

Sustainable solutions. New business ideas and new ideas on business.

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Abstract: *The transition towards sustainability calls for a radical change, i.e. a systemic discontinuity. At a local scale, to promote this discontinuity means to generate low material intensive and highly context-related socio-technical systems.*

In this framework, companies have to become “system organisers” and “solution providers”, shifting their activities “from products to solutions”. And, in particular, to light, lean and context-related sustainable solutions..

The implications of this change in the companies’ role is that “new ideas on business”, and not only “new business ideas”, are needed.

The paper articulates the above statement, outlines the related design problems and, in particular, discusses what it means to conceive, produce and deliver sustainable solutions. And to do it “industrially”, i.e. with the highest possible degree of efficiency and efficacy.

The transition towards sustainability is a *learning process* in which human beings have to learn to live better consuming (far) fewer environmental resources and improving (or, in many cases, regenerating) their physical and social contexts of life.

This statement is, in my view, the most concise way of outlining what, over the next few decades (hopefully) has to happen in society on a worldwide scale. From this same very broad perspective we may extract also what (hopefully) is the future of those particular “living entities” known as companies and of their particular “ways of living”, which are their ways of doing business. Extended to the companies’ perspective, the initial general statement may be rephrased and become something like this:

For companies, the transition towards sustainability is a learning process in which they have to learn to do business consuming (far) fewer environmental resources, helping people to live better in a society and in an economy in which the overall material consumption decreases and in which the quality of physical and social contexts has to be improved and/or regenerated.

This paper deals with the way in which the perspective outlined in this statement might become a reality. And, in particular, it discusses the issue of the new business models that it will call for (or better: that it is calling for just now)¹.

¹ This paper is based on many different experiences and, in particular, on some an on-going research in Europe: *HICS, Highly Customised Solutions*, within the Growth Programme of the European Community (2001 – 2004).

Before developing these issues, and in order to give them the necessary framework, in the next paragraphs I will briefly present some basic background concepts. Precisely: some characteristics of the transition towards sustainability intended as *a social learning process*, the concepts of *systems and sustainable systems* and the those of *solutions and sustainable solutions*..

Sustainable solutions: background and concepts definition

The first issue to be discussed in order to build the framework for developing new business ideas (and new ideas on business) is related to the way we have to see the transition towards a sustainable society (based on a sustainable economy). It is a very complex and open issue that I will summarise in 3 points, moving on from the same statement used to open this paper which can be split in three parts:

1. *“The transition towards sustainability is a process in which human beings have to learn to consume (far) fewer environmental resources”.*

This first part of the statement is the most obvious one: today everybody agrees on the fact that sustainability is (also) about consuming less. What not so many people are aware of is the dimension of this “less”. Where the industrial system of production and consumption is concerned, “consuming less” means something in the degree of 90% less², and this figure says something that is not obvious at all. It says that *the transition towards sustainability will implicate a systemic discontinuity*.

In other words, we will not move towards sustainability simply by re-designing what exists. New way of thinking (i.e. new ideas of well-being and new ideas on business) have to be found and new systems of production and consumption, based on these new ideas, have to be generated³.

2. *“The transition towards sustainability is a process in which human beings have to learn to live better improving (or, in many cases, regenerating) their physical and social contexts of life”.*

This second part of the initial statement has been, until now, the less obvious: to combine living better with consuming less, it is necessary *to improve or regenerate our contexts of life*. In other words: the increased quality of the contexts of life (intended as the whole physical and social environment in which we live) has to compensate for the reduction in the consumption of material products.

The background idea here is that we can reduce consumption and mobility if the context in which we live is healthy, nice, friendly and connected: if there is good air and water, enough greenery, a lively neighbourhood community. And, *at the same time*, if it is so well connected with the rest of the world that, when we wish, we may have access to high quality services and to all the information we need (what I am outlining here is the *vision of context-based well-being* – Manzini 2001a)⁴.

² Many different studies – starting from more than ten years ago - have arrived to similar results. See, in particular: Jansen 1993 ; Schmidt-Bleek 1993.

³ From a technical point of view we can put it in the following way. If we will imagine offering the entire population of the Planet the same average degree of well-being that the industrial societies are enjoying now, the eco-efficiency of the overall socio-technical system should have to be improved by a Factor of 10. In other words, it would have to become ten times more efficient than now in its use of environmental resources. A task that is very tough but, technically, not impossible.

In the opinion of many observers, this huge improvement in the system efficiency, and the related reduction by 90% in consumption of environmental resources are not only and, probably, not mainly technical problems. Faced with these figures, the real issue is that, if we imagine a smooth transition towards sustainability (and, obviously, this positive, non-catastrophic perspective is the only one that we can look at), the *action of consuming less has to be combined with a perception of living better* (otherwise nobody will accept a “smooth”, i.e. voluntary, move from the present way of living and consuming to a new and sustainable one).

⁴ The importance of the concept of *context of life* in the perspective of the transition towards sustainable ways of living (and towards sustainable socio-technical systems to support these ways of living) has started to appear

3. *The transition towards sustainability is a social learning process.*

The path to overcoming the systemic discontinuity implied by an on-going transition, will be the result of the efforts of many different actors. And, given the dimension and the nature of the change, it will happen progressively, amid mistakes and contradictions – as always happens in any *learning process*.

In the this paper the focus will be on the *business side of this learning process*. We will consider, in particular, the possibility of taking some steps towards doing business while reducing consumption and regenerating the contexts of life. And to do it in a successful way *just now and starting form the local scale*⁵.

Even though a global transition (and a related global systemic discontinuity) will be a long term process, its “smooth” achievement calls for initiatives that have to be started now and, also, on a *local scale*. In other words, a future global discontinuity has to be prepared by generating a variety of *local discontinuities* and by creating a multiplicity of *manageable sustainable socio-technical systems* (Manzini 1999).

In the next paragraph the concepts of (*socio-technical*) *system* and of *sustainable (socio-technical) system* will be briefly introduced.

Sustainable systems

The concept of *sustainable system* refers to a network of people, products, services and infrastructures that, as a whole, exists and reproduces itself (as far as the people are concerned, “lives”) in a sustainable way⁶.

very clear in recent years (HiCS 2002a). Especially when the issues of the *rebound effect* (i.e. the negative impact of the diffusion of products and technologies that, originally, had been seen as environmentally friendly) has emerged (IPTS 1999c, Manzini 2001b) and when the crisis of the *local common goods* (and the relationships between the deterioration of local common goods and proliferation of “remedial goods”) has begun to appear in all its dramatic dimension with all its implications in terms of consumption (Manzini 2001a). It has to be said that how to face these problems is an open issue. The question of what in practice it would mean to combine living better, consuming less and improving/regenerating the contexts of life is still without a clear answer. Nevertheless, one point is clear enough: to regenerate the quality of the contexts of life, and to reduce drastically the consumption of environmental resources, *new cultural, social and economical paradigms are needed*. In other words, as it has been said, a systemic discontinuity has to take place.

⁵ The meaning of the adjective “local”, here, is not the traditional one of a physical space. Here, and in the next paragraphs, it has to be intended as “the context of action of a given actor, or network of actors”: a physical space that may be extended, becoming a hybrid space, by the use of different media of communication (on this point, see also Note 6, and IPTS 1999b, Kommonen, Botero Cabrera 2002, HiCS 2002a).

⁶ The term “system”, in its broader meaning, stands for a number of elements and their interactions, considered as a whole, as seen by a given “observer”.

Here we are particularly interested in a specific class of systems: the *manageable socio-technical systems* (which, from now on, we will refer to by the simple term *systems*). Their main characteristics are as follows:

Their *elements* are *artefacts and people* (products, services, infrastructures *and* the social actors that are, or have been involved in the production and consumption of these artefacts). The presence of people as elements gives the system an intrinsically non-deterministic nature and makes their evolution an intrinsically unforeseeable process.

Their *dimension* is limited to what (potentially) can be *manageable* (i.e. to what the actors involved in the same system can influence with their own choices). The dimension of manageable systems changes with the power of the actors involved and with the degree of connectivity.

The problem now is to articulate the meaning of the expression “in a sustainable way”.

The first rough answer to this question, bearing in mind what has been written in the previous paragraphs, comes from three major criteria: to be defined as “sustainable”, a system has to be *consistent with the fundamental principles*, and characterised by a *low material-energy intensity* and by a *high degree of context quality*.

- *Consistency with the fundamental principles*. It refers to *ethical principles* related to people and society (as *justice within and between generations; international justice*), principles related to relationship with nature and environment (conservation of biodiversity, zero hazardous wastes, etc.) and those concerning social and economic issues (wealth distribution, power balance, democracy enhancing, quality and quantity of job creation, community promotion, people involvement) (Sachs, 1999, Eherenfeld, 2001, Partidario, 2002)
- *Low material-energy intensity*: this refers to *systemic eco-efficiency* and to *light and lean systems* of production and consumption. This is the most traditional set of criteria for sustainability, and it remains the fundamental one: whatever the system, to be defined as “sustainable”, it has to be highly eco-efficient, bearing in mind the overall life-cycle of the related artefacts (Shmidt-Bleek 1993; Fussler, James 1996; Brezet, Hemel 1997, Carter, Tischner, 2001).
- *High degree of context quality*: this is the set of criteria that comes from our previous considerations on the overall quality of the people’s contexts of life and it refers to *highly context-related systems* of production and consumption. It integrates a variety of social, cultural and economic parameters in the framework of wider, and socially recognised, scenarios of sustainability. Today these scenarios of sustainability are still in their building phase. Nevertheless, at this stage, they are clear enough to allow us to state that, in their framework, to be defined sustainable, a system has to be integrated in a context, and that the whole, system-in-the context, has to be characterized by an high degree of social and environmental quality. The pre-condition for this result is that the system itself has to be highly context-related, i.e. it has to be tailored to fit the specific characteristics of the local context (see the different but converging visions and scenarios that in the last decade have been proposed: Braungart, Englefried, 1992; Braungart, McDonough, 1998; Pauli 1997; Sthael 1999; Hawken, Lovins, Lovins 1999, Sachs, 1999, Manzini 2001a).

These three sets of interrelated criteria constitutes the backbone of any possible scenario of sustainability: sustainable ways of living, sustainable economy, sustainable solutions, sustainable business models, etc. In conclusion:

A sustainable system is an integrated network of people, products, services and infrastructures that, as a whole, is consistent with the *fundamental principles* and characterised by a *low material-energy intensity* and by a *high degree of context quality*. “ (Manzini 2001c)

They are *sub-systems* of the broader global socio-technical *and* natural system (or, more precisely: of the hyper-complex multi-system) that constitutes our “reality”.

Defined in this way, these systems represent, for the actors involved, the *existing state-of-things*: the one that, eventually, has to be modified by actions finalised in a certain result, i.e. to get to a modified system that will represent a *new, needed/desired state-of-things*.

Sustainable solutions

Systems are dynamic entities: pushed by the people's needs and/or desires to get new results, or pulled by some technological possibilities of offering new results, they, and the state-of-things they are related to, are continuously changing. And it is in this dynamic framework that we may now introduce the concepts (that for us, here, are the most important ones) of *solution and sustainable solution*.

A *solution* is a process that enables an actor (a person and/or a community) to achieve a *result*⁷ by adopting a specific *strategy*⁸. In other words, it is a process that, thanks to the use of an appropriate set of products, services and knowledge, transforms the existing system and generates a (more) sustainable one (HiCS, 2001a)

To be more concrete: solutions are not, for instance, about cars, washing machines, food packaging, but they are about mobility, clean clothes, food delivery. The shift "from products to results" is the first and fundamental step to take in the transition toward a sustainable well-being and towards the sustainable business ideas that could make it possible.

The next step, obviously, leads from the concept of solutions, to the one of "sustainable solution":

A *sustainable solution* is a process that enable an actor (a person, a company, a community and/or a network of persons, companies and communities) to achieve a *sustainable result* in a *sustainable way*, i.e. adopting a sustainable strategy.

In other words:

A *sustainable solution* is a process that, by using an appropriate set of products, services and knowledge, transforms the existing system and generates a new one consistent with the *fundamental principles* and characterised by a *low material-energy intensity* and a *high potentiality in regenerating-ameliorating contexts of life*.

Moving from this definition it appears that:

A solution is not "sustainable" *per se*. Its sustainability depends on the *way in which it effects the existing system*. In other words, a solution may be considered as sustainable when:

- *it is light and lean and it makes the system on which it is applied lighter and leaner*, reducing its overall material and energy intensity.
- *it is context-related and it increases the quality of the contexts in which it is applied*.

For instance: bicycles, tramways and traffic information services are not sustainable *per se*, but they may be considered as components of a sustainable solution when they are systemised and applied in a given city. In fact, in this case, they may reduce the material, energy and transportation intensity of the whole urban system and increase its quality both on the physical side (less pollution) and on the social side (more opportunities for socialisation).

⁷ A *result*, in this context, is a needed/desired change in a given system: a change in the state-of-things that is motivated by the aim of solving a problem or reaching an objective and generate a new state-of-things, i.e. a new, modified system.

⁸ A *strategy*, in this context, is a particular combination of products, services and knowledge that, interacting with the existing system (i.e. the people and the artefacts constituting the present state-of-things) and with the larger natural and socio-cultural systems, enables us to achieve a needed/desired result.

It has to be underlined that, given that the existing systems are less and less sustainable and capable of restoring themselves autonomously, the role of sustainable solutions is, more and more, one of being “regenerative”. That is:

- to restore the quality of a context of life, when it has been lost (from cleaning the air, to restoring the deteriorated social fabric).
- to promote auto-regenerative systems, i.e. systems that regenerate themselves (thanks to the creation of social behaviour and economic activities that maintain their quality and orient their evolution in a positive direction) (Manzini 2002b).

Companies, solutions and systems architecture

In the business debate, and especially in the marketing debate, the concept of solution, *per se*, is not new. And nowadays, both in the business-to-consumer field and in the business-to-business one, we can find examples that clearly exemplify the tendency towards offering solutions, i.e. towards “*selling results instead of products*”.

Some of these examples, as in the case of Xerox which, a decade ago, started to present itself as the “document company”, offering “managed documents” instead of selling photocopiers, today may be considered as quasi-historical cases.

Moving to more recent years, we can observe that the number and the variety of these examples are increasing. Just to give an idea, we can mention some well known cases, in different industrial sectors: *Interface*, an American company, some years ago, started to lease and maintain (and to upgrade and recycle) carpets, instead of selling them. *Electrolux* has experimented with offering a “pay-for-wash” contract instead of selling washing machines. On the same lines, the Italian white goods firm *Merloni* has launched a full-service pay-for-wash programme, similar to the one proposed by Electrolux, but on a larger scale and in the framework of a broader offer of services.

Finally, we can mention the many recent examples of “selling results”, based on the intelligent use of information and communication technologies: from the case of IBM, which is now presenting itself as an *e-business consultant*, to the many cases of innovative solution-oriented services proposed by different service providers to increase efficiency and *de-materialise* some existing systems (see, for instance, the cases presented in Forseback 2000).

These old and new examples of solution-oriented offerings are interesting for us because they show what “solution architectures” can be like and because they demonstrate that, by breaking the business-as-usual attitude, it becomes possible to develop new and very innovative business ideas (Manzini, 1999, Forseback, 2000). However, as we will see in the following paragraphs, these examples are not yet “real” sustainable solutions. In fact, even though some of them are consistent with the first criterion of sustainability (low material and energy intensity), none, or at least very few, of them have really faced the second one (to improve the quality of contexts of life).

Solutions, users and network of partners

A company's possibility of doing business offering sustainable solutions is based on its ability to present to its potential clients some alternatives that they can recognise as *better solutions* (to their need and desires) and that, at the same time, may be considered as *more sustainable solutions* (from a social and environmental point of view). When this happens, the company enables the user/client to shift from an un-sustainable system and un-sustainable behaviours, to more sustainable ones. In other words:

A sustainable solution is successful if and when a new (and more sustainable) combination of products and services is recognised by users as better than the existing one (in this case, it

is: a new sustainable answer to the same demand for results), or if and when it meets a previously unexpressed and/or unanswered demand for some potentially sustainable results (in this case, it is: a new and sustainable answer to a new and sustainable demand for results).

Some implicit assumptions of this statement have to be made explicit:

- What users demand is not a given system of products or services, but the results that these products and services enable them to achieve. The same demand for results may change in time, when new results substitute the old ones.
- Given a result, it can be achieved thanks to different solutions: i.e. different combinations of products, services, knowledge and user's participation (in terms of energy, time, attention and knowledge). Each one of these combinations presents different social, economic and environmental characteristics

Finally, one more issue has to be underlined to characterise how it is possible for a company to do business offering sustainable solutions:

A sustainable solution, being the combination of different products, services and knowledge may call for –and as a matter of fact very frequently does call for – cooperation between different partners (other companies and a variety of stakeholders). The creation of a network of partners (*solution oriented partnerships*) is one of the most characterising activities in the development of effective and successful sustainable solutions (HiCS 2001b) .

Full services and enabling platforms

Considering the user's role, solutions, and the business models that they refer to, may assume different configurations between two extremes: the *full service*, on one hand, and the *enabling platform*, on the other.

- ***Full services.* In this case the provider's aim is to offer solutions to reduce user's efforts, time and attention needed to obtain a result.**

This typology of solutions can be seen as an extension of the organisations' dominant tendency to *outsource* activities that, previously, had been done internally. This tendency, started in the businesses, has been extended to the households in relation to an on-going change in the demography and in the composition of the households (IPTS 1999a) and in the evolving socio-cultural attitude towards ownership and consumptions (Rifkin 2000)¹⁰.

⁹ The way to promote Solution Oriented Partnership is the main goal of the HiCS research (see Note 1)

¹⁰ Some examples of *full-service solutions*: in the thermal management of buildings there are forms of contract (Demand Side Management -DSM- and Least-cost Planning -LCP), whereby what is offered and guaranteed is the "thermal comfort service" (and not the actual quantity of heating fuel supplied). What is interesting from our point of view is that in all these cases the economic interest of the producer becomes that of guaranteeing the best possible service, by reducing his own costs, that is, in the cases indicated, by reducing the consumption of fuel.

A similar approach has been followed in other fields, as agriculture, industrial painting, engineered materials. In agriculture, a "pest control service" can be offered and not the supply of pesticides; in the field of industrial paints, some chemical companies are moving to become a supplier of "colour services" to its customers rather than merely selling dyes and pigments. In the field of engineered materials, the strategy of some leading companies is to retain the 'ownership' of its product throughout its life cycle.

The same attitude, can be found in the field of durable goods and appliances, as for instance, when *full services solutions* are offered to solve specific problems in the office or in the daily life, as, for instance, the case of the big multinational that is entering in the business of the home delivered laundry services.

The *full services solutions* may present an environmental interest because, selling final results rather than material products, it is in the producer's economic interest to increase the eco-efficiency of the system, by extending the life of products, components and materials, and optimising their utilisation.

- ***Enabling platforms.* In this case, the provider's aim is to offer solutions that imply a high user involvement, i.e. solutions that empower the user in his/her ability to get his/her own results.**

This typology of solutions can be seen as the answer to a demand that emerge from the convergence of two interesting social trends: a major one towards an extended vision of the *do-it-yourself*¹¹, and the other, the minor but growing one, towards a renewed individual and social interest in *caring activities*¹² (caring of people, things, and contexts of life).

The convergence of these trends lead to very different results, depending on the different economic and socio-cultural backgrounds¹³.

Within the *enabling platforms*, the objective of a business becomes to deliver services to promote the leasing, pooling or sharing of certain goods, with the environmental advantage of optimising their use and reducing their quantity (i.e. the quantity of products required to answer a given demand for results).

Full services and *enabling platforms* are, for several reasons, good starting points from which to promote solutions consistent with the first criterion of sustainability (that related to material and energy intensity). In fact, when delivering *Full services* and *enabling platforms*, a company has to enlarge the system that, traditionally, it must consider in order to evaluate its own efficiency. I.e. it has to take into account not only its own manufacturing system, but also the *enlarged system* that comprehends other activities related to the solution delivery such as, for instance, the use of the products and their maintenance, the management of materials and products at the end of their life, and so on. This is a very good move because, when considering this enlarged system, the company has to *internalise* some environmental costs and, in this way, convergences between economic efficiency and ecological efficiency will appear (Sthael 1997, 1999, Manzini, Vezzoli 2001, Mont 2002).

On the other hand, as far as the second criterion of sustainability is concerned (that related to the quality of the contexts) the discussion on their potentialities has to be more articulated.

The *enabling platforms*, (may) offer some positive input to contexts quality: by involving the users, they (may) develop people's capability of care taking and of cooperating in care taking. Of course,

¹¹ This trend, that is a main-stream one, integrates the traditional *do-it-yourself* (intended as a hobby), with the growing *direct involvement* of people in the solution of different everyday problems (i.e. the result of the *de-intermediation processes* that are related to the diffusion of the information and communication technologies).

¹² This trend, that at the moment is involving a variegated and growing group of minorities, comprehends a wide spectrum of socio-cultural movements which present the common denominator of a promoting forms of personal involvement in some activities of care.

¹³ Some examples of *enabling platforms*: advanced leasing services are related to some specific activities (do-it-yourself tools, sport equipment, computer and electronic devices, ...) and they consist in an improvement of what has traditionally existed. Sometimes they can also be a different way of introducing some specific products into the market, opening up new market opportunities for them (e.g. relatively expensive professional series of mechanical saws, can be leased in the framework of a full service assistance, creating the possibility for even the private handyman to use such professional machines, even for short time).

Regarding the initiatives for common or shared use of products, the two discussed most are related to laundry services and car sharing (New concepts of friendly and ecoefficient public "wash centres" have been realised, where "friendliness" consists in the fact that the function of washing is integrated with a variety of other activities, as bar, reading rooms, video games, etc. Car sharing initiatives also have a long (and sometime successful) story and have to be considered as new forms of entrepreneurial activities.

this positive development may not happen: it is only a promising opportunity the realisation of which depends on the way in which each specific enabling platform is designed.

The *full services* solutions may even be socially dangerous since by aiming to reduce users efforts and involvement, they risk reducing the users' sense of responsibility and their capability to taking care of their own environment. Of course, in this case too, the risk is only potential. Avoiding it is, once again, a question of design.

Design guidelines for sustainable solutions

The issue now is to give some clearer directions on how to orient a system towards a more sustainable configuration, i.e. how to conceive solutions to transform a given system into a more sustainable one.

In this paragraph some *design guidelines* (or rather some, *system design guidelines*) will be outlined¹⁴.

These guidelines, synthesise the results of several previous research projects and practical experiences. This means that they are *the expression of the current state-of-the-art* in terms of technology, knowledge and creativity and that, as always happens in all learning processes, they are constantly evolving and may change into better ones.

- **Check basic assumptions.** Before starting a design program, verify its consistence with the ethical, social and economic principles of sustainability. Properly speaking, this is not a design guideline, i.e. this is not a design strategy. This is a deontological move that every designer and solution provider has to make before starting their design activity¹⁵.
- **Use what exists.** Before conceiving something new, re-use and/or reinvent the use of existing resources and infrastructures. This is the most obvious, but also the most frequently forgotten strategy to sustainability. Consider the possibility to regenerate and up-grade what exists, avoiding the risk of maintaining in function systems that, for some reasons, may be intrinsically unsustainable.

¹⁴ The *design guidelines* have to be considered as *concise expressions of possible design strategies*. Their role is to orient the design choices in the direction that has the highest possibility to bring to a given result (i.e. the result that motivates the same guidelines existence).

We can develop specific guidelines for *system design* and for *product design*: *system design guidelines* and *product design guidelines* are *complementary*, but *they are not the same*.

Design guidelines (both for systems and products) are *consistent but not coincident* with the *assessment indicators* that have to be considered in the evaluation phase of the design process.

The *design guidelines* have to be used in the *concept generation phase*, when the choices that have to be done are *necessarily holistic*. I.e. their social, economic and environmental dimensions are integral part of the whole project and, therefore, cannot be considered separately.

The *assessment indicators* are used when the design process is at an advanced stage of its development. In fact, only at this stage it is possible to split the impact of the designed system in measurable bits and, in this way, to define separately its social, economic and environmental impacts.

¹⁵ Except for the first "guideline", there are no guidelines specifically oriented towards specific ethical, social, economic themes. This choice is consistent with what has been said in the previous paragraphs: guidelines are holistic design directions in which all the different solution dimensions are included

- **Minimize mobility.** Bring people closer, shrink the cycles of material flows. The present world-wide flow of products and people is, and is becoming more and more, un-sustainable. Develop open systems with low (products and people) transportation intensity balancing the demand of free mobility with the opportunity of localise, or re-localise, a great number of production and consumption activities.
- **Use sun, wind, biomass.** Base the system on the regenerative use of locally available renewable resources. A regenerative use of the renewable resources is, on the long run, the only acceptable option. Promote their use developing distributed plants and connecting them in networked organisations.
- **Create symbiotic systems** Promote energy and material cascading towards closed-cycles and zero waste processes. The concept of industrial ecology is the pillar on which to build the new production systems. Combine different activities and processes to create symbiotic industrial clusters.
- **Integrate and share.** Integrate coherent services, reduce the need of material devices. The proliferation of products for individual use is un-sustainable. Promote eco-efficient, multifunctional, integrated systems, combining the demand of individuality with the one of socialisation.
- **Empower individuals and communities.** Promote the system enabling capability. Individual and social participation are pre-requisites for any context qualities improvement. Conceive systems that facilitate the focalisation of problems to solve, the convergence on how to solve them, the individual and social possibility to have a role in their solution.
- **Develop flexible, networked organisations.** Promote the system learning capability. The transition towards sustainability is a social learning process. Conceive systems that amplify the feed-back and increase the system capability to learn from the experience and re-orient itself.

Some considerations on these guidelines:

Each one of these guidelines has its own motivation that cannot now be presented in depth. In any case, it is clear that to adopt them successfully is today a very challenging task. In fact, if one of them seems to be coherent with these current major trends (*Develop flexible, networked organisations*), others are certain to be in complete opposition to the present dominant social and economic tendencies (in particular the first and second ones, *Use what exists* and *Minimize mobility*). And others present an evolving, contradictory condition (as, for instance: *Use sun, wind, biomass*; *Create symbiotic systems*, *Integrate and share*, *Empower local communities*)....”.

Leaving the discussion on problems and possibilities related to these contradictory possibilities to another paper, here I will add some general considerations on another fundamental company problem: how to conceive and develop highly efficient and effective solutions? That is: how to produce and deliver solutions in an economically feasible way?

Solutions (and sustainable solutions) industrialization

For a company (or, more frequently for a network of companies and stakeholders) intending to develop a sustainable solution, the issue of conceiving the outline of a solution that may be considered as “sustainable” is not the only problem. When a potentially sustainable solution has been outlined, the issue becomes how to develop it as an efficient and effective industrial activity. Many promising solution concepts have failed when they tried to move from the “prototype” phase to what should be the real production and delivery phase.

As a matter of fact, in developing a solution (and not only the most sustainable ones) a company has to face this kind of contradiction:

By definition, each solution is *context-specific*, i.e. it is related to a well defined user in its context. On the other hand, to make it economically feasible, it has to be *efficient, effective* and *replicable*. And all this calls for some forms of *standardization*.

The way to overcome this contradiction is what may be defined as *solution industrialization*: a design strategy thanks to which it becomes possible to produce and deliver context-specific solutions based on systemized and standardized components and procedures.

To discuss this issue we should introduce some complementary considerations on how *solutions*, and their *system architectures* have been conceived to make them *efficient and effective*. Here I will only present some general considerations.

- Very rarely can a single company offer a complete solution. The consequence is that the solution industrialization process calls for *solution oriented partnerships*: the convergence of different partners on a solution idea and their clear commitment to invest jointly in order to develop it.
- To industrialize a solution implies conceiving and developing *solution architectures* based on some form of *replicable platform*. That is, based on a set of *systemized* and *standardized* components and procedures.
- The ways in which systemization and standardization are realized, and the kind of partners that converge on a solution oriented partnership, determine the characteristics of the solution platforms and, in the end, of the solution performances.

Design guidelines for solution industrialization

Solution industrialisation is a process whereby products, services and communication are *systemised* with the dual aim of offering the end-user a better result and enabling the solution promoters to produce and deliver that solution in a highly efficient way.

In other words: solution industrialisation is a process which aims to increase, at the same time, both the *productive efficiency* and the *enabling potential* of the solutions by adopting the most advanced technology and organisational models.

To move in this direction two major steps have to be taken (HiCS 2002b):

- The first one is to outline a solution *architecture based on a replicable platform* and on a set of *integrative, variable elements*. That is, a platform of products, services and knowledge, on the basis of which a variety of *contextualised solutions*, i.e. solutions specific to a given context and a given user, may be delivered.
- The second one is to develop the outlined platform in order to standardize it, i.e. to make it more efficiently replicable in different contexts of use.

In this framework, another set of design guidelines will be introduced. They are *design guidelines for solution industrialisation*, and their aim is to give some directions by which to conceive and develop *industrialised solution platforms*:

- **Standardize products.** Standardize some components to increase the degree of industrialization of *material elements of the system* (i.e. operating on the design and/or on the organization of the production and delivery processes).
- **Formalize service procedures.** Formalize and standardize some *service procedures*, to

make them more easily replicable (e.g. developing protocols and formats to deliver families of services).

- **Increase elements interface-ability.** Standardize component interfaces, to improve the *interface-ability* of specific components and to facilitate their assembling and dis-assembling processes (e.g. designing their material and immaterial interfaces to facilitate manufacturers and/or users in the assembling phase of the platform and/or of the specific solution).
- **Increase products intelligence.** Develop new materials, products and machinery, *to materialize* some services in “*intelligent*” materials and products (e.g. developing an innovative “functional packaging”) and/or *to mechanize* some services in *automatic machines* (e.g. developing new kinds of vending machines).
- **Promote networked systems.** Formalize and standardize all the solution interactions to create the basis for a *networked system*, to make the system management and/or usability more simple and fluid (e.g. creating a common interface to all the components).

The combination of these guidelines related to the industrialization of the solutions, with the ones related to their orientation towards sustainability, give an overall view on the design challenges that companies, and the different partners and stakeholders with them, have to face to become positive agents in the transition towards more sustainable ways of doing business.

New business ideas and *new ideas on business*

To conclude, in the transition towards sustainability the traditional business ideas, based on the traditional ideas on business are not enough.

What is needed, instead, is a re-thinking of the very concept of “business”, developing new ideas on business and, from here, conceiving the necessary (or required) new, and hopefully more sustainable, business ideas.

To re-think the present business models is not an easy task and the questions it rises are very open ones. Nevertheless, on the basis of both past and on-going experiences, some initial “new ideas on business” may be outlined:

- Business is not about product and production *per se*, it is about *systems organisation*, i.e. about the use of technical and organisational knowledge to organise systems and to become *(sustainable) solution providers* .
- Business is not about standards *or* unique products, it is about organisations that deliver unique solutions on the basis of replicable platforms of products, services and knowledge, i.e. it is about the capability of delivering *industrialised and contextualised solutions*.
- Business is not about global *or* local systems, it is about the interaction between global *and* local resources and knowledge, i.e. it is about the capability of being *context-related business*, discovering, even in the framework of the most open society, the local dimension of every human activity
- Business is not only about competition, it is the more and more about *cooperation and partnerships*, i.e. it is about new ways to relate with clients, other companies and other stakeholders, *looking at them as (potential) partners* in the process of conceiving, providing and delivering solutions.

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