XVIII RESER International Conference: „New horizons for the role and production of services“, 25-26 September 2008, Stuttgart, Germany

Innovation in services and entrepreneurship: beyond industrialist and technologist concepts of sustainable development

Faridah Djellal[1] and Faïz Gallouj[2]

[1]University François Rabelais of Tours, Clersé and Gercie

[2]Université of Lille 1, Clersé

Innovation in services and entrepreneurship: beyond industrialist and technologist concepts of sustainable development[1]

Faridah Djellal[1] and Faïz Gallouj[2]

[1]University François Rabelais of Tours, Clersé and Gercie

[2]Université of Lille 1, Clersé

The questions of innovation in services, on the one hand, and sustainable development, on the other, are relatively recent concerns for economic theorists and public policymakers alike. They have become key issues, which pose considerable academic, economic and political challenges. However, these two questions, and the problems they raise, have evolved independently of each other. The present article seeks to link them by considering innovation in and by services and innovation-based entrepreneurship in services in terms of their relationship to sustainable development. Our hope in so doing is that we can play a part in moderating the industrialist, technologist, environmentalist and curative concept of sustainable development that is, paradoxically, still dominant in our service economies.

Introduction

Innovation in services, on the one hand, and sustainable development, on the other, are relatively recent concerns for economic theorists and public policymakers alike. However, they are no longer marginal issues but fundamental questions which, along with the academic, economic and political challenges they pose, are arousing increasing interest.

Thus the question of innovation in services has left the *non-recognition* phase, during which only innovation in manufacturing industry was taken into account (Djellal and Gallouj, 1999). It could not be otherwise in economies dominated by services. Three different approaches can be identified in the current debate (Gallouj, 1994, 1998; Gallouj and Gallouj, 1996): *assimilation*, in which the differences between innovation in services and in manufacturing are minimised or eliminated, *differentiation* of one from the other and, thirdly, attempts to *integrate* the first two approaches. The question of sustainable development, for its part, has gone beyond its earlier status as a militant, utopian demand to become a controversial but fundamental theoretical category, a socio-economic goal of vital importance globally and a society-wide movement, a defining purpose and ambition for society at large.

[1] This article draws on a research carried out for the European Commission, ServPPIN project (FP 7).

The aim of this article is to link these two questions and the problems they pose by investigating innovation in and by services and innovation-based entrepreneurship in services in the context of sustainable development. Although the links between services and innovation in services, on the one hand, and sustainable development, on the other, are now obvious and manifold (both positive and negative), these two problematics have, in essence, evolved independently, with the primary concern being to establish academic and institutional recognition for both of them.

The notion of sustainable development developed essentially as a reaction to the initially environmental and then socio-economic damage associated with economies based on manufacturing industry and intensive agriculture (exhaustion of non-renewable resources, proliferation of waste, pollution, desertification, deforestation, climate change, social exclusion in the rich countries and increased inequality between North and South). It still has a strong *industrial connotation*, even though certain services (tourism, transport, etc.) are major contributors to environmental damage and the rise to prominence of the social or socio-economic aspect of sustainable development has paved the way for greater recognition of services.

The notion of sustainable development is also frequently associated above all with technological innovation. This *technologist bias* is not unconnected with the earlier sectoral bias. After all, technological innovation is often regarded as the main instrument for the intensive exploitation of natural resources in manufacturing industry and agriculture, and also as the main lever of economic growth. This emphasis on technological innovation has led to underestimation of the non-technological forms of innovation, which are particularly important in a service economy and can play an essential role in economic growth and sustainable development.

Even though the threefold environmental, economic and social dimension of sustainability is recognised, an *environmentalist bias* still prevails. Taking services into account (introducing a service dimension into the notion of sustainability) has been an important factor in shifting attention towards the socio-economic components of sustainability.

The notion of sustainable development is further characterised by a fourth bias, which is closely linked to the previous three. After all, the dominant concept of sustainability does seem to be a *curative or defensive* one. Sustainable development is considered primarily in terms of the reactive objective of reducing or repairing the essentially environmental pollution and damage caused by industrial or technological civilisation. Drawing on a database of technological innovations developed in order to foster sustainable development, Patris et al. (2001) note that the main purpose of these innovations is, firstly, the reduction of environmental pollution and, secondly, remediation. And indeed, so-called ‘end of pipe’ innovations and remediation account for almost 55% of their sample.

Nevertheless, services (and innovation in services) play a major role in guiding economies towards sustainable development. However, this role is still too frequently underestimated. And yet, in many respects, the expansion of the service sector in contemporary economies would seem to lead 'automatically' to increased sustainability. After all, the expansion of the service sector has led to an increase in

activities whose very nature means that their 'environmental footprint'[2] is, at least for the moment, lower than that of manufacturing and agricultural activities. Thus in France, the service sector (excluding transport) consumes only 16% of total energy. The expansion of the service sector has also led to an increased emphasis on activities whose fundamental purposes are social and civic in nature: these are service activities (public, private or non-profit) aimed at reducing unemployment or promoting human development and social cohesion. More generally, however, since they are the main suppliers of jobs in contemporary developed economies, services are, automatically, the main factors in reducing inequalities. Thus it can be hypothesised that the expansion of the service sector in our economies is helping to reduce the *environmentalist bias* in approaches to sustainability by shifting the emphasis towards socio-economic concerns. It is true, as Gadrey (2009) notes, that this positive relationship between the expansion of the service sector and sustainability can be questioned, from a long-term perspective, and that in the future, the structure and extent of the service society are likely to be strictly determined by its environmental footprint. Whether the relationship is considered in positive or negative terms, the lesson to be remembered is that such a relationship does indeed exist. The expansion of the service sector and sustainable development are not unconnected with each other, far from it.

The slackening of the industrialist bias and the increased emphasis on the role of services in approaches to sustainable development leads automatically to a reduction in the technologist bias. After all, one of the conclusions of the recent literature on innovation in services, as well as that on innovative entrepreneurship, is that non-technological innovation (i.e. organisational, methodological, social and strategic innovation) and the corresponding forms of entrepreneurship (particularly social entrepreneurship) play an essential role. They should, therefore, play an equally essential role in approaches to sustainable development in a service economy. We would also hypothesise that this shift in the focus of the preoccupations linked to sustainable development (tertiarisation of preoccupations) should eventually lead to the emergence of a less reactive and more 'natural' or proactive approach to this notion.

In sum, in economies dominated by services and in view of these activities' (passive or active) role in sustainability, the industrialist, technologist, environmentalist and curative connotations of sustainable development, which have historical origins, should gradually become blurred. This article seeks to contribute to this process.

The article is divided into four sections.

The first section consists of a brief review of the traditional definitions of services and of sustainable development. We attempt to identify, presumptively, some possible links between the characteristics of services and those of sustainability and to highlight a certain number of convergences and common preoccupations.

The second part is given over to the question of innovation *in* services as it relates to sustainable development. The ‘assimilation, differentiation and integration’ analytical framework (Gallouj, 1994, 1998; Gallouj and Gallouj, 1996), which is used to tackle

[2] A population's environmental footprint is a simple indicator based on the area of the planet on which that population depends in order to sustain its economic activities.

many problems in the economics, management and politics of services, provides a valuable heuristic for approaching this particular question as well.

Even though there are obvious links between them, the subject of innovation *in* services must be distinguished in analytical terms from that of innovation *by* services. After all, service activities are not confined to innovating on their own behalf: they can also exert a decisive influence on innovation in other firms and sectors of the economy (induced innovation). In the third section of this article, therefore, we examine the question of sustainable innovation (*induced*) by services.

This question of innovation in and by services is closely linked to that of entrepreneurship. In the fourth section, therefore, we tackle the question of the new types of innovation-based entrepreneurship in services, several particularly dynamic forms of which are also closely linked to the issues surrounding sustainable development.

1. Services and sustainable development: analogies and conceptual convergences

Independently of the innovation issue, comparison of the definitions of the various notions of service and sustainable development reveals a number of interesting relationships between the nature of services and sustainability. First of all, a number of analogies are revealed between the definitions of services and those of sustainable development. It also becomes clear that some of the technical characteristics of services can be closely linked to certain aspects of sustainability. Finally, the two research agendas (i.e. those relating to services and sustainable development respectively) are shown to be overlapping and mutually enriching with regard to the question of performance (both its definition and measurement).

1.1 The definition of services and of sustainable development: some analogies

In contrast to a good, which is a material or tangible artefact, a service is generally defined as a change in the state of a medium, whether it be an object, codified information, an individual or an organisation (Hill, 1977; Gadrey, 1996a). The process of transformation is generally intangible and interactive. It cannot, by its very nature, be easily stored. Thus the 'product' or output of a service is an act, a process, the definition and designation of which are determined by convention, on the basis of a multiplicity of complementary or competing evaluation systems. Furthermore, this output can be broken down temporally, with a distinction being made, to use Gadrey's terminology (Gadrey, 1996a), between a short-term output (the immediate act of delivery) and a long-term output (the mediate output or outcome).

A number of analogies between the definitions of services and of sustainable development can be identified. The concept of sustainable development, which was popularised by the Brundtland Report, is by definition located within an even longer time horizon, since it is defined as 'development that meets the needs of the present with-

out compromising the ability of future generations to meet their own needs'. Furthermore, sustainable development, as defined in the Bruntdland Report, has three dimensions: it is not only environmental, but also economic and social, which brings into play, here too, a pluralist (complementary or competing) evaluation system. In a way, sustainable development is concerned with the transformation of a collective entity's (in this case humanity's) support medium, whether it be its material medium (i.e. its physical environment at both local and global level), its economic medium (i.e. the way it conceives of and creates wealth) or its social and symbolic medium (equity in the redistribution of wealth). In a way, it also includes, the coproduction and interaction dimension that lies at the heart of the definition of services. After all, citizens' participation (e.g. in selective waste sorting) plays an important part in any approach to sustainability.

1.2 Typology of services and sustainable development

To the best of our knowledge, there is no typology of services that takes account of the problems of sustainable development. The definition of services alluded to above suggests a relatively simple one. After all, the sustainability of service activities (and the component concerned) depends to some extent on the nature of the mediums that these activities are seeking to transform. Thus services can be divided into four broad categories: those concerned primarily with processing materials, information, knowledge or persons. Table 1 provides a number of illustrations of services belonging to these four categories.

A number of hypotheses can be formulated regarding the nature of the relationships between these categories of service and the problems of sustainable development. However an analysis of this kind has certain limitations that should be noted at the outset. The first is that, in reality, all service activities affect a number of different mediums: they are combinations, that vary in both time and space, of functions associated with different mediums (material, informational, cognitive and relational functions). The second is that sustainability is also a composite category that has economic, environmental and social dimensions. Sustainability is a trade-off between these three dimensions and it is difficult to envisage a one-to-one relationship between a type of service and overall sustainability. The third limitation is that the economic dimension of sustainable development is not a structuring factor in our analysis, since all types of services are affected by this dimension, whose role in sustainability is confined to the way in which it takes the other two into account. For simplicity's sake, our analysis will in most instances be confined to the distinction between environmental and socio-economic sustainability.

Table 1: Typology of services and sustainable development

Medium or dominant function of the service	Examples	Dimension of sustainability affected	
		environmental	socio-economic
Material	Transport of goods, water, gas, electricity, large-scale retailing, restaurants, collection of household waste, cleaning, decontamination	++	+
Individual • spatial location	Passenger transport, tourism	++	
Individual • aesthetic state, health • knowledge	Health services, elderly care services, hairdressing Education		++ ++
Codified information	Banking, insurance		++
Knowledge of organisations	Consultancy in all its forms		++

With due account being taken of the limitations outlined above, a number of hypotheses can be formulated about the relations (positive or negative) that exist presumptively between the various types of services and the problems of sustainable development.

• Material processing services (such as goods transport, and water, gas and electricity supply) are often associated with sustainability from the environmental perspective. After all, these activities cause significant environmental damage (pollution, congestion, etc.). Nevertheless, some of them also have a negative impact on social sustainability: this applies to large-scale retailing (productivist pressures on agriculture) and fast-food restaurants (junk food/unhealthy eating).

Note should be taken of the particular case of cleaning or decontamination, which are material processing services directly associated with environmental improvement. The same is true of a number of public environmental services, such as the maintenance of public parks, garden and woodlands.

It might also be asked whether, all other things being equal, some material processing services, including some of the most environmentally destructive, might also evolve structurally to include activities with a lower environmental footprint. After all, the material components of their output are declining in favour of other (informational and cognitive) components that are, on the face of it, less environmentally damaging. This could apply, all other things being equal, to road freight transport (Djellal, 2001) or even to retailing (Gallouj, 2007). In the case of road freight transport, this hypothesis would appear to fit with the abandonment in European sustainability policies of the modal shift principle and a reorientation towards co-modality (Zéroual, 2008). This approach no longer seeks to substitute the most sustainable modes of transport for the least sustainable but to find the most effective combination possible of the

different modes. It favours a broader definition of road freight transport as a logistical system.

Services whose target medium for processing is individual human beings are not homogeneous as far as their relationship with sustainability is concerned. They do vary, after all, depending on the nature of the processing involved. It is hardly surprising that services that transform individuals' location in space (e.g. passenger transport and tourism) have a similar relationship to sustainability as some material processing services (freight transport). They also affect environmental sustainability. On the other hand, services that transform the aesthetic, physiological and cognitive aspects of individuals (e.g. local services, health and education services) tend rather to affect socio-economic sustainability.

Information-processing services (particularly financial services: banking and insurance) seem to be associated with the question of sustainable development largely from the socio-economic point of view. After all, the process whereby their outputs are produced is not generally associated with environmental damage that is perceived as significant. On the other hand, these services do have a considerable influence on direct and indirect social sustainability, which they may impact adversely (indebtedness, unfairness in granting of credit, etc.) but can also help to restore (mutual or cooperative banks, microcredit).

Services that process (organisational) knowledge seem not to have any direct consequences for environmental sustainability. On the other hand, they do influence social or socio-economic sustainability by contributing to the development of the knowledge economy, which is replacing the material (tangible) economy.

• Sustainability considered from the environmental perspective seems to be inversely proportional to materiality. The more intangible (cognitive, informational) a service is, the less it seems to pose problems for this aspect of sustainability. Conversely, the more closely a service is linked to tangible mediums, the more it appears to pose direct environmental problems (e.g. transport and tourism) and/or indirect problems, by exerting pressure on other sectors. Thus large-scale retailing, for example, exerts productivist pressures on its suppliers, but it also has a direct, and negative, effect on the urban and suburban environment. In these cases, however, sustainability can be pursued through its environmental dimension, as well through other, particularly social dimensions (e.g. fair trade).

Considered from the social perspective, sustainability seems to be positively linked to the intangible and relational aspect of services. The more intangible a service is (this is the case with informational and cognitive services) and/or the more relational it is (this applies to many services for individuals, e.g. support services for the elderly), the more the social aspect of sustainability seems to occupy an important position.

1.3 The problem of defining and measuring performance in a service economy: from growth to (sustainable) development

The question of measuring and evaluating the 'output' of services also provides fertile ground for the dialogue between the problems posed by services and those posed by sustainable development. Whatever name we give it, the post-industrial, information, knowledge, "permanent innovation" or "quality" economy, comes up against certain

technical and conceptual problems when it comes to measurement, which bring into play the informational/cognitive and service-based component and the notion of sustainability in its various facets (environmental, social and economic).

Thus numerous arguments can be advanced in support of a multi-criteria, pluralist and flexible approach to wealth and performance and thus of the abandonment of the absolutism of GDP and productivity (Gadrey, 1996b). The use of GDP and productivity for evaluation purposes is based on volumes or quantities of ouputs. However, the service economy is characterised by a considerable increase in the cognitive content of economic activities and by a proliferation of service-based social relations between providers and customers. In an economy of this kind, the quantities or volumes of outputs matter less than their long-term utility effects. In other words, the outcomes and mechanisms that create trust are often more important than any measurement of output or productivity. Furthermore, some volumes should not be included in any measure of wealth, namely those equating to expenditure on making good environmental damage. The drive for growth and productivity produces negative externalities, which have to be deducted. It can give rise to a number of costs, both social (stress and health problems) and environmental (in the form of environmental damage), that are not included in measurements of growth and productivity.

Overall, it would increasingly seem that the level of the production of goods and services is neither the only indicator of a society's well-being nor necessarily the best. Consequently, in an attempt to reflect more accurately the creation of wealth and well-being in contemporary post-industrial societies, a considerable number of alternative indicators of development that seek to measure the various dimensions of sustainability are currently being developed.

2. Innovation *in* services and sustainable development

There is an extensive literature dedicated to analysis of the link between technological innovations and sustainable development, considered essentially from an environmental perspective. This technologist bias in analyses of the relationship between innovation and sustainable development is reinforced by the ambivalent status of technologies, which are regarded both as a source of the problem (e.g. a cause of pollution) and as a solution (technologies used to make good damage or clean up pollution).

Innovation in services, as it relates to sustainable development, is not immune to this bias. In services as well, it is very often the technologies deployed that are the sources of environmental problems (polluting means of transport, for example), and hence it is in technological innovations adopted by services that the solution to these problems is sought. The aim of this section is to highlight other forms of innovation in services that are linked in some way to sustainable development. In this way, it will be shown that innovation in services is usually, given the intangible and relational nature of the output, sustainable innovation.

There are three approaches to tackling the question of innovation in the economics of services (Gallouj, 1994, 1998): *assimilation*, in which innovation in services is reduced to the adoption of technical systems, *differentiation*, in which the aim is to

identify the specificity of innovation in services, and *integration*, the aim of which is to develop common models for industrial and service-sector innovation. These three approaches also provide starting points for investigating services in terms of sustainable development.

2.1 Assimilation

The assimilative approach is based on a technologist concept of innovation, in which services are limited to adopting the technological innovations produced in manufacturing industries, for example, means of transport, cooking and refrigeration equipment, automatic dispensing machines, computers, etc. (Gallouj, 1994, 1998) This approach also seems to be widespread, indeed dominant, in studies of innovation in services considered in terms of their relationship to sustainable development.

A number of remarks can be made with regard to this dominant assimilative approach.

1) It reflects a view that services play a subordinate role when it comes to innovation. For example, a local authority that buys gas-powered or electric vehicles for its public transport system, on the grounds that they are clean, quiet and need little maintenance, is not, strictly speaking, the innovator but simply the adopter of an innovation. In this case, services' role in environmental damage and its repair is located not in the production of innovation but rather in its use.

2) From this assimilative perspective, environmental innovation targeted at environmental problems is the most obvious form of innovation. However, this should not blind us to the development of technologies aimed at the social dimensions of sustainable development. Thus technological innovations developed in response to the problems faced by the elderly (e.g. domestic robots, 'smart' homes, tele-surveillance, etc.) constitute a powerful innovation trajectory in ageing service societies (Djellal and Gallouj, 2006). Within these tangible technologies that lie at the heart of the assimilative approach, a distinction can be made between *environmental technologies* and *social technologies*.

3) The assimilative approaches to innovation in services have placed great emphasis on the pervasiveness of ICTs in services, and the main theories of innovation in services are based on the dynamic of ICTs (cf. Barras's model, 1986). Since ICTs are regarded as low-MIPS[3] technologies, and in view of their pervasive diffusion in services, it can be said that they foster sustainability and that, more generally, the information society is consistent with sustainable development. Within services, innovation in ICTs (often in combination with other environmental or social technologies) is also playing (or is likely to play) an increasing role in sustainable development. The most frequently cited examples include the use of videoconferencing as a substitute for physical travel (business travel) and the introduction of new modes of work (e.g. teleworking). ICTs are also a powerful tool for measuring, checking and monitoring the problems of sustainable development. They also play a part in other aspects of

[3] The MIPS indicator (material intensity per service unit) measures the amount of non-renewable natural resources used to produce a good or service.

sustainability (particularly the social dimension). For example, they can be used to question the public authorities and to mobilise citizens at short notice.

4) The assimilative approach can also be interpreted, from the strategic point of view, as an attempt to eliminate the specificities of services, so that they differ as little as possible from goods. To do so, it is necessary to make them less fuzzy or intangible, to reduce or eliminate the periods of interactivity (in other words, the service relationship) and to make them less immediate by establishing certain forms of stockability. The ultimate goal is to reduce the diversity of possibilities and to create a product or quasi-product that can be embodied in an explicit contract. This is sometimes referred to as the industrialisation of services. This process of industrialisation, whether it involves a gradual move towards the production of tangible goods, to the detriment of the provision of intangible services, or the implementation of a certain mode of production (Gadrey, 1996b), has helped to ensure the success of the Fordist growth regime. It is often regarded as a factor that has had a negative influence on the notion of sustainable development. The best-known examples are fast food, low-cost airlines, discount stores, mass tourism and large-scale food retailing.

2.2 Differentiation

The assimilative approach is incapable of providing a full account of innovation in services. It is the cause of what might be called the '*innovation gap*' (NESTA, 2006). There are, after all, many forms of non-technological innovations that are not captured by the traditional indicators. They are often described as 'hidden' or 'invisible' innovations. This innovation gap has been the object of an expanding literature for the past fifteen years (Gallouj, 1994, 2002; Sundbo, 1998).

This gap also affects service-sector innovations linked to sustainable development (Seyfang and Smith, 2006). The assimilative approach focuses on technological innovations to the detriment of less spectacular innovations, which are, nevertheless, numerous and of considerable importance in the sphere of sustainable development. These innovations are non-technological and, in particular, social in nature and are generally ignored in the economic literature.

All in all, in order to capture invisible or hidden (sustainable) innovation, an approach based on differentiation has to be adopted, one that seeks to reveal the particular forms of service innovations linked to sustainability, whether it be economic, social or environmental in nature.

Table 2: Examples of innovations from a differentiating perspective

Type of service	Examples of innovations in the various dimensions of sustainable development	
	Environmental	**Socio-economic**
• Materials processing *Goods transport, water, gas and electricity distribution*	Car sharing, cleaning without water, materials recycling	No gas, water or electricity cut-offs, fair trade, producer outlets, community supported agriculture schemes
• Processing of individuals *Transport, personal services, health, education*	Work integration enterprises, sustainable tourism (agro-tourism, cycling, industrial tourism)	Work integration enterprises, sustainable tourism (linked to local social fabrics), care of the elderly, services for individuals living in hardship, cooperative nurseries
• Information processing *Banking, insurance, family allowance offices, local authorities*	Information on environmental and social situation, loans at preferential rates	Microcredit, PIMMs (points d'information et de médiation multi-services/information and multi-service mediation points, Points Services Publics/Public Service Points (PS), 'Maisons des services'/public service and advice centres
• Processing of organisational knowledge *Consultancy services*	New area of expertise (environmental law, sustainable development consultancy services), ad hoc innovation, methodological innovations (MIPS, PER model)	New area of expertise (social law, sustainable development consultancy services), ad hoc innovation, methodological innovations

Table 2 provides examples of sustainable innovations in services, as revealed by adopting a differentiating approach, i.e. one that is not focused on the technological dimension.

As far as material processing services are concerned, examples include, among others, car sharing and waterless cleaning, where in both cases the objective is an environmental one, and fair trade, the growing number of producer outlets and community supported agriculture schemes or even the maintenance of water, gas and electricity supplies to groups living in hardship, all of which are pursuing socio-economic goals.

Some forms of sustainable tourism and the many innovative initiatives in the care of the elderly or of young children are examples of non-technological innovations in services in which individuals constitute the medium to be processed or changed.

As far as information processing services are concerned, examples might include financial innovations designed to promote sustainable development, such as microloans in response to the problem of exclusion from banking services and loans at preferential rates in order to encourage firms to install environmentally-friendly machinery. Mention could also be made of the development by local authorities (possibly in partnership with private companies, particularly in areas where services to individuals are inadequate) of facilities ('one-stop shops') providing services for people in

hardship: PIMMs (multi-service information and mediation points), Points Services Publics (PS/public service points) and public service and advice centres.

The innovations produced by knowledge intensive business services would seem, by definition, to be 'environmentally friendly'. They involve the provision of cognitive solutions without any particular direct adverse impact[4] on sustainability, particularly on its environmental dimension. Thus Gallouj (1994, see also Gadrey and Gallouj, 1998) identifies three types of innovation in consultancy activities: *ad hoc innovation* (the joint development, with the client, of an original solution to a problem), *new expertise field innovation* (i.e. the identification of an emerging field of knowledge and the provision of advice in that field) and *formalisation innovations* (the implementation of methods with a view to making a service less ill-defined). This typology of innovation can readily be applied to sustainable development. After all, there are lot of examples of ad hoc solutions provided by consultants to social and environmental problems. Sustainable development, in all its various facets, is a new field of expertise that has given birth to many specialist consultancies, in environmental and social law, for example, as well as in sustainable development itself. Finally, there have been large numbers of methodological innovations in the field of sustainable development. The MIPS indicator already mentioned above can be cited by way of example.

This differentiating approach also gives rise to a number of observations.

1) We referred above to the mistake of linking technological innovations too closely with environmental and ecological objectives, since such innovations can also purport to have economic and social aims (solving problems for the elderly and handicapped, for example). The same argument can be deployed here as in the case of non-technological innovations. Their end purpose is not exclusively social: it may also be economic and environmental. This applies, for example, to certain forms of sustainable tourism, which seek not only to preserve the environment but also to promote economic development and to enhance and preserve local socio-economic fabrics.

2) From this differentiating point of view, innovation in services, as far as its relationship with sustainability is concerned, overlaps and merges with the vast and prolific field of social innovation (which, nevertheless, remains little explored in economic theory). Thus the assimilative perspective can be said to promote a 'top-down' approach to technological innovation as it relates to sustainable development. On the other hand, in view of the intangible and not necessarily spectacular nature of the innovations it reveals, the differentiating perspective promotes a 'bottom-up' approach to innovation. Seyfang and Smith (2006) use the expression 'grassroots innovation' (in contrast to 'green mainstream business innovations') to denote the devising, by individuals or organisations, of 'bottom-up' innovative and sustainable solutions that respond to local problems and are in keeping with the interests and values of the communities concerned.

3) While the assimilative approach is associated with the industrialisation of services, the differentiating approach is associated with another form of innovation-producing

[4] Some cognitive solutions provided by consultants can have a negative impact on social sustainability, particularly when they involve plant closures or redundancies.

rationalisation, which Gadrey (1996b) terms professional or cognitive rationalisation, in contradistinction to industrial rationalisation. This cognitive rationalisation, which is at work in some consultancy companies, for example, can be embodied in three strategies: the standardisation of cases, the formalisation of problem-solving procedures (methods) and the use of individual or organisational routines. In contrast to industrial rationalisation, professional rationalisation does not seem to have any negative effect on the notion of sustainable development.

2.3 Integration

In the integrative approach to innovation, it is regarded as possible, indeed necessary, to use the same tools to analyse innovation in goods and services (Gallouj and Weinstein, 1997; Gallouj, 2002). This approach takes into consideration technological innovation as well as non-technological forms of innovation, particularly social innovation (Harrisson and Vézina, 2006). The integration of goods and services (the transition from an economy based on the production and consumption of goods to one based on the production and consumption of hybrid solutions or packages) is a factor in sustainability. After all, by adding services to their product or by increasing the service content of their goods, firms are reducing the relative share of material processing activities, which are causes of environmental damage.

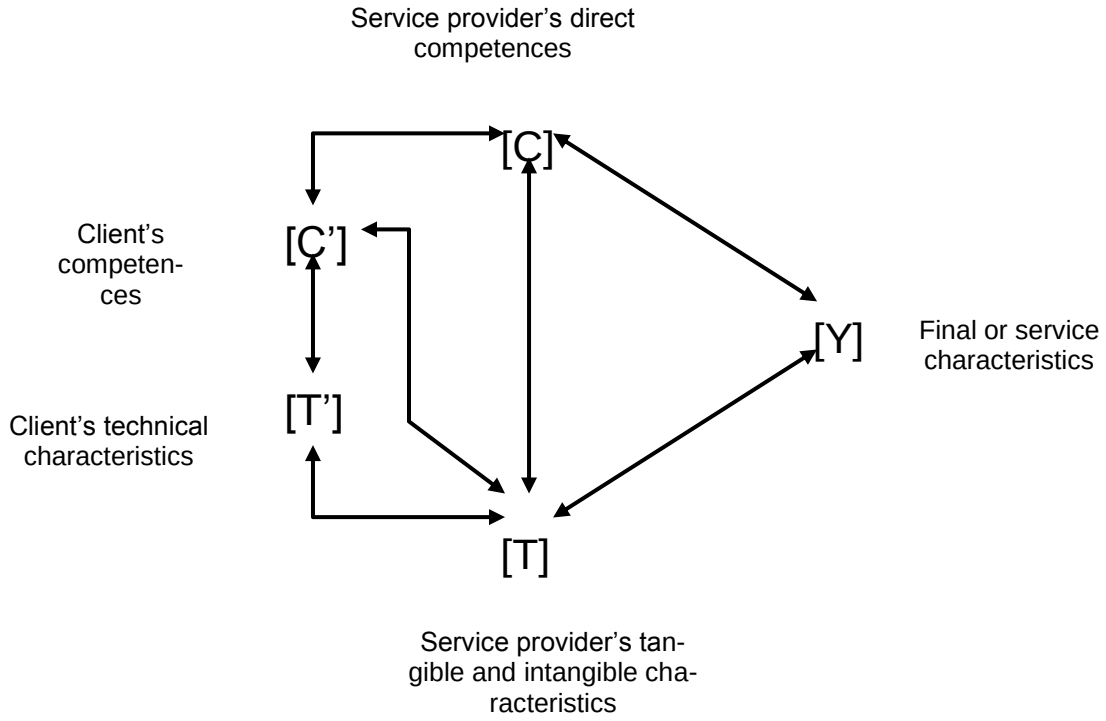
This integration is based on several observations that suggest that the boundary between goods and services is becoming blurred. The first of these is that goods and services are increasingly less likely to be sold and consumed separately but more and more likely to be sold as solutions, systems or functions. Secondly, the service or the information provided is the main component of many goods. A number of studies have sought to identify and measure the informational or service value of goods, or even the increasing prominence of the service dimension in goods. Studies of this type have focused on manufacturing industry, particularly the automotive industry (Lenfle and Midler, 2003) and on agriculture (Le Roy, 1997). Others (Broussolle, 2001) have shown that NICTs (as technical systems shared by both manufacturing industry and services) are contributing to this ‘blurring’.

However, a further argument in favour of integration is to be found in the notion of sustainable development itself. After all, the very definition of this concept encourages a synthetic or integrative approach to innovation. The notion of sustainable development has economic, environmental and social aspects; sustainable innovation should, in consequence, link these various dimensions and thus encourage an integrative concept of innovation.

The blurring of boundaries that can be observed naturally leads to a theoretical analysis, with the aim of developing integrative interpretative frameworks. Gallouj and Weinstein (1997) (cf. also Gallouj, 2002a) make use of this theoretical perspective by adopting a Lancasterian approach to the product (adapted to services). They define the product (whether it is a good or a service) as the conjunction of vectors of characteristics and of competences: service characteristics [Y], internal technical character-

istics [T] and external technical characteristics [T']5 and internal competences [C] and external competences [C'] (cf. Figure 1).

Figure 1: The product as the conjunction of characteristics and competences (after Gallouj and Weinstein, 1997)



The general representation in Figure 1 can be used very flexibly. It makes it possible to include in the analysis both tangible artefacts, such as cars or computers, and intangible products (insurance contracts, financial products or consultancy services). It can be used to include pure services ([C']—[C]—[Y]), as well as less pure services ([C]—[T]—[Y]) or even self-service arrangements ([C']—[T]—[Y]). And it is also capable of illustrating the provision of hybrid solutions (whether goods or services), for example a car and various associated services, both upstream and downstream (insurance, maintenance, finance, guarantees, etc.).

This approach to the product also makes it possible to take account of certain aspects of sustainability. Sustainable service characteristics on both the socio-economic and environmental level, can be incorporated (for example, socio-civic service characteristics), as can the corresponding technical competences and characteristics. The following socio-civic characteristics in the case of postal services can be cited by way of example: fair treatment for users (counters, delivery rounds), fairness in accessibility, non-discrimination (e.g. young people or foreigners) in customer con-

[5] The inclusion of clients' technical characteristics was suggested by De Vries (2006) in order to take account of the new channels of consumption and delivery (e.g. when consumers use their own technologies to access a service on the web).

tact, assistance for marginalised populations, social prices and social banking services (accounts for low-income earners, reasonable penalties, advice for individuals living in hardship) (cf. Gallouj, Gadrey, Ghillebaert, 1999). Negative externalities (pollution and congestion in the case of motor vehicles, for example) can also be included in the service characteristics vector.

Thus on the basis of this representation of the product, innovation emerges as a change in the (technical, service or competence) characteristics brought about by one of a number of mechanisms: addition, subtraction, association, dissociation or formatting. This definition makes it possible to identify several models of innovation, which can be applied without difficulty to sustainable service innovations. These models are radical, ameliorative, incremental, recombinative and formalisation innovation (cf. Gallouj and Weinstein, 1997; Gallouj, 2002).

Radical innovation denotes the creation of a new set of characteristics and competences. The introduction of wind turbines would, at the time, have been an example.

Ameliorative innovation reflects an increase in the prominence (or quality) of certain characteristics, but without any change in the structure of the system of competences and characteristics. The aim here is to increase the prominence or significance of a sustainable technical characteristic or competence, in other words to improve a sustainable service characteristic. The components targeted may make the product in question more environmentally friendly (by improving energy efficiency, for example, or reducing pollution levels) or they may be socio-civic in nature (for example, an increase in assistance for disadvantaged groups).

Incremental innovation denotes the addition (and possibly also the elimination or replacement) of characteristics. So-called ‘add-on’ technologies fall within the scope of this form of innovation. Another common example is the addition of services to an existing product. This form of innovation ‘automatically’ increases the sustainability of those firms that make use of it, since it contributes to the ‘dematerialisation’ of their activities, which in turn enhances environmental sustainability. However, the ‘add-ons’ may also be social or civic characteristics and competences (cf. the examples listed above for postal services).

Recombinative innovation is a form of innovation that relies on the basic principles of dissociation and association (i.e. the splitting or combining) of final and technical characteristics.

Formalisation innovation, finally, is based on the formatting and standardisation of characteristics. One illustration would be the development of numerous methodologies aimed at increasing sustainability.

3. Innovation *by* services and sustainable development

In the previous section, we tackled the question of innovation within service firms and industries. This section, in contrast, focuses on the way in which service firms or organisation induce innovation in other firms or sectors (innovation by (as opposed to in) services). This mainly concerns two groups of activities, namely knowledge-

intensive business services (KIBS) and public services. These two sectors share the particular characteristic of innovating for themselves while at the same time contributing in different ways to innovation in other sectors.

3.1 KIBS, induced innovation and sustainable development

The term KIBS denotes a number of service activities, the particular characteristic of which is that knowledge is their main input as well as their main output (Miles et al., 1994; Gallouj, 2002b; Toivonen, 2006). They include many consultancy, R-D and engineering services, as well as certain aspects of other activities, such as financial and insurance services, etc. These activities are among the most innovative in their own right, as the results of the Community Innovation Surveys (CIS) indicate. However, one of their main characteristics is that they also provide support for innovation in client organisations.

This support can take various forms. For example, consultants may be involved in the introduction of new environmental standards. Thus Nicolas (2004) analyses the way in which the introduction of eco-label standards (e.g. the organic farming standard) has given rise to an organisational learning process for firms, which is based on the use of external knowledge-intensive services (e.g. training services). Another example is those knowledge-intensive services that contribute to the development of sustainable innovation on behalf of clients, generally with the latter's participation (co-production). These innovations may be based on material sciences and technologies (in the case of R&D activities) or on the humanities and social sciences and organisational engineering. Thus they may be technological innovations, but also non-technological and, particularly, social innovations. One final example of the support knowledge-intensive services can provide for sustainable innovation is that of the banks, which can play a decisive role as catalysts of innovation by offering financial products that encourage sustainable development (e.g. loans at advantageous rates).

Public authorities, which are the subject of the next section, can also facilitate the use of knowledge-intensive services with a view to fostering sustainability. This applies, for example, to the regional authorities that have put in place 'incentive programmes' in order to encourage upgrading, compliance with standards and innovation in the sphere of sustainable development through mechanisms such as the regional consultancy support funds Maubrey, 2003).

3.2 Public services, induced innovation and sustainable development

The links between sustainable development and public services (whether national, regional or local) can be considered from various points of view. The first has already been mentioned above: it is that of public services as suppliers (in a variety of ways) of products (water, energy, transport) that are likely to pose problems of sustainability that can be tackled by innovations. The second point of view is that of local, national or supranational public authorities as producers of laws, regulations and norms with which organisations and users have to comply. In this case, public authorities, via the legislation they enact, act as drivers of change and innovation in the sphere of sus-

tainability. The third and final perspective, and the one that concerns us here, is that of public policies intended to promote and support sustainable innovation.

These public policies aimed at inducing sustainable innovation can take a variety of forms. Just as with innovation in services, the 'assimilation, differentiation, integration' (ADI) framework provides a satisfactory basis for analysis.

Many public policies intended to promote and support innovation in services as it relates to sustainable development do, after all, fall within the scope of a type A (assimilative) approach. In services, as elsewhere, the aim here is to support sustainable technological innovations, on both the production and consumption sides. This support can take various forms: funding, taxation (e.g. by granting tax credits for clean or energy-saving technologies), public purchasing, the diffusion of information, etc.

D-type approaches (differentiation policies), for their part, emphasise the specificities of sustainable innovation in services. Generally speaking, they favour non-technological innovations, particularly social innovations. One example that can be cited is local authority support for business incubators nurturing firms specialising in environmental or social problems.

In the case of the UK, Seyfang and Smith (2006) identify two sustainable development strategies that clearly illustrate at a national level this distinction between type A and type D approaches: on the one hand, environmental modernisation and technological innovation and, on the other, local action and the social economy. According to these authors, these two types of sustainable development strategies have been investigated in separate bodies of literature, one on technological innovation aimed at fostering sustainable production and consumption (Fusslar and James, 1996 ; Smith et al., 2005) and the other on local activities and civil society (Amin et al., 2002; Seyfang, 2001).

Finally, some public policies fall within the scope of I-type approaches. These are integrative policies aimed at supporting categories that are regarded as cutting across sectoral boundaries. This would seem to apply, for example, to public strategies intended to encourage the development of certain forms of sustainable governance (corporate social responsibility). The promotion of an innovation culture can also be regarded as falling within the scope of an I-type approach, since it transcends sectoral boundaries. Patris et al. (2001) provide a number of illustrations of national and European programmes targeted at this same objective, for example the National Action Plan for Environmental Education for a Sustainable Future launched in the year 2000 by the Australian government.

4. Innovation-based entrepreneurship in services and sustainable development

Concerns about sustainable development and the particular forms of innovation examined in the previous sections also raise the question of innovation-based entrepreneurship (in services) in so far as it relates to sustainable development. A not inconsiderable part of this Schumpeterian entrepreneurship falls within the scope of a

sustainable development perspective. Four new types of sustainable entrepreneur/innovator in services can be identified: the 'cognitive' entrepreneur, the 'social' entrepreneur, the 'environmental' entrepreneur and what might be called the 'entrepreneurial' entrepreneur.

1. The 'cognitive' entrepreneur

'Cognitive' entrepreneurs are experts who establish their companies on the basis of new fields of knowledge that they themselves have helped to develop (*researcher-entrepreneurs*) or of which they make good use without actually having contributed to it (*consultant-entrepreneurs)*. The latter are closely linked to what we have termed new expertise field innovation (cf. § 2.2). This new knowledge may be derived from the natural sciences or engineering, or from the humanities and social sciences. The cognitive sphere of sustainable development is fertile ground for the development of this form of entrepreneurship. Examples might include expertise in environmental labelling, North-South cooperation, environmental law, consultancy in sustainable development, etc. Cognitive entrepreneurs play an active role in the diffusion of knowledge within firms and, more generally, in knowledge-based societies.

2. The 'social' entrepreneur

The 'social' entrepreneur's sphere of action is the social and solidaristic economy. Social entrepreneurship involves the establishment of new organisations in order to take responsibility, in innovative ways, for disadvantaged or vulnerable groups in the population: young children, the elderly or people suffering from handicaps of various kinds, whether socio-economic, physical or psychological. In other words, the aim of social entrepreneurship is to find innovative solutions to social problems.

3. The 'environmental' entrepreneur

The 'environmental' entrepreneur's sphere of action is the preservation of the environment and the quest for sustainable development. The tourism industry and the various component parts of this composite service (hotels, restaurants, leisure activities, etc.) provide many examples of entrepreneurs of this type, who have carved out market niches for themselves, by steering tourism in new directions linked to local social fabrics or by introducing new forms of exploration, such as agro-tourism, industrial tourism, cycle touring, etc. Another group is the one that is emerging around the exploitation of what are sometimes called 'green technologies', i.e. tangible or intangible (methods, protocols) technologies that contribute to preservation of the environment.

4. The 'entrepreneurial' entrepreneur

We use this term to denote business incubators. Incubators are programmes designed to encourage and support, in various ways, the gestation, birth and first steps of firms and thereby to improve their viability. They are organisations providing a complex service, whose aim is to create entrepreneurs. They are, as it were, '*entrepreneurs in entrepreneurship'*. Many experiments in entrepreneurial entrepreneurship are based on the principles of sustainable development (regional development, local redevelopment and restructuring, etc.). Thus in the USA in particular, there are examples of incubators that specialise in female entrepreneurship, ethnic minorities, not-for-profit associations, etc.

Conclusion

The notion of sustainable development is characterised by four interdependent biases: it is industrialist, technologist, environmentalist and defensive. As an instrument of militant protest and then as a major theoretical category, it was born and grew to maturity in an environment dominated by an all-powerful manufacturing industry reliant on continuous technological innovation that impacted on the environment. Before it acquired its social or socio-economic dimensions, sustainable environment was (and continues to be to some extent) primarily ecological and environmental; its main concern was manufacturing industry's devastating effects on non-renewable resources and the environment. However (and this is a consequence of the four interdependent biases), this notion of sustainable development is also 'defensive', that is it is fundamentally concerned with the repair of damage (essentially to the environment).

These four biases persist in economies in which services are the main sources of wealth and jobs. However, services alter the terms of the sustainable development problematic. They play (and will increasingly be led to play) an important role in sustainable development, both statically and dynamically, that is through the innovations they produce or induce. The present article has argued in favour of a service-based approach to sustainable development, which involves a loosening of the various biases in question.

Thus it is in the dominant service sector that the future of the sustainable development question will be played out, whether positively or negatively. At the moment, a large proportion of service activities have a fairly small environmental footprint compared with manufacturing industries, while at the same time producing essential socio-economic effects: it is services that generate most jobs in contemporary economies. They are also the main users of information and communications technologies, which are regarded as having a relatively low MIPS. However, as Gadrey (2009) notes, none of these characteristics is irreversible over the long term and the future of the service society (the nature of its constituent sectors and their size) is closely correlated with the environmental variable.

Furthermore, non-technological (particularly social) innovation occupies an essential place in a sustainable service society. Many new services, which may possibly be delivered through new forms of entrepreneurship (and this has been recognised by public policy), are sources not only of jobs (economic solutions) but also of solidarity (services to individuals living in hardship).

Finally, whether the innovation is technological or non-technological, environmental or socio-economic, services play an active role in the production of innovations, not only those that cure or repair damage inflicted on the environment or on individuals' socio-economic well-being but also those that are preventive and proactive (education of populations, training related to environmental norms or labels, etc.).

Bibliography

Amin, A.; Cameron, A.; Hudson, R. (2002): *Placing the social economy*, Routledge, London.
Barras, R. (1986): Towards a Theory of Innovation in Services, *Research Policy*, 15, pp. 161-173.
Broussolle, D. (2001): *Les NTIC et l'innovation dans la production de biens et services : des frontières qui se déplacen*t, 11th RESER conference, Grenoble, October.
De Vries, E. (2006): Innovation in services in networks of organizations and in the distribution of services, *Research Policy*, 35, 7, pp. 1037-1051.
Djellal, F. (2001): Les trajectoires d'innovation dans les entreprises de transport routier de marchandises, *Revue Française de Gestion*, 33.
Djellal, F. ; Gallouj, F. (1999) : Services and the search for relevant innovation indicators : a review of national and international surveys, *Science and Public Policy*, 26, 4, pp. 218-232.
Djellal, F.; Gallouj, F. (2006): Innovation in care services for the Elderly, *The Service Industries Journal*, 26, 3, pp. 303-327.
Fusslar, C.; James, P. (1996): *Driving eco-innovation : understanding wealth creation*, Pitman, London.
Gadrey, J.; Gallouj, F. (1998): The provider-customer interface in business and professional services, *The Service Industries Journal*, 18, 2, pp. 1-15.
Gadrey, J. (1996a): *L'économie des services*, Repères, La découverte.
Gadrey, J. (1996b): *Services : la productivité en question*, Desclée de Brouwer, Paris, 359 pp.
Gadrey, J. (2009): *The environmental crisis and the economics of services: the need for revolution,* in F. Gallouj, F. Djellal, F. and C. Gallouj. *The handbook of Innovation and Services,* Edward Elgar Publishers (forthcoming).
Gallouj, C. (200):. *Innover dans la grande distribution*, De Boeck, Bruxelles, 372 pp.
Gallouj, C.; Gallouj, F. (1996): *L'innovation dans les services*, Economica, Paris, 112 pp.
Gallouj, F. (1994) : *Economie de l'innovation dans les services*, L'Harmattan, Paris, 255 pp.
Gallouj, F. (1998): Innovating in reverse : services and the reverse product cycle, *European Journal of Innovation Management*, 1, 3, pp. 123-138.
Gallouj, F. (2002a): *Innovation in the Service Economy : the New Wealth of Nations*, Edward Elgar Publishers, Cheltenham, UK, Northampton MA, USA, 226 pp.
Gallouj, F. (2002b): *Knowledge intensive business services : processing knowledge and producing innovation*, in J. Gadrey and F. Gallouj (editors), *Productivity, Innovation and knowledge in services*, Edward Elgar Publishers, pp. 256-284.
Gallouj, F.; Gadrey, J. and Ghillebaert, E. (1999): La construction sociale du produit financier postal*, Annals of Public and Cooperative Economics*, 70 (3), pp. 417–445.
Gallouj, F.; Weinstein, O. (1997): Innovation in services, *Research Policy*, 26, pp. 537-556.
Hill, P. (1977): On goods and services , *Review of Income and Wealth*, 1:315-338.
Harrisson, D.; Vézina, M., 2006. L'innovation sociale : une introduction», *Annals of Public and Cooperative Economics,* 77,2:129-138
Le Roy, A. (1997): *Les activités de service : une chance pour les économies rurales ? vers de nouvelles logiques de développement rural*, L'Harmattan, Paris.
Lenfle, S.; Midler, C. (2003): Innovation in automative telematic services : characteristics of the field and management principles, *International Journal of Automative Technology and Management,* 3,1/2, pp.144-159.

Maubrey, R. (2003): Les problèmes et solutions pour accéder aux innovations environnementales au sein d'entreprises et de collectivités, Innovations, *Cahiers d'économie de l'innovation*, 18, pp. 113-138.
Miles, I. et al. (1994): *Knowledge-Intensive Business Services: Their Role as Users, Carriers and Sources of Innovation*, PREST, University of Manchester.
NESTA (2006): *The innovation gap : why policy needs to reflect the reality of innovation in the UK*, National Endowment for Science, Technology and the Arts, Research Report.
Nicolas, E. (2004): Apprentissage organisationnel et développement durable. La norme AB, *Revue française de gestion*, 2,149, pp.153-172.
Patris, C.; Valenduc, G.; Warrant, F. (2001): *L'innovation technologique au service du développement durable*, Rapport pour les Services fédéraux des affaires scientifiques techniques et culturelles (SSTC), Fondation Travail-Université, Namur, Belgium.
Seyfang, G. (2001): Community currencies : small change for a green economy, *Environment and planning*, 33 (6), pp. 581-593.
Seyfang, G.; Smith, A. (2006): *Community action : a neglected site of innovation for sustainable development ?*, CSERGE Working Paper EDM 06-10.
Smith, A.; Stirling, A.; Berkhout, F. (2005): The governance of sustainable socio-technical transitions, *Research Policy*, 343, pp.1491-1510.
Sundbo, J. (1998): The organisation of innovation in services. Roskilde University Press, Roskilde.
Toivonen, M. (2004): *Expertise as business : Long-term development and future prospects of knowledge-intensive business services*, PhD, Helsinki University of Technology.
Zéroual, T. (2008): *Vers une réévaluation des politiques de transport durable de marchandises*, Séminaire du programme SITE, Clersé, University of Lille 1, 28 February.

Authors addresses

Faïz Gallouj, Professor of economics
University of science and technology (Lille 1)
Faculty of economics and sociology, Bâtiment SH2
59 655 Villeneuve d'Ascq Cedex, France
Email : Faiz.Gallouj@univ-lille1.fr

Faridah Djellal, Professor of economics
University François Rabelais of Tours (France)
Email : Farida.Djellal@univ-lille1.fr