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Innovative Sustainable Companies Management: The *Wide Symbiosis* Strategy

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1. Introduction

The **main objective** of this paper is proposing a theoretical and innovative approach for companies' sustainable strategy development from the *private* point of view and according to a best-practices approach focused on very new market trends.

Nowadays the scientific community widely accept that one of the main pillars for sustainable development effective implementation is the "closed loop economy" objective: energy and material processes shifting from linear (open loop) systems - in which resources move through the economic system to become waste - to a closed loop system where wastes are inputs for new processes.

Starting from the above statement, the key thesis of this paper is that "closed loop economy" approach and concept can be successfully extended from material and energy flows to non-material flows, shifting all the relationships which involve the companies (B2B-Business to Business; B2C-Business to Consumers; B2I-Business to Institution as well as Companies internal relationship) from a type I (linear / hierarchical / one-way relationship) towards a type III - symbioses (cyclic relationships with internal loops and feedbacks). When this symbiosis approach involves simultaneously all the relationships (B2B, B2C, ..) we will name it "wide symbiosis". We will see as this systemic approach can support in sustainable development implementation that is achieving economic, environmental and human/social goals (Fusco Girard, 2009).

In relation with the above aim, in the **second paragraph** we will briefly describe the most important **business trends expected for next years** focusing on the actual global economic crisis. Then (par. 3) we will point out **what sustainable company management is** and **how** it can support companies for next years challenges. After that (par. 4) the **sustainability vision is declined** in some **more concrete sustainability strategic objectives**. The next paragraphs are focused on describing B2B, B2C, B2I and companies internal relationships aiming at analyzing how they can contribute to the loop economy promotion achieving the sustainability strategic objectives as they have been previously described.

The final part of the paper is focused on analyzing **decision making processes** and **evaluation tools** to effectively implement loop economy choices. Indeed, conclusions highlight the **primary role of cultural values** to promote the *Wide Symbioses* relationships.

2. The context

Below are summarized some of the main global business trends as they are expected for next years. Of course the aim is not an in-depth drill down on possible future trends (see also Simon and Zatta, 2011), but just providing some general context evolution tendencies.

- **Global economic crisis is expected to continue**, with some relevant exception (eg. developing countries like Brazil, Far East ...): by this time it seems clear that the wished economic recovery at *ante-2008 level* will not take place soon and presumably the global GDP will evolve according to a “W trend” (see also Hope, 2011)
- **Globalization is expected to increase**: competition is getting more and more global, involving every value-chain phase: world based recruiting; worldwide level sourcing; manufacturing de-localization... This is fostering to increase Asian leadership Vs Western countries (see also Yeung et al, 2001 and Sunley, 2011)
- **Interest in environmental issues is expected to continue to grow** over the next years driven by customers and supported also by Governments. Climate change / greenhouse gas reduction and fresh water scarcity are expected to be the main issues (see also Laszlo, 2009 and Makower, 2009)
- **Raw materials and energy costs are expected to continue their increasing trends**, mainly driven by their scarcity and the widening demand to support developing countries growth. Also the recent nuclear giving up at global level (following the Fukushima nuclear disaster) will foster to increase the energy prices
- **Politics and Government influence on business is expected to remain high**: following the first part of current economic crisis (2008-early 2009) many Governments strongly entered into market dynamics for saving companies and the overall global interests (see also Simon and Zatta, 2011)
- **Customer's behaviours definitely changed**: customer's expectations Vs new products are by far higher than in the past, furthermore web-based communities fostered customers sharing of products experiences, their opinions about performances, ranking, values etc. (see also Boaretto et al, 2011)
- **Growing internet based-connections**: starting from the “home internet” we pass through the internet everywhere (due to PDA / *smartphones* diffusion) to reach the “internet anything”, where a number of equipments (eg. TV, cars, washing machines, home anti-theft systems ...) are web-connected (see also Simon and Zatta, 2011 and Boaretto et al, 2011).

3. The vision

In the above-described context, sustainable company management can be the key approach to really win the competition (Werbach, 2009). So, below we will describe first of all what sustainable company management is and then how it can be implemented.

Following Seralgerdin approach (Seralgerdin, 1999), which recognizes four different kinds of capital (economic capital, natural/environmental capital, social capital and human capital), sustainable development can be seen as aimed to maintain or increase all capital stocks at the same time.

According to this approach, it is also possible to express sustainability under the point of view of comprehensive efficiency or “complex efficiency” (Fusco Girard, 2008), which is the

extension of the efficiency concept to all the above forms of capital, involving (see also Goodwin, 2003):

- Economic efficiency, which is the efficiency in economic capital usage. It refers to minimizing the economic resources use while maximizing goods and services production aiming to reach the state where nothing more can be achieved given the available resources (O'Sullivan and Sheffrin, 2003)
- Natural efficiency (eco-efficiency) that is linked to the use of natural capital. It refers to minimizing the environment impacts (also in terms of waste and pollution) while maximizing goods and services production (Schmidheiny, 1992) aiming to *de-coupling* economy that is economic growth without corresponding increases in environmental pressure (Bleischwitz and Henricke, 2004)
- Social efficiency, which involves the efficiency in social capital usage. It refers to the aiming of achieve economic results maximizing the value of social relations and the role of cooperation and confidence (Putnam, 2000)
- Human efficiency, which entails the efficiency in human capital usage aiming to improve stock of competences, knowledge and personality attributes (see also Human Development Report, UNDP, 2011)

with the overall aim of maximizing / balancing them.

Furthermore, complex efficiency enlarges time and space perspectives in managing companies:

- Enlarging spatial perspective means following a **holistic approach** and focusing not just on the single company
- Enlarging time perspective means considering not just short term, but also **medium and long term**

Given the above descriptions, it is clear that complex efficiency requires a multidimensional and systemic approach (Fusco Girard, 2009).

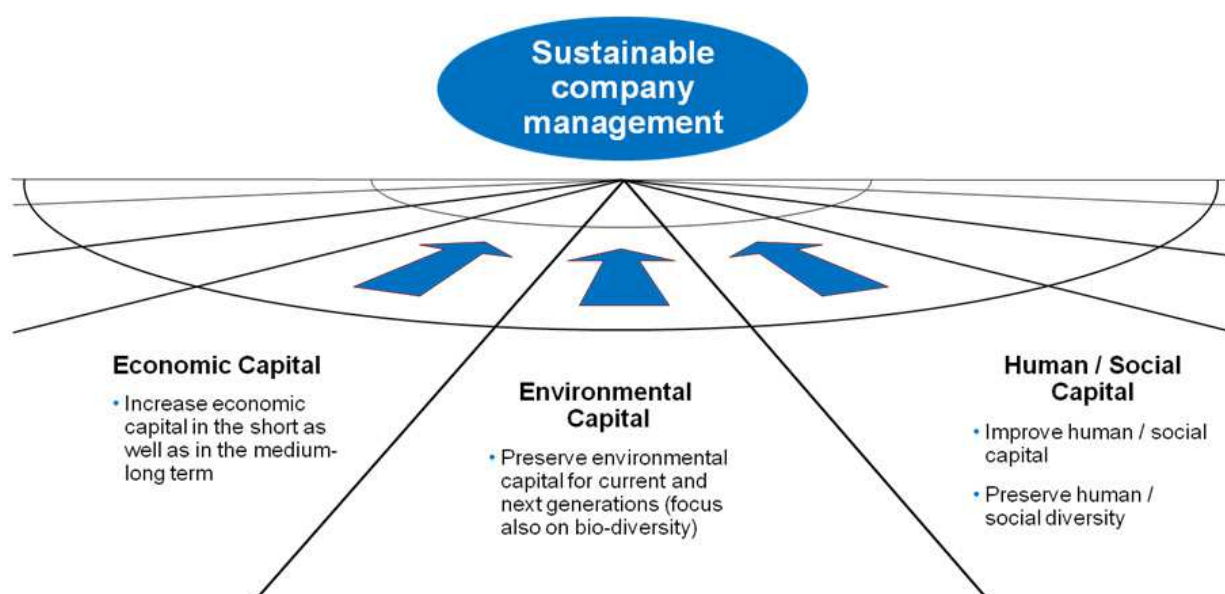


Fig. 1. Sustainable companies management vision

4. Vision and strategic objectives

The above sustainable company management vision can be realized through a **systemic approach** and by the achievement of a number of strategic objectives. Below we have grouped them according to their phase in product lifecycle and summarized, being aware of some significant overlapping.

- Overall:
 - **Achieve good financial/ economic performances also in medium-long term:** long-term approach is based on customer loyalty. Indeed, companies built on a foundation of customer loyalty can grow over the long term through all types of economic climates, while companies with weak customer loyalty face an unstable future: "Bad profits" undermine customer relationships, and include ill-gotten earnings (Reichheld, 2006). The main condition for companies sustainable management is – for sure – that the company itself must exist and long-term approach is *conditio sine qua non* in order to achieve it. Clearly, companies' risks must be managed coherently (see also Laszlo, 2008)
 - **Promote companies integration with eco-systemic dynamics:** companies as well as their products and their by-products must be always considered as part of larger eco-system, avoiding perturbing it (Ayres and Ayres, 2002)
 - **Promote companies integration with social environment (with major focus on local social environment):** encouraging strong relations with local communities can be a leverage also for increasing employees (that usually are local citizens) well-being and productivity. The integration with local social environment can be an important way to improve companies internal and external social capital
- Production phase:
 - **Follow a lifecycle approach in product design:** in the design phase all the stages of a product's life from-cradle-to-grave must be considered (i.e., from raw material extraction through materials processing, manufacture, distribution, use, repair, maintenance, and disposal or recycling) in order to achieve wished impacts on economic, environmental and social / human capital (see also Costanza, 1991)
 - **Reduce production costs:** production cost cutting (usually achieved leveraging on people/processes/IT improvements) can positively impact economics and also environment, when linked to energy / raw materials savings (see below)
 - **Reduce the quantity of required energy and materials, focusing on renewable:** consider dematerialization opportunities, that is "doing more with less", decoupling economy wellness from energy and material consumption, maximizing renewable energy and material consumption Vs non-renewable. (Bleischwitz and Hennicke, 2004)
In many field this trend is gaining room also leveraging on technologies opportunities (eg. in the work environments the use of paper is greatly reduced / eliminated thanks to digital communications) and swapping from product to services. For examples, customers need to illuminate a room (that is the service) while light bulb is just a way (product)
 - **Sell every manufactured product:** production waste is usually referred to product not-fulfilling specific "qualitative" requirements, but production waste can be considered also every unsold manufactured product: as matter of facts, unsold products can be seen as waste of money, energy and material impacting both economics and environment

- **Consider that employers have no capability limits:** the main key success factors to achieve best employers performances are an adequate management, the trust that enterprise successes are their own success, and an effective training
- Lifecycle / using phase
 - **Reduce lifecycle costs for maintenance and operation:** nowadays consumers are more aware of lifecycle costs and their increasing can be seen almost as a robbery when not justified. For example paying more than €400 for a rear mirror on a €8.000 car (about 5%) negatively impacts the customer-carmaker relationship
 - **Follow integrated approach to protect the environment:** considering that real environmental impacts are very-very difficult to be calculated, their global minimization can be very important to protect the environment *leveraging on both new technology opportunities and correct customers behaviors promotion*. For example, new cars CO2 emission are usually reduced VS previous models, but this effort can be invalidated by a more frequent car usage as well as by inappropriate drive style
 - **Satisfy customers:** considering that customers can be sorted in promoters, passives and detractors (Reichheld, 2006), every post-sales effort could be aimed on increasing the number of promoters and strongly avoiding detractors, definitively overcoming a Customers Relationship Management (CRM) approach focused just on IT systems
- Lifecycle end
 - **Extend product lifecycle:** as matter of fact, wasting a “still working product” has two key important issues: a) increasing the waste disposal needs (that can be very hard for electronic waste / hazardous materials) b) increasing energy and materials needs for replacing the wasted product. For example, replacement rate of *still working* mobile phones is very high, impacting the needs of waste disposals (that can be hard for some components such as batteries and silicon parts) as well as the need of new material and energy embedded in the new mobile phone
 - **Facilitate reuse:** as stated for the production phase, also the design efforts could be focused on both conventional reuse - where the product (or its parts) is used again for the same function - as well as new-life reuse where the product (or its parts) is used for a new function. As matter of facts, reuse help save time, money, energy, and resources, opening new opportunities to offer quality products to people and organizations with limited means
 - **Facilitate recycling** in order to prevent waste of potentially useful materials, cut the consumption of fresh raw materials, cut energy needs, reduce air and waste pollution by reducing the need for "conventional" waste disposal, and lower greenhouse gas emissions as compared to virgin production.

In the Table 1 every objective is mapped according to its impact on complex efficiency

5. How objectives can be implemented: Symbioses

Implementing sustainable development means shifting a linear economic model to promote a loop economy.

In this context, the paper aims at investigating conditions and consequences of the above well accepted and known statement:

- Extending its focus from material also to non-material flows, partially widen industrial ecology (Ayres and Ayres, 2002) / ecological economics (Costanza, 1991) approaches

- Approaching the issues from the private/enterprise point of view, filling an important gap, since most of studies are mainly focused on a public point of view.

Group	Objective	Impacts on capital		
		Economic	Environmental	Social / Human
Overall	Follow a long-term business approach	●		◐
	Promote companies integration with eco-systemic dynamics		●	◐
	Promote companies integration with social environment			●
Production phase	Follow a lifecycle approach in product design	◐	●	
	Reduce production costs	●	◐	
	Reduce the quantity of required energy and materials, focusing on renewable	◐	●	
	Sell manufactured products	◐	◐	
	Consider that employers have no capability limits	◐		●
Lifecycle / using phase	Reduce lifecycle costs for maintenance and operation	●		
	Follow integrated approach to protect the environment		●	
	Satisfy customers	●	◐	
Lifecycle end	Extend product lifecycle	◐	●	
	Facilitate reuse / recycling	●	●	◐

Table 1. Objectives impacts on complex efficiency

For the above aim, we will follow a 3 steps path:

- Recognizing of the existing elements and relationships in every node involving the companies (B2B-Business to Business; B2C-Business to Consumers; B2I-Business to Institution as well as Companies internal relationships)
- Investigate the *wide symbioses* approach opportunities, that is demonstrating how making every recognized relationships “symbioses” (that are cyclic relationships with internal loops and feedbacks) can help to promote sustainable company management matching the above strategic objectives
- Recognizing the role of specific tools and of cultural factors in order to effectively implement symbioses.

6. B2B symbioses

Hereby we investigate the development of the relationships among different companies (Business to Business), pointing out the system evolution from one-way relationship toward symbioses.

6.1 The relationship evolution and symbioses description

Type I: Before the “revolution of quality”, the **relationship** among different companies was **one-way and hierarchical**: main assembler companies provisioned from lot of little suppliers. Assemblers lead auction among suppliers to buy components previously designed by the assemblers and to be manufactured by suppliers. The competition was fully price-based: best is cheaper with very limited care of product quality. Since only assemblers are in charge of the design process, no product innovation could be implemented by suppliers, which were **frequently replaced in order to save money**.

Type II: One of the main “revolution of quality” innovation is the recognizing that **knowledge, know-how, technology and a real understanding of process and production can be allocated also in suppliers**. This recognising is the first step in establishing a new relationship with **suppliers, which became partners**: supply agreements have been lasting longer and different companies have been working in partnership sharing knowledge, technology, and – occasionally - also management strategies.

Type III: New and useful relationships (symbioses) among different companies are established when collaboration involves not only business goals, but also environmental and social goals, such as the implementation of a common Environmental Management System or the extension of LCA (Life Cycle Analysis) also to partner process.

Top symbiosis level is **industrial symbiosis**, which is based on resource exchanges: although there is not a general accepted industrial symbiosis definition, in general three primary opportunities for resource exchange are considered (Chertow, 2007):

1. By-product reuse – the exchange of firm-specific materials between two or more parties for use as substitutes for commercial products or raw materials
2. Utility/ infrastructure sharing – the pooled use and management of commonly used resources such as energy, water, and wastewater
3. Joint provision of services – meeting common needs across firms for ancillary activities such as fire suppression, transportation, and food provision.

In such a way partnership relationship do not involve only products, but also by-products, waste, emissions and whatever is no more functional for a company but could be useful for another one (Rutten and Boekema, 2004).

Below the industrial symbiosis is described by one of the main example: Kalundborg (Danmark).

6.2 Kalundborg: An industrial Symbiosis example

The most well-known example of industrial symbiosis is Kalundborg (Denmark), where co-operation has developed spontaneously over a number of decades and currently involves about 20 different projects. By products exchanges are schematized in figure 2.

Main participants in the Kalundborg Industrial Symbiosis are:

- DONG Energy Asnæs Power Station,
- Gyproc plasterboard factory,
- Novo Nordisk pharmaceutical plant
- Novozymes enzyme producer A/S,

- Statoil oil refinery
- Kara/Noveren waste company
- Kalundborg Municipality

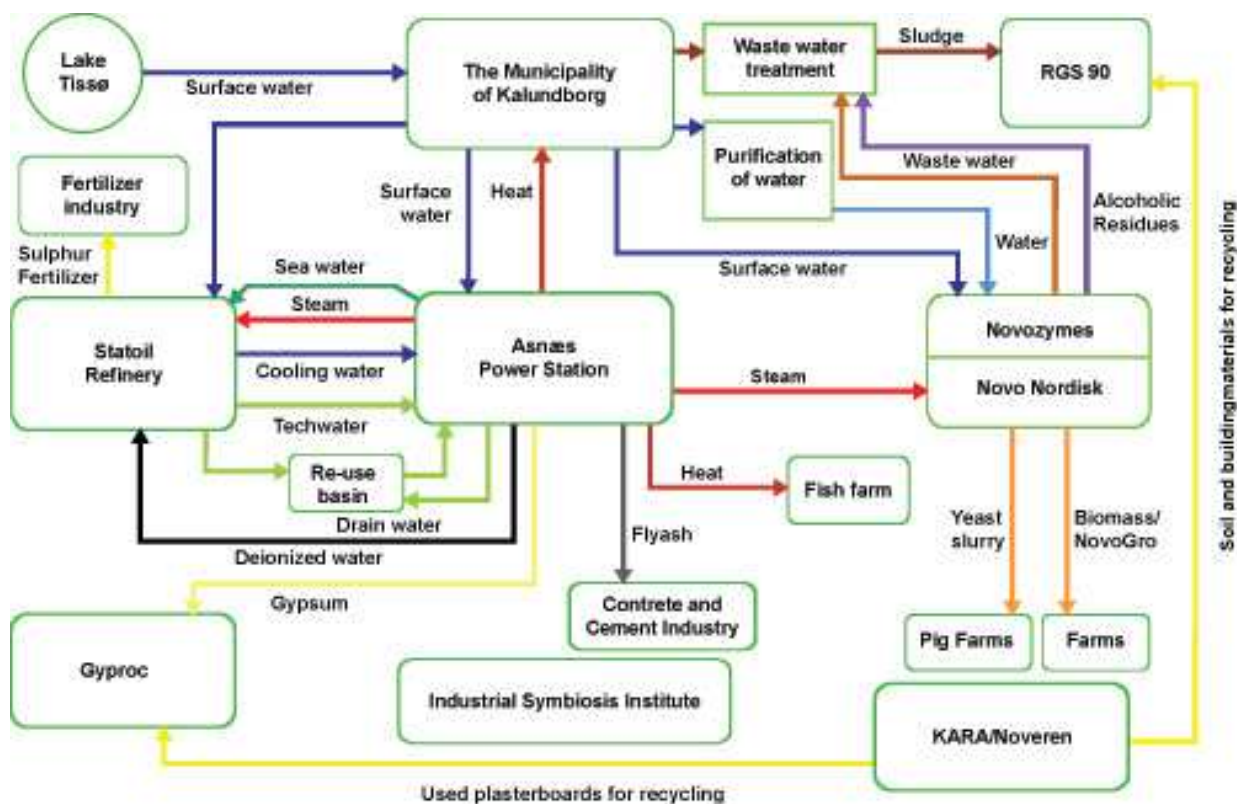


Fig. 2. Kalundborg by-products exchanges

Examples of Symbiosis Projects: Energy savings

The Asnæs Power Plant is a coal power plant (one of the main electricity plant in Denmark, producing about 10% of the electricity consumption in the Country); its excess heat is utilised as process steam and central heating. More in detail, Statoil Refinery, Novo Nordisk and Novozymes A/S receives annually about 1,5 mio. GJ (equivalent to more than 75.000 family houses yearly electricity consumption and to around 240.000 tons CO₂).

The symbiosis will optimise the process steam cooperation and return up to 150.000 m³ steam condensate to the Asnæs Power Plant.

Currently a DONG Energy technology company is setting up a bio-ethanol plant next to the power plant operating on straw - a by-product in the agricultural sector. The use of steam and delivery of biomass as fuel in the power plant improves the overall CO₂ account with more than 25.000 tons CO₂ - not including the CO₂ reduction from the replacement of bio-ethanol in gasoline and diesel. (<http://www.symbiosis.dk/industrial-symbiosis.aspx>)

6.3 Symbiosis sustainability evaluation

Below we will analyse the most important symbiosis impacts on complex efficiency in achieving vision's objectives; furthermore there are many other impacts which are more in depth analysed in industrial symbiosis and industrial ecology literature. (Ayres, 2002)

- a. Achieve good financial/ economic performances also in medium-long term: symbioses are usually shaped by market hand, driven by economical reason and usually require stable business partnerships, which is very consistent with the long-term business approach
- b. **Promote companies integration with eco-systemic dynamics:** as matter of fact, industrial symbioses follow the nature approach (see also Hawken, Lovins et al, 1999), where one company's products waste is an input for another company
- c. **Promote companies integration with social environment (with major focus on local social environment):** despite the appearances, industrial symbiosis is strictly linked with (mainly local) social capital. In literature many scholars point out that some industrial symbioses fail to grow despite economic profitability of material exchanges. The reason is that cultural background is a key factor to implement symbiosis. It seems – from practical experiences – that realizing material exchanges require, on its turn, the existence of non material exchanges (Fusco Girard, 2009)
- d. **Reduce production costs:** as Kalundborg experience points out, many symbiosis projects have been stimulated just by economic saving opportunities. Indeed in some cases the industrial symbiosis was not “discovered” by outsiders / scholars just because the exchanges have been shaped by the invisible hand of the market rather than from conscious direct involvement
- e. **Reduce the quantity of required energy and materials, focusing on renewable opportunities:** a positive impact on the environment due to symbiosis is based on natural resources improved management, since energy, by-product exchange and common waste management increase the efficiency in resources using (Fusco Girard, 2008)
- f. **Facilitate reuse / recycling:** these are, by definition, the industrial symbioses key characteristics

7. B2C symbioses

Over the past decade, the **relationship between customer and companies** has been substantially developing. The following analysis shows this **evolution from mass production toward co-creation**, focusing on material and immaterial loop closing.

7.1 The relationship evolution

Type I: During the so-called *mass-production* period, companies produce as much as they can in order to profit from scale economy according to a push model. Of course models are always **standard** with no (or very limited) customization opportunities, quoting Henry Ford “We produce any colour cars - so long as it's black”.

This “**push**” approach is completely **linear** and implicitly implies that companies know how to fully satisfy customers.

Type II: The spread of the so-called **Toyota spirit** radically changed the relationship between customers and companies. The push approach is gradually replaced by the pull one: *just in time* and *lean production* make possible the achievement of scale economy, although products are customized, so customers began to contribute to product features. Due to this customization opportunities the **B2C relationship** is no more only one-way: **customer**

requiring a tailored products (Customer to Business input) **to be provided by companies (Business to Customer feedback)**. The new customer-focused approach implies also that, according to Kano quality model (Watson, 2001), companies put into practice a new proactive attitude, trying to anticipate, and not just to follow, customers requirements. (Ohno, 2004)

7.2 Symbiosis description

Type III: Implementing symbioses with customers means **recognising customer relationship as the most important factor in company development, promoting continuous flows and feedbacks with customers, potential customers and non-customers.**

B2C relationship as key success factor

The importance of this relationship is pointed out by many scholars, highlighting as in nowadays markets the key **success factor is not a requirement but is the relationship with customers**. Reichheld (Reichheld, 2006) stated that the relationship allows tracking promoters and detractors distinguishing good from bad profits. . The discriminator between good and bad profits is “the ultimate question”: “treat the customers as if you were a customer yourself”. As matter of facts, bad profits boost short-term earnings but alienate customers. They undermine growth by creating legions of detractors-customers who complain loudly about the company and switch to competitors at the earliest opportunity. On the contrary, company makes good profits through enthusiastic customer participation which can be achieved joining material requirements (as they are Kano’s model) to not-material requirements, such as environmental compatibility, health care, respect of human rights etc (which can be also important drivers for product and process innovations).

B2C relationship for the Co-Creation symbiosis

For a long time, the market was the place of *value exchange*, while companies’ premises were the place of *value creation*.

According to Prahalad and Ramaswamy (Prahalad and Ramaswamy, 2004) some new trends (currently costumers are informed, aware, and networked and the product value is not linked just with provided services or products) are important drivers to radically change the relationship with customers **enabling co-creation, a new form of value creation**.

Times companies simply sell their products and services are over. Successful companies allow their customers to take part in the designing process, to keep track of production tasks, to participate in customers community: **customers take part in value creation, which that is not out, but in the market**.

Under current trends, consumers "seek to exercise their influence in every part of the business system," and companies have to accommodate, by designing "experience environments" for creating new value creation spaces.

Wikinomics can be seen as the peak of the above new B2C relationship. Indeed, according to Tapscott and Williams (2006), the word *Wikinomics* identifies how some companies are using **mass collaboration** (also called *peer production*) and open-source technology to be successful.

The use of mass collaboration in a business environment, in recent history, can be seen as an extension of the trend to outsource: i.e. externalizing formerly internal business functions to

other business entities. The difference however is that instead of an organized business body brought into being specifically for only one function, mass collaboration **relies on free individual agents to come together and cooperate to improve a given operation or solve a problem** (A.T. Kearney, 2009).

The new B2C Symbioses examples can be seen along all the value chain

- **Research and development:** for example, P&G (Procter and Gamble, Fortune 500 American multinational corporation manufacturing a wide range of consumer goods) leverages on external networks (NineSigma and InnoCentive), where consumers develop and put forward suggestions for technical / scientific issues submitted by P&G. This allows an overall R&D investments reduction, while innovation success rate significantly increased. So P&G is planning to source 50% of their new product and service ideas from outside the company, where 90,000 scientists around the world can help solve tough R&D problems for a cash reward (Tapscott and Williams, 2006)
- **Purchasing:** Goldcorp (a Canadian gold producer), published geological data about an area of 200 km² on the Internet and offered awards for the best potential sources of gold. Scientists and researchers from all over the world used that data for identifying 110 locations out of which half were new for Goldcorp. At over 80% of the listed sources, Goldcorp discovered a total of 227 tons of gold (Tapscott and Williams, 2006)
- **Design:** Companies can allow customers to design their own individualized product, such as Somerset, a US houseboats manufacturer that aims to leverage on "emotional bonding with... the company" and "a greater degree of self-esteem". (Prahalad and Ramaswamy, 2004). Other interesting practice is NikeiD where, according to the slogan "you design it. We build it", customers can customize shoes in terms of both look (materials, colours and personal id adding ...) and performance (wide and narrow sizing, independent left and right sizes, outsoles picking ...)
- **Marketing/Communications:** here many companies are focusing their efforts frequently leveraging also on new trends like Facebook. One of the main example can be Danone (a French food-products multinational corporation): Consumers vote for the targeted flavour of a new pudding by SMS or on a website or by facebook: more than 1 million consumers voted and were already familiar with the product before it went to market.
- **Sales/Distribution:** here frequently online companies are the most involved. For example, eBay set up an online community which is free of charge, optional offer with discussion forums, news, tips for all eBay members. Users of the eBay community bid twice as much in auctions, pay up to 24% higher prices, and spend 54% more than eBay members who are not part of the community.
- **Post-sales / CRM** (Customer Relationship Management): this broad term covers all the concepts which are used by companies to manage their relationships with customers, including collecting, storing and analyzing customer information. Since getting new customer costs about 5 times more than keeping current ones (Farinet and Ploncher, 2004), CRM is a key tool to really understand customers' requirements in order to design new products and to adjust current products in this perspective. Once again, this points out that the best company key factor is the best possible relationship with customers, rather than the best possible products. One of the main example of post sales B2C symbiosis can be H3g (UMTS-based mobile phone company) which provides on-line free customer assistance fully leveraging on other customers knowledge (see www.lesaitutte.it)

7.3 Symbiosis sustainability evaluation

The B2C symbioses impacts on complex efficiency can be summarized as below:

- a. **Achieve good financial/ economic performances also in medium-long term:** establishing and maintaining a strong customer relationship through B2C symbioses is a good way for generating long-term “good profits”; According to Reichheld, good profit implies high level of success: for example, every Dell not satisfied customer costs about 57 USD, whereas satisfied customer breeds about 328 USD (Reichheld, 2006)
- b. **Promote companies integration with eco-systemic dynamics:** Recognising that customers personal values are appreciated also by the companies could be an important key factor in the B2C symbiosis perspective. For example, ISPO survey points out that 77% customers state to avoid to buy products made by company which are not involved in social or environment campaign
- c. **Promote companies integration with social environment:** Active and proactive customer participation foster to improve human and social capital. Looking for and reaching information is useful to improve skills, but also to establish new networks, through internet or customers associations.
Recognising that important values are shared also with a company could be a main factor also in purchasing process: in a 2004 survey over an half of customers declare to know fair trade and 6,6% declare to buy only from fair trade
- d. **Reduce production costs:** B2C symbiosis allows many interesting savings in production costs as above pointed out in many examples along the value chain
- e. **Sell every manufactured product:** the B2C symbiosis approach implies that only sold products have been manufactured
- f. **Reduce lifecycle costs for maintenance and operation:** co-design experience by definition foster lifecycle costs reduction according to customers needs
- g. **Satisfy customers:** co-design and value co-creation can strongly help companies in making customers satisfied. Furthermore, likewise CRM surveys point out that (Farinet and Ploncher, 2004) 76% of satisfied customers buy again the same product, 33% buy again a not fully satisfying product, but 89% of customers buy again a not fully satisfying product if customer service is excellent. Once again, this points out that the best company key factor is the best possible relationship with customers, rather than the best possible products (Ronchi, 2003)
- h. **Extend product lifecycle:** through co-creation, it is possible to establish an emotional relationship with the product that can foster to prolong product life cycle, encouraging also a correct maintenance Vs thruway approach.

8. B2I symbioses

Below we investigate the evolution of the relationship among companies and Institutions, starting from command and control approach/ policies, which is a one-way and hierarchical relationship, towards voluntary agreement that needs feedbacks and reactions (symbiosis).

The relationship evolution

Type I Command and Control was the first step towards modern sustainability policies. At the beginning these laws were focused on safety in the working environment, and then have been widened also to environmental emission and waste management. These kinds of laws

reflected a one-way relationship between Public Institutions and companies so that, in many cases, companies do not appreciate them seeing mostly their additional management costs (Fusco Girard, 2009).

8.1 Symbiosis description

Type II and III: below we will analyse the type II and III relationship between Companies and Public / Private Institutions. We will analyse both types in the same time because both are based on considering sustainability as a development opportunity, through active involvement instead of passive laws acknowledge (Fusco Girard, 2009) and hereby the difference is not in the instruments, but in the level of involvement.

In this perspective, command and control instruments have been integrated by:

- **Economic instruments, in order to internalize external costs.** This goal is usually achieved through **emission trade system set up**. Here, a central authority sets a limit or cap on the amount of a pollutant that can be emitted. Companies are required to hold an equivalent number of credits or allowances which represent the right to emit a specific amount. The total amount of credits cannot exceed the cap, limiting total emissions to that level. Companies that need to increase their emissions must buy credits from those who pollute less. The transfer of allowances is referred to as a trade. Therefore, at least in theory, those who can most cheaply reduce emissions most cheaply will do so, achieving the pollution reduction at the overall lowest possible cost.
- **Green / Sustainable Procurement:** integrating also environmental and social criteria into procurement decisions in addition to the conventional criteria of price and quality.
- **Education:** education is a fundamental instrument to spread the sustainability concept, in order to increase the demand for sustainable product/services as well as a coherent use.
- **Voluntary agreement** is a contract between the public administration and a company in which the firm agrees to achieve a certain environmental or social objective and receives a subsidy to change its technology through R&D and innovation. The agreement is bilateral, between firm and administration, and requires a voluntary element on both sides.

It is very important to consider that best results can be achieved only by well combining the above instruments, in particular: (Carminio et al., 2002)

- Command and control instruments are necessary to guarantee minimal requirements
- Economic instruments are very useful to change implant behaviour
- Education is finalised to promote sustainable behaviour also through best practices.
- Voluntary agreement can be implemented only where there is a social background that promotes sustainability concepts.

8.2 Symbiosis sustainability evaluation

Symbioses promote sustainable organization of companies with positive impacts in achieving the sustainable objectives

- a. Achieve good financial/ economic performances also in medium-long term: Sustainability is the key strategy that European Union Institutions identified in order to

improve European companies competitiveness. Furthermore, it is important to notice that also “do nothing” option has its own costs: Munich Re (2009) pointed out that economic losses due to climate change related extreme events grew up from less than 5 Millions USD in 1950 till to current over 70 Millions USD

- b. **Promote companies integration with eco-systemic dynamics; Follow a lifecycle approach in product design; Reduce the quantity of required energy and materials, focusing on renewable; facilitate reuse / recycling:** The reduction of the impacts on natural capital is frequently the aim of such instruments, so we can assume that this goal is always - at least partially - achieved. Here it is also important to consider that these kinds of impacts are typically extra-national, so involving as many countries as possible is the key strategy for increasing effectiveness
- c. **Promote companies integration with social environment; Consider that employers have no capability limits:** Beyond the impacts on safety in the working environment, the impacts on human and social capital involve both offering and demand (Fusco Girard, 2009)
 - Offering-side policy could be achieved to spread new skills and knowledge in strategic fields. Similarly this kind of intervention can foster the cooperation among different firms to promote also knowledge spread through the creation of new network.
 - Demand-side policies are fundamental to educate customers to choose sustainable products. In this kind of intervention it is very important also the communication: for this reason these policies must be completed by a labelling system laws

9. Company internal symbioses

Below we will analyse the evolution of the internal organization of the firm, focusing on the employees relationships and on the relationship among company structures to analyse how the setting out of symbioses relationships could be useful in fostering towards sustainable development.

9.1 The relationship evolution and symbioses description

Type Ia: before **Scientific Management** internal relationships were **one-way and hierarchical**. Procedures and methods were not explicit, so companies management/white collars did not have to coordinate workers activities, but mainly to convince them to make available to the company their own knowledge (which usually remained tacit).

Type Ib: When the Scientific Management (also called *Taylorism*) spread, companies internal relationships have **usually been still one-way**, with no feedbacks between management and workers. Tacit knowledge was partially coded in procedure and methods, so that management duties were mainly focused on requiring and checking that workers effectively implemented them.

Type II: quality revolution led to enhanced productivity through improving workers role; the best way to assure that **a job gets done right is not to increase worker supervision, but to educate, empower, and trust the person assigned to the job**. Concurrent opinions and feedbacks finished the passive-workers era to foster a new one in which **every worker can contribute to the company** by defining his own duties and organization improvement.

Internal relationships developed similarly to customer-supplier relationship: if the quality is in the process, end process inspection is useless.

Type III: since the goals of companies are complex and do not involve only the economic sphere in the short term, **top management know-how, skills and knowledge cannot be enough. Top management leadership must be integrated with workers leadership.**

So, top management have to foster vertical collaboration - among different company hierarchical levels - and horizontal collaboration - among different company departments -. The aim should be to improve knowledge sharing through formal and informal networks and feedbacks (Galgano, 2004). This approach is becoming more and more common across both small and larger companies (Foray, 2006).

For example, Toyota – the car world leading manufacturer - implemented a program to stimulate employees to submit new ideas to management. The results is that in 2008 management approved nearly 100% of the 400 new ideas coming from the employee, achieving benefits in terms of quality of the final products, total costs and in employee satisfaction.

For implementing so high a collaboration level it is necessary to deeply understand that human capital has no limits capability if it is well run, if it trusts that enterprise success is its own success, and if it is conveniently trained.

Another instrument to implement symbioses in **internal relationship is the workers participation in company capital.** In such a way it is possible to extend the internal symbiosis to strategic aspects as company owners. In the USA, for example, institutional investors are increasing their stock participation in raising number of firms. (Caselli, 2006)

9.2 Symbiosis sustainability evaluation

Companies internal symbioses contributions to promote sustainable objectives achievements can be summarized in the following way. (Fusco Girard, 2009)

- a. **Achieve good financial/ economic performances also in medium-long term:** Revenues are the main driver in fostering company towards internal symbioses. First of all, the sharing of goals and strategies all around the firm is the only way to really implement them. Besides, it is universally recognised that the essential requirement for continuous improvement is the full involvement of every employee. Furthermore, workers participation in company capital allows to achieve:
 - workers stability within the firm (minimizing turn-over)
 - keeping tacit knowledge within the firm
 - trust and collaborative company atmosphere
- b. **Promote companies integration with social environment:** internal symbioses promote human development through the implementation of social networks, strengthening internal links. Indeed workers trust that, apart from their formal links with the company, their future is strictly linked with company future, which contributes to foster collaborative and constructive company internal climate. Trust is stimulated by cooperation and, in its turn, it promotes cooperation

10. Multi criteria evaluation approach for symbioses design

Multi criteria evaluation approaches and tools (Shi and Zeleny, 2000; Saaty and Vargas, 2006; Bogetoft and Pruzan, 1999) must have a primary supporting role for symbioses design and strategy implementation:

- *Ex ante* multi criteria evaluation should have a central role since symbioses require the involvement of a number of different stakeholders (eg. private companies, public institutions...) with different (and in some cases even conflicting) interests to be adequately evaluated and prioritized through multi criteria approach. The same approach can successfully support also coordination of actions of all partners/stakeholders to create synergies and positive interdependences in innovative management toward symbioses (see also Freedman, 2007)
- *On-going* multi criteria evaluation to monitor different steps effective achievements of goals and strategy redefinition, when need (Saaty and Vargas, 2006)
- *Ex post* multi criteria evaluation of pilots / experimental projects have a significant role to highlight costs and benefits and identify best practices as well as lesson learned providing benchmarks and strategies (Nijkamp and Rietveld, 1990), in order to support the definition of a path from “one shot” experiences towards ordinary practice

An important issue about the above evaluation is related to the indicators: as matter of fact, a consistent set of both quantitative and qualitative indicators is required to compare multidimensional aspects, defining targets and monitor project outcomes.

11. The role of culture to promote the wide symbioses

As we have seen above, in some case symbioses relationships are increasing and growing up, fostered mainly by economic drivers (Estes, 2009; Makower, 2009). According to that, can we assume that global economy is running toward sustainability? Can only market rules promote sustainability?

Unfortunately the most likely answer is negative.

What is needed is a **strong intentionality and a systemic approach** (Meadows, 2008): it is necessary to recognise that lot of aspects which seems to be like chalk and cheese, are just different aspects of the same issue.

So, what could be done in order to promote the **wide symbioses** and the **systemic approach**?

Symbioses are – by definition- constituted by two main elements: nodes, which are deputy of exchanges, and connections which are the mean to let the exchange be.

Currently we are living the “communication age”: internet, mobile phones, PDAs, as well as “old media” such as radio and TV make available billions of information to the public, so it can be assumed that what is needed are not new connections.

The need is to improve the nodes of the current network, making them really able to exchange information. Symbioses, in facts, can happen only among active *subject nodes* and never among *passive objects nodes*: **closing both material and immaterial loops through feedbacks and immaterial exchanges have sense only among subjects.**

Thus, there is not an issue related to infrastructures, but related to **culture**. So, in other words, **the first step in implementing symbioses is to “reintroduce the subject”** (Scola, 2006).

The subject reintroduction does not involve only the firms, but all the system of values they are part of. **Reintroducing the subject** means focusing on “why do?” and on “what to do?” instead of “how to do something” (Zeleny, 2005). In other words, it means to **promote critical thinking and wisdom**. The real challenge is recognizing links that others are not able to

recognise, understanding the connections among different form of capital and the following impossibility to long term maximize economic capital giving up other forms of capital.

But which are, practically, the values that promote the subject re-introduction, that means to promote the symbioses implementation?

Even though in a different context, F. Capra points out that there is a link among ethics, values and thought (see table below), so we need to **promote integrative thought instead of self assertive one**, (Capra, 2005) **that implies to promote integrative values for indirectly supporting the symbioses implementation** (see also Fusco Girard, 2009).

Thought		Values	
Self-assertive	Integrative	Self-assertive	Integrative
<i>Rational</i>	<i>Intuitive</i>	<i>Expansion</i>	<i>Conservation</i>
<i>Analytical</i>	<i>Synthetic</i>	<i>Competition</i>	<i>Co operation</i>
<i>Fragmented</i>	<i>Holistic</i>	<i>Quantity</i>	<i>Quality</i>
<i>Linear</i>	<i>Not linear</i>	<i>Domination</i>	<i>Association</i>

Table 2. Values and Thought

12. Conclusions

In the new global context - characterized by a growing complexity and uncertainty, increasing scarcity of natural resources and energy, climate destabilization, in which public institutions, consumers and NGO are demanding a better environment quality - business sector is charged by new responsibilities, **companies play a central role in the strategies for sustainable development effective implementation**. (World Business Council for Sustainable Development, 2009)

In the above context, we pointed out, in order to achieve sustainable company management, the importance of closing both material and not material flows, that is the wide symbioses generating/promoting.

All the nodes of the network which the company is part of could promote the wide symbiosis model: innovative relationships with other companies, with customers, with public institutions as well as company internal relationships. This should be the master way to real implement sustainability.

To the above aim, cultural aspects play a great role: we need to promote integrative thought instead of self assertive one that implies to promote integrative values.

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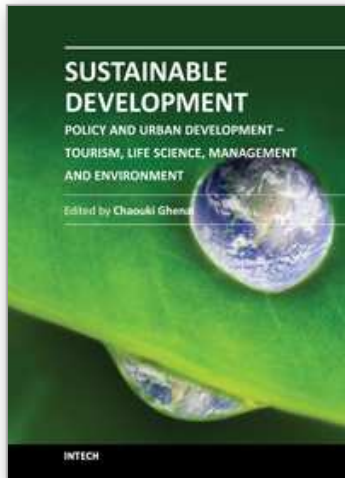
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