the "wheel of retailing" model (McNair, 1958) can be summarised as follows :

- 1) All new forms of retailing appear first in a "discount" version, i.e. outlets offer a limited range of goods and services and the main objective is to maximise sales volumes.
- 2) Their success causes the "wheel" to revolve as retailers gradually "trade up" by adding new products and services to the original ranges ; this leads in turn to increased operating costs and higher prices.
- 3) This "bourgeoisification" of the retail form opens up the market for new, more "Spartan" entrants (to borrow the terms used by Tarondeau and Xardel, 1992).

Other analyses couched in terms of cycles, which cannot be outlined in any detail here (e.g. C. Gallouj, 1997), have extended the "wheel of retailing" model". Goldman's analyses (Goldman, 1975) distinguish between various possible forms of "trading up" or ways of causing the wheel to revolve by the degree of innovation in goods or service they introduce into the range. In the "accordion theory" (Hollander, 1966), the retailing dynamic is characterised by alternation between outlets offering a wide, non-specialist range of products and those with a narrow, specialised product range.

However, the cycle model in its various forms, as well as Barras' reversed cycle model (Barras 1990 ; Gallouj, 1998), cannot account adequately for the wide diversity of forms of innovation in the retail sector. These retail cycle models are concerned only with innovation in shop format (i.e. organisational innovation). However, even in this particular case, they are trapped within a binary logic (low/high prices; wide/restricted product range) and fail to take full account of the diversity of new shop formats and of new forms and new channels of distribution.

Nor do these models take account of the following forms or areas of innovation, most of which require detailed investigation if they are to yield up their secrets :

- new methods of selling (mail order, door-to-door selling ...) ;

- new products and services retailed in stores ;
- new products and services designed by the retailer or on his initiative ;
- new processes (or new forms of organisation and operation) within the same format, whether based on the introduction of new technologies or not (within the same form of retail outlet or within the environment - customers, suppliers, other stores - of the form under consideration).

1.4 Ad hoc innovation, formalization trajectories, service trajectories

Studies based on this service oriented approach often take the "purer" services as their field of investigation, i.e. those in which the criteria of intangibility and the coproduction of output are assumed to be most evident. Consultancy services, for example, are an interesting area for empirical analysis of service-oriented innovation.

Detailed investigations of consultancy firms (F. Gallouj, 1994,) make it possible to highlight in particular the existence of ad hoc forms of innovation that are not immediately reproducible and of institutional "formalization" trajectories (i.e. the search for a certain degree of formalization, though not necessarily, or even predominantly, in tangible form). More precisely these investigations highlight the three following forms of innovation.

1.4.1 Ad hoc innovation

This type of innovation consists of creating and utilizing synergies out of available knowledge and experience accumulated in the course of past practice, in order to create original solutions (for organizational, strategic, fiscal and other such problems), new knowledge, and higher-value knowledge in cooperation with clients. Examples that can be cited include the numerous unprecedented ad hoc legal solutions sweeping into the cracks in the system, or the specification by different types of consultants of particularly novel strategies that confer a certain competitive advantage on the client.

As far as it is often produced in cooperation with the client and it is generally "non-programmed" (Zaltman et al., 1973), *Ad hoc* innovation raises appropriation and reproducibility issues. If the client participates in the production of innovation, to whom does it ultimately belong ? How is this appropriation to be formally implemented ? In the case of *ad hoc* innovation, these two levels of appropriation are both difficult to determine. As regards reproducibility, however, even if the service cannot be reproduced totally, knowledge, experience (whether codifiable or not), tacit and idiosyncratic techniques resulting from practice, methods utilized for their production and transfer, can, for their part, be reused.

Ad hoc innovation is a frequent form of innovation within consultancy (especially legal and strategic consultancy) although it is not taken into account by economic analysis. Generally speaking it is hardly spectacular, and in this regard a number of professional assert : "our innovations are invisible".

1.4.2 Expertise-field innovation

Based upon surveying and listening to the environment and the client's problems, this form of innovation consists of detecting new needs and responding to them through a procedure of accumulating knowledge and expertise. In the case of legal consultancy, examples include investments by innovators in new potential fields of law (upper space, information technologies, consumerism, environmental protection...). However, innovation remains only

potential, and will only be materialized in an interaction with the client. As a consequence, it requires a certain amount of marketing work which, in the field of consultancy, most often comes in the form of participation in conferences, publication of studies or books, etc.

Expertise-field innovation determines the long-term growth of activity. The essential results of this form of innovation are the opening of new markets, diversification (internal or external) or renewal of product ranges, and creation of a competitive advantage or monopoly in terms of knowledge and expertise.

1.4.3 Formalization innovation

This is a more heterogeneous type of innovation which through different means, aims to lend a "material" form to services. Among these means can be counted :

- the "script" design i.e. the formal specification of the stages of the process and their content (up to a certain point). The methods, and innovation in the methods, play a fundamental role here since they make up the skeleton of this invisible or mysterious animal that is consultancy ;
- the incorporation, at certain points in the process, of technical tools adapted to the demands of consultancy ;
- the contents and organization of packages, whether it be by unbundling a general service or by bundling up the basic units of service (Bressand and Nicolaïdis, 1988, Henderson and Clark, 1990) ;
- organizational innovations. A new service provided to the client can be materialized in a new organization ;
- tool kits (in a restricted sense, in which the marketing dimension predominates).

To conclude this point we could add that the three previous forms of innovation may either have an autonomous existence or be combined or interact (figure 2). Expertise-field innovation seems to be a core component in this interacting system in the sense that it may be followed by *ad hoc* and/or formalization innovation. However expertise-field innovation may occur simultaneously with formalization innovation. This is what happens when a new field of expertise is detected and exploited and when methods and tools are built without delay and independant services defined among the new expertise field. Furthermore figure 2 shows that *ad hoc* innovation is a source of ideas both for methods improvements (formalization innovation) and for new expertise field detection.

Figure 2 : The main links between the different forms of innovation in consultancy services

The studies by Van der Aa and Elfring (1993), Gadrey et al. (1993, 1995) and Sundbo (1993, 1994a, 1994b, 1997) also take a broad, Schumpeterian view of innovation. According to Sundbo (1993, 1994, 1996) innovations in services do not follow a technological trajectory (in Dosi's sense) but rather "service-professional trajectories" (e.g. a certain number of ideas on management, banking, etc.) in which technologies are only one vector among several others. Van der Aa and Elfring's study (1993) displays two main general categories of innovation in services. The first, technological innovations, need to be splitted into "information technologies" and "other forms of technologies". The second (pure) organizational innovation comprises : new combinations of services and new services ; the different ways of making customers co-producers ; multi-unit organisation and chain-formation (cf. Figure 3).

2. Functional approaches

In order to avoid the difficulties of the distinction between product innovation and process innovation some works favour a functional approach rejecting the opposition between goods and services. The hypothesis underlying these works is that clients are less interested in a good or in a service than in meeting a need (a function). Two attempts deserve attention.

2.1 From "Vector" concept to forms of innovation

Belleflamme, Houard and Michaux (1986) base their analysis of innovation upon the heuristic notion of "Vector" which they define as "the set of means and conditions necessary and sufficient for the preparation and existence of a product". They formalize the Vector as follows :

$$V = I + bP + cS$$

where P is the production process ("set of material means for the preparation of the product") ; S is the servuction process ("set of means and conditions for the "consumerization" of the product" i.e. "for the differentiation and adaptation of the product to the user's specifications") ; I, the set of elements of the general organization of the firm. The coefficients b and c represent the relative importance of production and servuction processes i.e. if $b > c$ the goods dimension is most important while if $b < c$ the service dimension is most important.

The authors distinguish several forms of innovation according to the component of the Vector which the innovation acts on :

- the introduction of a *new service* ;
- the introduction of a *new production process* or the improvement of the previous one ;
- the introduction of a *new servuction process* or the improvement of the previous one (certain technological systems such as computers belong to the "production process" when located in back-office and to the "servuction process" when used in front-office)
- any combination of the three previous forms.

This classification doesn't take into account the variable I of the "Vector" although it may be an important locus of innovation. Furthermore this provides solutions to neither the problem linked to the high subjectivity of the notion of novelty in the field of services nor the

distinction between product and process. Finally servuction, production and service innovation oftent overlap.

2.2 Functional, specification and production innovation

The study by Barcet, Bonamy and Mayère (1987) adopts a functional approach and results in a classification of the forms of innovation that applies to both goods and services. These authors categorise innovations according to whether they relate to function, specification or the production process.

— The first category (*functional innovation*) encompasses the emergence of new, undifferentiated, abstract functions, such as the storage of picture and sound in the case of video recorders, or the identification of a new risk to be covered in the insurance industry. Its appropriability regime is relatively low.

— The second (*specification innovation*) involves the concrete realisation and differentiation of the functional innovation. The aim is to design products and services different from those of competitors, adapted to different types of clients and of easier appropriability regime. Among innovation by specification are fast food catering, ATM money distribution, home booking, in the case of services and the evolution of cars in the case of goods.

— The third category (*production innovation*) corresponds to a cost-cutting trajectory (as a result of standardisation, the use of new technical instruments especially in the back-office, etc.). Production innovation mainly corresponds to "mass services" such as banks, insurance companies, social services... However it can be developped in consultancy services as well (e.g. expert systems...).

As far as is it is synonymous respectively of new functions, new services and new processes this typology still reflects the traditional ambiguities between product and process. Furthermore the distinction between functional and specification innovation even though analytically useful seems to be difficult to put into practical use. "Specificity" is a subjective notion and the frontiers of a "function" are difficult to grasp.

3. A unified model of characteristics and competences in product/services

The characteristics approach derived from Lancaster (1966), which it is our intention to develop here, is also integrative. Firstly, it encompasses both goods and services. Secondly, it applies both to technological innovation itself and to the non-technological forms of innovation. Such an approach is sufficiently flexible to make it possible to grasp in the same analysis both goods and services without neglecting service specificities in terms of innovation². It can be seen as a way of clarifying and making more operational the earlier functional approach, which proved to be too general. This is what we propose to demonstrate now.

According to Saviotti and Metcalfe (1984) following Lancaster, *the provision of any type of "product" can be described in terms of a set of characteristics* that reflect, on the one hand, the internal structure of the product in question and, on the other, its external properties, i.e. the type of service being offered to users. Saviotti and Metcalfe divide these characteristics into three main types :

²The analysis presented in this section is developed in Gallouj and Weinstein (1997) and Gallouj (2002).

— *The final or service characteristics.* These are the characteristics of the product seen from the point of view of the end user, e.g., in the case of a car, its size, performance, comfort, safety features, etc.

— *The "internal", technical characteristics* comprise the characteristics of the various technical mechanisms used to obtain the final characteristics. In the case of a motor car, for example, they would include the type of engine, transmission, suspension and so on.

— *The process characteristics,* finally, relate to the methods by which the product in question is produced, and the technologies and modes of organisation involved (the materials used, the ways in which they are processed, the forms of energy, the organisation of the process, etc.). Thus they include all the technologies used in the design, production and marketing of products. In the case of the motor car, for example, the assembly line is a process characteristic.

Despite some difficulties (see Gallouj and Weinstein, 1997 and Gallouj, 2002) these three types of characteristics can be transposed to the representation of a service as following examples show it :

— The characteristics of an automated telling machine service in a bank will reflect in particular the various uses to which it can be put (deposits, withdrawals, balance enquiries, ordering cheque books, etc.) and the ease with which it can be used ("user-friendliness"). In the case of monetary and financial instruments, Tobin and Golub (1997), for example, suggests that the main characteristics of a service constitute a finite set in which liquidity, divisibility, reversibility/substitutability, yield, income, predictable final value, ease of exchange, risk, etc. feature prominently.

— In the case of services, technical characteristics of a product may be material technologies in the usual sense of the term, particularly information technologies. However, the service characteristics of a product are also produced through the implementation of specific *intangible "technologies"*, such as legal or financial expertise, or mathematical instruments (economic and financial modelling, operational research methods), for example. One of the major features of service activities is undoubtedly the fact that these "technologies" usually take the form of knowledge and competences embodied in individuals (or teams) and implemented directly when each transaction occurs, rather than in physical equipment.

— *In services process characteristics are difficult to separate from technical characteristics.* To try and draw a kind of boundary between them we could consider that *technical characteristics concern mainly front-office "techniques" whereas process characteristics concern back-office ones.* For example, insurance products require suitably adapted back-office management systems which may count as process characteristics.

I shall add to Saviotti and Metcalfe's formalisation *the range of competences mobilised* by the various technological elements that constitute a product. In the case of services, as was stressed earlier, these competences (and especially the more formalized among them) are often contained within the technical characteristics. I shall consider them separately here, in order to take account of situations in which service providers make direct use of such competences in order to provide the service characteristics ("pure service").

In order to take into account one of the fundamental characteristics of service activities, particularly "knowledge-intensive" ones, namely client participation in the production of the

service characteristics $[Y_i]$ (coproduction) I propose to introduce into our diagrammatic representation a distinction between two types of competence : those of the service provider (column vector $[C_k]$) and those of the client (linear vector $[C'_k]$). The coproduction relationship, therefore, is represented by the combination of the terms of the two vectors. There are several reasons for taking account of this client/provider interface. Firstly, it may itself be the subject of innovations (organisational changes, interface management methods, etc.) ; secondly, it is the "laboratory" where a form of innovation often neglected in economic analysis, ad hoc innovation (cf. § 4.4), is initiated ; finally, the quality of the client firm's competences ($C'_1 C'_2 \dots C'_k$) is one criterion for the success of innovations and technology transfer (in the broadest sense). In this respect, it may be useful to make a distinction within the vector $[C'_k]$ between the technological competences of the client firm (i.e. the areas of knowledge in which it has expertise) and its capacity to absorb and assimilate new competences. The management of this interface, i.e. of the combination or conjunction of $[C'_k]$ and $[C_k]$, may offer a solution to the awkward question of protecting innovation in services. A service provider may in fact be able to develop highly complementary combinations of $[C'_k]$ and $[C_k]$ that encourage a form of dependency known as "customer lock-in", which is relatively common in the computer services field.

The most general and most significant representation is the one shown in Figure 4. The relation $[X_j] \text{--->} [Y_i]$ displaying how services characteristics are obtained by the combination of technical characteristics is the one proposed by Saviotty and Metcalfe (1984).

Figure 4 : The representation of a product (good or service) as a system of characteristics and skill

In the general formalization, provision of service characteristics $[Y_i]$ (i.e. the good or service) requires both a) the direct implementation of knowledge and competences

(embodied in individual members not only of the provider firm $[C_k]$ but also of the client company $[C'_k]$) and b) the mobilisation of "technical" factors (the X_j). These factors consist of knowledge that is codified and formalised in such a way that they can be used repeatedly for the provision of similar services or of services of different kinds (depending on whether they are more or less generic or specific). They may be tangible (computer or telecommunications

systems) or intangible (modelling methods, legal expertise, etc. Thus they are codified and formalized [Ck]).

In most cases these two patterns a) and b) are combined but we can consider that the ideal-type relation $[C'k][Ck] \leftrightarrow [Yi]$ represents the "pure service" pattern in which competences are directly implemented to provide service characteristics without using any technical characteristic either material or immaterial (methods).

Finally, it should be noted that the system $\{[C'k], [Xj], [Yi]\}$ through which the consumer makes direct use of his knowledge and competences represents in particular the various ways in which the client himself/herself is "put to work" within the service firm: self-service situations (super/hypermarkets, fast-food restaurants, self-service banking, etc.), hiring of various equipment (such as vehicles, for example).

4. Trajectories and modes of innovation revisited

On the basis of the previous representation six modes of innovation can be envisioned. They are interpreted within the framework of a dynamic of characteristics. Indeed, innovation can be defined as any change affecting one or more vectors of characteristics. These changes are brought about by a range of basic mechanisms: evolution or variation, appearance, disappearance, association, dissociation or formatting.

4.1 Radical innovation

It is the creation of a totally new product, i.e. one defined in terms of a system of characteristics and competences $\{[C'^*], [C^*], [X^*], [Y^*]\}$ unconnected with those of an old product. This definition is the narrowest and most exacting. In many cases, the term 'radical innovation' is also applied to those innovations that replace all the $\{[C], [C], [X]\}$, that is the 'internal structure' or its equivalent, even if it leaves the service characteristics [Y] unchanged (to a certain extent), at least in absolute terms (it is rare for the 'levels' not to change at all). The transition from horse-drawn carriages to motor vehicles was a radical innovation, even though to a certain extent the service characteristics remained the same, that is individuals were still transported with certain degrees of comfort, safety and speed...

The design and marketing by insurance companies of care and assistance products may, for example, be seen as a radical innovation that has changed the entire system. Companies offering these products are no longer selling life insurance, savings or damage insurance products but are actually providing services. The technologies used are different (alarm, monitoring, communications and transport systems, social networks, specific commercial networks), and the service characteristics are different: it is no longer a case of making a money payment when a specified event has taken place, but rather of providing a more or less complex service (housing, health care, transport, etc.). The vector of competences is also modified as a result of course.

4.2 "Ameliorative innovation"

According to the strictest definition, this type of innovation consists simply of improving certain characteristics, without any change to the structure of the system. The value of certain Y_i is increased either directly, by improving certain C_p , or by improving certain X_j . This is

due more to the learning effects that normally accompany any activity than to innovation in the strict sense of the term. Nevertheless, this type of innovation cannot be ignored: the extent and cumulative nature of its effect on overall productivity are widely recognised.

These two first modes of innovation are nodal traditional forms. However, it is possible to envisage three other major modes of innovation.

4.3 “ Incremental ” innovation (innovation by substitution or addition of characteristics)

This mode of innovation also describes an improvement to the product. In this case, however, the improvement takes a different form, since it involves the addition (and possibly also the elimination) of characteristics. Thus in this approach, *incremental* innovation is understood in its original meaning of innovation produced through the addition of *increments* rather than in the broader sense of the term generally used in economic theory, which encompasses the various modes of innovation (including ameliorative innovation) that cannot be classed as radical innovations. Indeed, one of the advantages of the characteristics-based approach is that it enables to make precisely this distinction.

Thus in the case of “ incremental ” innovation, the general structure of the system {[C’], [C], [X], [Y]} remains the same, but the system is changed marginally through the addition of new elements to [X] and/or [Y] or through the substitution of elements (Figure 4). This may involve, for example, the addition of one or two new characteristics to a certain type of product, either by directly mobilising certain competences or by adding new technical characteristics. It is certainly difficult clearly to define the boundary between this mode of innovation and the previous one, i.e. to distinguish the moment at which a new characteristic is added (e.g. the addition of a guarantee to meet deadlines) from the one at which a simple improvement is made (reduction in deadlines or delivery times). It is often the desire to formalise the improvement as a new *specification* that makes the difference : the transition from a mode to an other can therefore be interpreted as a social construction.

Figure 4 : S2 : incremental innovation through the addition of characteristics (Y5) ; S3 : incremental innovation through substitution of characteristics (substitution of Y5 for Y4)

Staying with improvement and incremental innovation categories, the argument can be advanced even further, firstly by introducing the distinction already noted above between

improvements to or the addition of main or complementary characteristics. Secondly, the distinction made by Baily and Gordon (1988) between a "proportional" innovation, which increases the quantity and/or quality of the service characteristics (i.e. the performance of the product, for example, the power, processing speed or memory of a computer) to the same extent as the cost of the resources use, and a "non-proportional" innovation, which increases performance by a greater extent than the cost of the resources, may also prove useful from this point of view.

It should be noted that non-proportional innovations seems to be particularly common in service activities. Easingwood (1986), for example, makes a distinction between change and innovation in "software" (what we call service characteristics) and in "hardware" (what we call here technical characteristics in the strict sense $[X_j]$ and process characteristics). The "newness" of new services lies in the intangible software dimension, while the hardware dimension remains unchanged. For example, an airline might introduce a ticket with new conditions attached to it (software change). However, this new product will be provided by means of the same aeroplanes, crews, reservation systems, etc. In other words, "software" innovations will tend to proliferate in service activities.

4.4 Ad hoc innovation

Ad hoc innovation can be defined in general terms as the interactive (social) construction of a solution to a particular problem posed by a given client. It is a very important form of innovation in consultancy services as we already mentioned it and also in "informational services", as defined by De Bandt (1995), and more generally in other services involving a high-level degree of interaction between provider and client. In ad hoc innovation the available knowledge and experience accumulated over time are harnessed and put to work synergistically in order to create fresh solutions and new knowledge that changes the client's situation in a positive and original way.

The service characteristics $[Y_i]$ (output) of an ad hoc innovation can be seen as an original solution, or a set of original solutions, of an organisational, strategic, legal, fiscal, social or human nature that emerges in response to a (partially new) problem. From the point of view of the service provider, an ad hoc innovation helps to produce new knowledge and competences that have to be codified and formalised in order that they might be re-used in different circumstances. There is thus a significant change in the vector of competences $[C_k]$, and particularly in the intangible elements of the technical characteristics $[X_j]$. This a posteriori codification and formalisation of certain elements of a given solution in order that it may be partially and indirectly reproduced is what distinguishes ad hoc innovation from the ad hoc nature of many service transactions.

As a product of the client/provider interface, ad hoc innovation, particularly in consultancy activities, depends on the nature of that interface and the various elements of which it is made up. Thus interfaces of the "sparring" type (coproduction) are more conducive than those of the "jobbing" type (subcontracting) (Gadrey and Gallouj, 1998) to the creation and success of this form of innovation, since they enable the innovation to be better understood and accepted (legitimated). Moreover, problems of a strategic nature, which are potential sources of innovation, are usually tackled in interfaces of the "sparring" type: they are seldom subcontracted.

In particular, the existence of this interface helps to limit the reproducibility of an ad hoc innovation in its original form. However, the knowledge, the experience (whether codifiable or not) and the unformulated, idiosyncratic techniques that emerge from practical experience and the methods used to produce and transfer them can be reproduced. Ad hoc innovations are profitable, even if they are not reproducible, since they are based on an informational and cognitive input that can be transferred in part to other ad hoc situations.

What is generally known as **customised innovation** can be included in both incremental and ad hoc modes of innovation. In the case of the insurance industry, for example, (Gadrey and Gallouj, 1994) "*adapted customised*" innovations, in which a standard contract is tailored to suit a particular client (or often a whole market segment) by changing the rates or introducing certain additional clauses, could be included in incremental innovation category. On the other hand, "*fully customised*" innovations, in which a genuinely new contract is drawn up for a specific client (often a large company), and "*cover for special risks*", in which insurance is provided against a risk that might affect very small populations (for which no statistics are available) would be included in ad hoc innovation category, since the ad hoc element is much more significant.

4.5 Recombination innovation

A major mode of innovation frequent in services and also in microelectronics and biotechnologies industries is what might be called recombinative innovation (cf. Foray 1993) or architectural innovation (Henderson and Clark 1990). Innovation of this kind exploits the possibilities opened up by new combinations of various final and technical characteristics, derived from an established stock of knowledge and a given technological base or existing within a defined technological trajectory. Taking as its starting point the final and technical characteristics of an existing family of products and technologies, it forms the basis for a relatively routine method of producing innovation through the systematic re-utilisation of certain "elements" or "components". This does not mean that the creation of a new product through a new combination of characteristics does not require specific competences, considerable development work and a not insignificant amount of creativity.

Innovation based on the addition of characteristics can be considered as a form of recombinative innovation, particularly when the characteristics added have their origins in pre-existing products. There are two other possible forms³ which, in the field of services, have been particularly highlighted by Bressand and Nicolaïdis (1988). The first involves the creation of a new product by combining the characteristics of two or more existing products (Figure 5), while the second involves the creation of new products by splitting up an existing product, separating out various characteristics and turning certain elements into autonomous products (Figure 6). This second case can be illustrated by the example of recruitment consultants. Broadly speaking, a recruitment service provides the service characteristics inherent in four types of sequential activities: the analysis of the client organisation's needs, the choice of a method of approach (direct, through advertisements, etc.), the selection of candidates, their monitoring and the assistance in integrating them into the firm. In accordance with the principle of architectural innovation, consultancy companies have split up this generic service in such a way as to provide perhaps only that set of service characteristics specific to one or more phases of the combination outlined above.

³ However, a distinction should be made between combinations of characteristics and combinations of modules (which is one of the technical forms in which architectural innovation commonly manifests itself).

Figure 5 : A new service (S3) produced by recombining the characteristics of two existing services (S1 and S2)⁴

Figure 6 : Two autonomous new services (S2 and S3) produced by splitting up the characteristics of an existing service (S1)⁵

4.6 Formalisation innovation

The various models of innovation outlined above are based on qualitative or quantitative variation in technical or service characteristics or competences (addition, elimination, improvement, bundling, unbundling). There is a final model in which it is not quantity or quality that varies, but rather the “visibility” and the degree of standardisation of the various characteristics.

This model, which we shall call the formalisation model, consists of putting the service characteristics “into order”, specifying them, making them less hazy, making them concrete, giving them a shape. This objective is often achieved by putting in place technical characteristics, whether tangible (equipment, software, etc.) or intangible (e.g. methods, organisation, toolboxes). This formalisation model also constitutes an attempt to clarify the correspondences between these technical characteristics and the service characteristics.

⁴ In order to simplify the analysis we consider in figure 6 and 7 the case of "pure service".

⁵ In reality, the "autonomous" existence of S2 and S3 (and, in Figure 6, the existence of S3 as a combination of S1 and S2) constitutes an additional service characteristics that has to be incorporated into the vectors.

Putting the service characteristics “into order” frequently involves the transformation of a general function into sub-functions or service characteristics. This general process makes it possible to understand why this formalisation model often precedes the recombination model. In many services, including knowledge-intensive ones, this formalisation model constitutes a genuine “natural trajectory”, in the sense of the term adopted by Nelson and Winter (1982).

There are plenty of examples of this model. They are found in the cleaning industry, where Sundbo (1997) highlights the growing importance of what he calls modularisation. They are also found in the fast-food industry (cf. the organisation of work at McDonald’s, analysed by Levitt, 1972). Legal consultancy also provides examples. The service known as “legal audit”, for example, has always been provided by consultants more or less automatically and always informally. The formalisation process consisted of finding a name for the service and establishing (following the model of financial auditing) reference points or methodological markers by which it could be defined. In this case, as in the other, the various elements can be said to have “existed” implicitly beforehand: they are rendered explicit through a process of social construction. It should be noted that this process of formalisation innovation was followed by implementation of the recombination model, in which the general legal audit is broken down into a number of specific audits: contract audits, patent audits, etc., all of them “products” that can be given an independent existence and be sold as such.

The ultimate configuration of this formalisation model is the one that leads to the production of a real object that can be reduced to Saviotti and Metcalfe’s original representation. This is the case, for example, with the development of expert systems. The substitution of ATMs for transactions over the counter falls within the scope of this model.

Conclusion

In this chapter I have addressed the question of the variety of innovation forms and trajectories in services by focussing on service oriented approaches and integrative approaches. Drawing upon the works of Lancaster and Saviotti and Metcalfe I have sought to enlarge and operationalize integrative approaches. As I have just shown, an approach to products in terms of final, technical and process characteristics offers a stimulating starting point for the study of innovation in services. Such an approach is sufficiently flexible to include both goods and services without sacrificing any of the specific aspects of innovation in services. Various modes of innovation are highlighted (radical, ameliorative, “incremental”, ad hoc, recombinative and formalisation innovation) and interpreted in terms of a characteristics dynamic.

This approach has implications for traditional theories of innovation, some aspects of which have already been mentioned and to which we now return by way of conclusion.

Description of a product in terms of characteristics clearly reconciles the "science-push" and "demand-pull" approaches to innovation: science, denoted by the vectors [C] and/or [X], and the demand for service characteristics, denoted by the vector [Y], constitute the two facets of the product (good or service). An innovation may use one of these two points of entry, or both at the same time. The "science-push" determinant, it should be noted, cannot be limited solely to the physical sciences, however: it also takes account of progress in the social sciences. [X] and [C] respectively encompass not only technologies in the narrow sense of the term and the

competences relating to those technologies, but also the "technologies" specific to services (legal, financial, commercial, etc.) and the competences corresponding to them.

This has consequences for the definition and content of technological trajectories in services. In Saviotti and Metcalfe's approach, the "technological regime" (in Nelson and Winter's sense) or the "dominant design" (in Abernathy and Utterback's sense) correspond to a given list of technical characteristics X_j . A "technological trajectory" is a path of gradual improvement in the X_j . In the case of services, the term takes on a particular meaning, since it can refer as well (or indeed exclusively) to service "technologies" (financial, actuarial, human resource management etc.). These technologies are also characterised by "lock-in" phenomena: it is difficult to envisage a return to Taylorism in areas where other techniques of work organisation have been tested. It is also possible in the "purest" services to introduce cognitive trajectories: the accumulation of expertise, individual and collective learning processes, gradual improvement of the C_k . In this case, the technological regime can be renamed the cognitive regime, thus constituting a general frame of competence formalised by a list of cognitive characteristics (C_k).

Even though certain modes of innovation (such as recombinative innovation) are particularly important today, it does not seem possible to articulate the various modes of innovation over the course of a product's life cycle. Barras' attempt to do so (Barras, 1990) is interesting but reductionist in terms of modes of innovations.

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