Area of protection in S-LCA: human well-being or societal quality

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Abstract:

Purpose:

The set of stakeholders included in the Social Life Cycle Assessment (S-LCA) guideline (UNEP/SETAC 2009) could create confusion as to the target of the assessment: individuals or society. This paper attempts to develop the epistemological foundations of S-LCA in social sciences. Its major discussion is who should be addressed in S-LCA: individuals or society as a whole. This article contributes to the definition of a social life cycle based on sociological perspectives.

Methods:

This paper is a critical evaluation of well-being methodologies and sociological perspectives used to analyze the effects of a change in a social system. The two perspectives, individualistic and holistic, have been evaluated based on four criteria: subjectivity, social values, possibility of aggregation of social data and rebound effects. We have examined different points of view in the sociologic discipline to determine which perspective would be more suitable. Insights have been taken from structural-functionalist, symbolic interactionism and conflict theories to answer the troubling debates identified in S-LCA: Can the life cycle defined for LCA be used in S-LCA? More specifically, does S-LCA include the same actors and timeline as LCA? Does aggregation of data of individuals convey the characteristics of a society?

Results and discussion:

Organizational or technical change induce new cost and benefits in the social system. When focusing on the well-being of individuals, little emphasis is directed to the relations between people and thus social costs and benefits are not valorized. The sociological perspectives that deal with social change (structuralism, functionalism and symbolic interaction) seek to explain social phenomena based on the relations that are established and affected by a social phenomenon. The sociologic concept has brought insights to the definition of a social life cycle, the object of S-LCA.

Conclusions:

This paper is an attempt to bring the attention of S-LCA practitioners to the concept of social change defined by sociologists. Whether society is considered as a sum of individuals or as an independent entity determines our approach as individualistic or holistic. This would obviously influence our perspective in the selection of stakeholders of the life cycle, the boundaries of the analysis and the indicators to be assessed. We recognize the central social matter of a product system as its contribution to the overall order in a society.

***Keywords**: Social Life Cycle Assessment (S-LCA), well-being, societal quality, individualism, holism, epistemology, Area of Protection (AoP)*

1. Introduction

Consumers are more and more concerned about social impact relative to the products they buy, leading to the rise of debates such as “fair trade”, “fair use of resources” and “socially responsible consumption.” This pressure from consumers for a higher quality of life on enterprises has prompted them to not only be economically viable and environmentally sustainable but also to magnify their social benefits and avoid unaccepted ethical matters such as child labor, excessive working hours, unhealthy working environment and so on. While the principles of sustainable development are well defined, it is still difficult to achieve a similar consensus on an operational definition that can be used to assess the effectiveness of specific actions (Swarr 2011). The concept of Corporate Social Responsibility (CSR) has emerged in this regard as: “the commitment of business to contribute to sustainable economic development, working with employees, their families, the local community and society at large to improve their quality of life” (Holme & Watts 2000, P.10). However, this approach lacks operative quantitative methods of calculating social effects a business may have on society. S-LCA was introduced in mid-1990s, based on the framework of an environmental assessment developed in 1960s - Life Cycle Assessment (LCA). S-LCA aims to assess the impacts that a product has on the people who interact along the life cycle of that product. There have been several attempts to formulize the social assessment and make it as robust as the environmental part of this assessment, such as Guidelines for S-LCA of products developed by the United Nations Environmental Program and the Society for Environmental Toxicology and Chemistry (UNEP/SETAC 2009) and progressively The Methodological Sheets for Sub-categories in S-LCA developed by the same organizations (2013). These guidelines provide recommendations on how to conduct the first two phases of S-LCA (i.e., goal and scope definition and life cycle inventory). The research on the third phase (life-cycle impact assessment, LCIA) was, at that time, not considered sufficiently mature to be included (Sureau et al. 2017). Impact assessment methodologies are under development and S-LCA is an open field for future research (UNEP/SETAC 2009). While the Guidelines (UNEP/SETAC 2009) are an important reference for the methodological framework for S-LCA, they currently co-exist with a plethora of other S-LCA methodological frameworks and methods (Wu et al. 2014, as cited in Sureau et al, 2017) which incorporate alternative criteria and indicators into S-LCA framework. “It is foreseen and desirable that the methodological sheets are a living resource in the sense that they continue to evolve and their content is expanded over time” (UNEP/SETAC 2013, p.5).

The S-LCA guideline (UNEP/SETAC 2009) considers social impacts as those that may affect stakeholders along the life cycle of a product and may be linked to company behavior, socioeconomic processes and impacts on social capital (UNEP/SETAC 2009, p.37). Furthermore, it considers these impacts consequences of positive or negative pressures on social endpoints (i.e. well-being of stakeholders) (UNEP/SETAC 2009, p.32). However, in the S-LCAs carried out to date, the term social impact is used in a broad manner encompassing the notions of effects, consequences, social change processes and presence of social attributes (UNEP/SETAC 2009, p.69, footnote 48). Among the six main categories defined in the guidelines (UNEP/SETAC 2009) as human rights; working conditions; health and safety; cultural heritage; governance; and socioeconomic repercussions and the range of five stakeholder categories (worker, consumer, community, society, and value chain actors), the most considered stakeholder category is “workers” (Petti et al. 2014) and consequently the most analyzed indicators are relevant to this category (fair salary, health and safety, child labor, equal opportunities/discriminations) (Wu et al. 2014; Kühnen and Hahn 2017) which shows the dominant thinking of CSR focusing on individuals directly involved in the production system as recipients of the product systems’ effects. “Currently, much of the S-LCA literature reflects a focus on society as a collection of individuals, with impact

categories used in the case studies more often focusing on an impact that falls on an individual rather than an impact to a community overall (methodological contributions examining community-level impacts include Feschet et al. (2013) and Bocoum et al. (2015), which both address relationships between economic activity and population health)" (Grubert 2016, p.7&8). "A perspective that considers how the development of a product would affect the social structure in which it will be embedded seems to be lacking" (Zamagni et al. 2011, p.597). The hypothesis that focuses on individuals would have repercussions on S-LCA methodologies (Iofrida et al. 2017) omitting social relations and cultural context of the target population. The shortage of case studies on holistic perspectives of product systems in S-LCA or/and the dominance of individualistic case studies has encouraged us to conduct a study to examine the features of S-LCA in a holistic perspective. In the S-LCA literature, the holistic perspective is considered as a methodology among many others. It is an epistemological question whether to adapt an individualistic approach or a community (or society) level approach. Most of the S-LCA applications take into account values, stakeholders' perceptions, subjectivities, and participation in an interpretivist way, but often without clarifying their theoretical underpinnings (Iofrida et al. 2017, 2018). S-LCA needs further grounding in sustainability science (Sala et al. 2013) and social sciences to improve its rigor (Grubert 2016). Although S-LCA is a management tool which needs to be practical, simple to understand, and relatively fast to perform, eventually we have to decide to what extent rigor should be sacrificed for practicality. Proponents of Life Cycle Management (Fullana i Palmer et al. 2011) have already called for more social science input, mainly to help LCA practitioners better navigate the political, social, and cultural contexts in which they work. An arena where rigor remains challenging is defending the topics of inquiry and more fundamentally, the choice of the area (or areas) of protection (AoP) that S-LCA should address (Grubert 2016). "A reinforcement of the theoretical bases of S-LCA is needed, with more attention given to the epistemological discourse" (Iofrida et al. 2018, p.477). Despite the consensus on considering S-LCA and the other life cycle assessment methodologies to be management tools to work toward more sustainable patterns, it is doubtless that S-LCA addresses social impacts, which are a concern of sociology which entails that the epistemological eclecticism of these disciplines (management and sociology) be reflected in S-LCA literature (Iofrida et al. 2018).

This paper aims to improve the scientific embeddedness of S-LCA in sociological perspectives by contributing to its epistemological discussion of social analysis. Epistemology defines the way to reach knowledge. In this paper, we review the sociological paradigms that have been developed to analyze social change. Throughout sociological thinking we encounter two opposing intellectual convictions, that of individualism which considers the starting point of sociological thinking to be human individuals (a position originating in Max Weber) and that of holism which by contrast claims that the starting point must be the collective entity of society itself (a position attributed to Emile Durkheim) (Šubrt 2017). Meanwhile some theories have emerged viewing both these tendencies as one-sided and limited and attempted to overcome them by bridging or linking them. Among these theories are the symbolic interaction theory (Blumer 1969), embeddedness (Granovetter 1985/2000) and more recently Social Quality Theory (Walker and Maesen 2002) which considers the individual as the core unit of the society who shapes the social structures by interacting with other individuals.

In the following sections of Part One, we present the definition of terms employed by the well-being methodologies and sociological perspectives that support our discussion in section 3. In section 4 we see how the social life cycle (social system) may be adjusted to be compatible with the sociological perspective.

1.1. Area of Protection

Issues of importance to a target society (Area of Protection) are the core of a social assessment. Area of Protection (AoP), also known as safeguard subjects (Weidema 2001) or damage categories (UNEP/SETAC 2009), are the entities to be respected in the social assessment. AoP acts as a benchmark defining the ideal situation. The divergence or convergence to this point marks the quality of situation. Joroen (2002 cited in UNEP/SETAC 2009) has defined AoP as a cluster of category endpoints of recognizable value to society. Therefore, the AoP is very much relative to the social context of assessment. However, there is a major discussion between S-LCA researchers on which social impacts should be investigated or which hypotheses should be validated. The social impacts considered in an analysis are mainly on human capital, human well-being, cultural heritage, socio-economy and social behavior (Weidema 2006; UNEP/SETAC 2009). Other authors have listed other goals or have used different wording to present the AoP list in S-LCA: human dignity and well-being (Hauschild et al. 2008); autonomy; well-being (in the sense of freedom); fairness based on a capability approach (Reitinger et al. 2011); and human dignity and health (Dreyer et al. 2006). Papers on S-LCA show a broad consensus that the AoP should be human well-being itself (Weidema 2006; Dreyer et al. 2006; Jørgensen et al. 2008, 2010; UNEP/SETAC 2009, Reitinger et al. 2011). The concept of AoP in LCA—which includes human health, natural environment, natural resources, and man-made environment— was extended to "human well-being" by S-LCA practitioners, allowing extra-engineering values to enter into engineering discourse and practice (Sakellariou 2018).

Most of the S-LCA literature transposed the definitions of social impacts from CSR and Social Impact Assessment (SIA) into this new perspective (Iofrida et al. 2018). SIA's objective is the sustainable social development of local communities where the projects and the companies operate. SIA relies largely on the preference of local community for the definition of social development goals identified through a participatory process of planned social change designed to improve the well-being of the community as a whole and especially of the vulnerable, disadvantaged or marginalized groups within a region (Vanclay et al. 2015). CSR is a philosophy that looks at the social interest and the enlightened self-interest of businesses over the long run as compared with the old, narrow, unrestrained short-run self-interest (Steiner, 1971). Thus, social responsibility requires that business people engage in actions and change their attitude 'for reasons at least partially beyond the firm's direct economic or technical interest' (Davis 1960). That is to say, the responsible exercise of both economic and social power requires that business people look at the impact of their decisions on their workers and the communities affected and take those impacts into account in directing the economic activities of the companies in which they hold positions of responsibility (Cragg et al. 2009).

1.2. Human well-being

Well-being is gaining acceptance as an indicator of social and economic progress by many governments and agencies (Parackal 2016). However, its meaning has been discussed since the time of the Greek philosophers. Three theoretical possibilities emerge: (a) 'well-being' is an empty notion; (b) 'well-being' is an important and meaningful term which conveys meaning no other term conveys (and, given further research, will be shown to convey this meaning universally); or (c) 'well-being' is 'essentially contested'—its meaning and content fluctuates depending on who is using it, and why they are using it (Seedhouse 1995). Since the first two definitions lead nowhere, we are persuaded to focus on the third possibility. One solution to define well-being is to leave it to each individual. There are as many quality of life (well-being) definitions as there are people (Liu 1976). To distinguish what the scholars mean by the term well-being, we may refer to the approaches that they employ to discuss the matter. We can perceive two major waves of

scientific literature addressing well-being: those which focus on psychological matters of satisfaction, (eudemonic) happiness, self-perception of health which are referred as Subjective Well-Being (SWB) and those economic oriented studies which address the level of material possession through the subjects of poverty, inequality and welfare. Welfare economics has developed this aspect of well-being which relies on the premise that preferences are exogenously given and stable (Friedman 1962). Welfare economics is concerned with the conditions which determine the total welfare of a community which is equal to the sum of the utilities of all constituent individuals (Lange 1942). It develops the discourse around the marginal utility of income and the inequality in the distribution of incomes. While on the contrary, SWB is founded on the discourse of subjective preferences of individuals. SWB is associated and measured with overall life satisfaction. It is argued that human well-being is at least as much about what people 'internally' think and feel about their life (Veenhoven, 1994 in Copestake 2009) as it is about challenges that each person faces in life and their future perspectives and opportunities (Budowski et al. 2016). It's people's perception of their current state of being compared to their peers and other groups as well as to their own past (Weeratunge et al. 2014). The closer their actual situation is to their expected situation, the higher an individual's (subjective) well-being.

Emergent approaches, such as that of researchers at International Well-being Group at University of Bath-UK, have proposed a third dimension of well-being, adding human relations to the subjective and material measures. 'Relational' aspects include relations of love and care, networks of support and obligation, social, political and cultural identities, including relations with respect to organs of the state and formal structures, which determine the scope for personal action and influence in the community (White, 2009). This particular model of well-being is also referred to as "social well-being" in order to distinguish it from approaches that emphasize only well-being's subjective and material aspects (White 2009; Weeratunge et al. 2014; Belton 2016).

1.3. Societal Quality

Societal quality is the term employed in this paper to comprise the elements of society which stabilize its overall conditions and guarantee its maintenance. More particularly, a society equipped with such elements is capable of resolving occasional conflicts raised due to (technological, institutional and natural) changes in their conditions. To discuss such conditions, we refer to sociological perspectives which deal with the issue of social change. In this section a brief introduction to two main sociological perspectives that each look at a society from different points of view are given. The objective of this introduction is to see the characteristics of a socially sustainable society through each of these perspectives. We take insights from these sociological perspectives for the development of the discussion on the goal (AoP) of S-LCA.

Since the seventeenth century the confrontation of social structures and the role of individuals in shaping them was a debate among philosophers. Social contract as a dispositive of sovereign's control over people is presented by Thomas Hobbes in *Leviathan*, while John Locke sees it as having a protection function over the liberty and property of citizens. Hobbes assumes a sovereign power of social structures over the actors and Locke believes society is founded on an accord of its members. In the first, it is the sovereign who is in charge of defining the good in the society and in the second it is based on the consensus of its citizens. Rousseau has a position between the two and sees society as a submission of an individual's will to the general will. The more recent sociological perspectives that have investigated the interaction between social structures and individuals are: symbolic interactionism (Blumer 1969) and structural functionalism (Parsons 1937/1968). The prominent philosophers and their corresponding theories of structural

functionalism[1] are Niklas Luhmann (social systems theory), Talcott Parson (action theory) and Emile Durkheim (division of labor). According to functionalism, each of the social institutions (family, educational system, politics, economics, etc.) contribute functions to society (reproduction, transmission of knowledge to youth, governance and production of goods and services). In social studies the holistic perspective refers mainly to Durkheim's view on society as an independent social fact *sui generis*. Durkheim (1895, 1982) contended in a passage from *The rules of Sociological Methods*, "the group thinks, feels and acts entirely differently from the way its members would if they were isolated. If therefore we begin by studying these members separately, we will understand nothing about what is taking place in the group."

The Chicago School of Sociology's pragmatism view discusses the role of human interactions in shaping social processes and eventually social organizations. This school of thought -- particularly that started by Goerge Herbert Mead and then echoed in the works of Blumer (1969)- believed that the study of human behavior must begin with human association, a notion that was not common in the viewpoint of early American sociology, which treated the individual and society as discrete entities (Meltzer and Petras 1970). In Blumer's view, social institutions exist only as individuals interact. Society is not a structure but rather a continuing process where agency and indeterminateness of action is emphasized (Collins 1994). Gerson (1976) has stated such relationships between individuals and society generate each other via a continuing process of negotiation. This approach rests on the assumption that both social order and individuals arise in and through a process of ongoing negotiation about who shall be whom and what order shall pertain. The path of a society's creation departs from the interactions and leads to structures and not the other way around. This is the main difference between action-structure duality and structuralism which believes that the individuals' actions are determined by structures, leaving them no autonomy (inspired by Boudon and Bourricaud 1982).

Hybrid methodologies emerge by crossing these two methodologies. Giddens (1987) proposes the study of reciprocal relations between actions and institutions. Among those we may refer to Social Quality Theory (2017) that has defined "the social as the outcome of the dialectic between processes of self-realization of people (as social beings) and the formation of collective identities." Social Quality Theory (SQT) follows a consistency between individual recognition as social beings and societal solidarity, taking social cohesion as a conditional factor and social recognition as a constitutional factor, and sees their interplay as the most crucial issue (Lin and Herrmann 2015).

2. Research Method

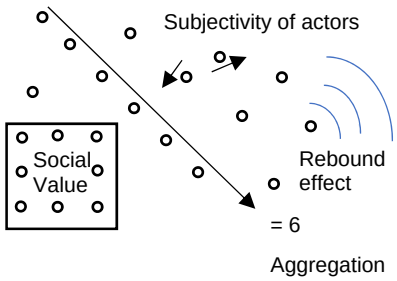
Since the well-being perspectives (SWB and welfare) concentrate on individuals and the sociological perspectives look at the whole society (each based on their own definition), we are considering in this paper the two visions of individualism and holism. The individualism-holism debate is one of the most important yet most misunderstood debates in philosophy of the social sciences (Herfeld 2018). This confrontation is analyzed based on four criteria: subjectivity, social values, possibility of aggregation of social data and rebound effects. Through this debate, we discuss the information that would be acquired through studying human actors (agents) as opposed to learnings from studying their actions (agency). Changing the individualistic perspective to a holistic one in S-LCA would have effects on its

[1] Since the boundary between structural-functionalism and functionalism was never rigid (Bernard 2000) we would use the term functionalism through the text which represents the ideas of sociologic discourses pertaining to structuralism, functionalism and structural-functionalism.

methodological features. In this paper, the boundaries of the system would be discussed by reviewing the concepts developed by sociologists.

The methodology of this research is founded on two principle phases (Fig.1). First, the S-LCA literature[2] were screened to identify the methodological gaps and the challenges of S-LCA application (second column in Fig.1) and then at the second phase a conceptual review of sociological perspectives was realized (first column in Fig.1) and solutions to the S-LCA methodological challenges were presented (third column of Fig.1). The sociologists' points of view on four criteria of subjectivity, social value, possibility of aggregation of social data and rebound effects have been investigated (in section 3.3, 3.4 and 3.5). A discussion on the nature of social change has been added to facilitate the proceeding discussions.

Figure 1: Schematic representation of methodology

Sociological perspectives	S-LCA challenges	Result
Insights Structural-Functionalism Symbolic Interaction		Definition of a Social System for S-LCA
Sections 3.2, 3.3, 3.4 & 3.5	Section 3.1	Chapter 4

3. Results

3.1. Epistemological challenges of S-LCA

The S-LCA studies present a wide range of challenges that is coherent with its diversity of ways they have approached the social issues and the methodologies used. Iofrida et al. (2018) have classified S-LCA literature between two main paradigms: post-positivism and interpretivism. Their review, that has been carried out on S-LCA literature from 2003 through 2015, ascribed about 73 % of the studies to the group of interpretivism-oriented paradigms, and only 24 % to the post-positivism. The orientation towards UNEP-SETAC (2009, 2013) approach which emphasizes stakeholders' involvement, social values, actors or companies' behavior and context specificities has been classified as interpretive. Those who followed the causal chains (known as impact pathways) were ascribed to post-positivism. The positivists are characterized as value free, objective, reductionist and affordable and the interpretivists are considered to be rich in meaning and values, relativist, holistic, long and costly.

S-LCA practitioners rely mainly on the procedure described within the UNEP/SETAC (2009) guidelines to define the goal and scope of the study and do not question some key aspects that makes the analysis a challenge such as functional unit and system boundary definition (Zanchi et al. 2018). Also for those who seek to model the social consequences raised by a product system, the central problems seem to be how to relate the social indicators to the functional unit of the product-system and how to restrict the many social indicators proposed to a manageable number (Kloepffer 2008).

[2] It is not an exhaustive literature review by itself

The inherent value-laden and context specific nature of social aspects remains one of the key challenges for developing a general applicable framework (van Haaster et al. 2017; Freidberg 2018). A coherent discussion about the social values and ethical and ideological positions that underlie the indicators of social impacts is missing (Baumann et al. 2103; Iofrida et al. 2018). More research is needed concerning S-LCA's applicability to the social analysis of systems and services (Sousa-Zomer and Cauchick Miguel 2018).

Finally, the actual S-LCA methodology seems to offer little or no assessment in regards to the actual functional societal benefits of a product during a product uses phase (Shin et al. 2015). The use stage and the relations between value chain actors receive less attention than the production stage (Sureau et al. 2017). The set of indicators and subcategories proposed by the UNEP/SETAC (2009) guidelines for the use phase relate to the company behavior/general behavior like consumer complaints, quality labels, management measures to improve transparency like publication of sustainability reports, and privacy of consumer data (Subramanian and Yung 2018). These indicators target the satisfaction of the consumers from the product and from the interaction they have with the retail seller. However, the use phase may be interpreted in another way: the effects that the consumption (presence) of the product would have on the social interactions. Some aspects of the S-LCA methodological challenges overlap with the on-going discussions between LCA practitioners. LCA methods suffer from uncertainties because of "the (unknown) system behavior" and also because of "the uncertainty in value" (Hofstetter et al. 2000). Practitioners of LCA acknowledge that more input from social scientists can help advance the cause of life cycle management (Freidberg 2015).

3.2. Nature of social change

The inherent nature of the impacts under assessment are different in S-LCA from LCA, as the latter was conceived to analyze environmental impacts (linked to natural sciences) and the former to analyze social impacts (belonging to the realm of social sciences) (Iofrida et al 2016). As discussed earlier, the social change may be studied at the level of social context, at the level of individual behavior change, or in terms of the relation between the two (Trommsdorff, 2000). Other words employed by other sociologists for these two extremes are "social structures" and "economic action" (Granovetter 1985), institutions (or constraints) and actors' interaction (Bernoux, 2004/2010). By studying the case of a car factory of Volvo in Kalmar in 1960s, Bernoux (2004/2010) announces that it is the reaction of workers to the (institutional and technological) changes that caused social change. Disruptive behavior (conflict) is the change maker (Goffman 1983) in social structures. The conflictual situation creates an environment which leaves no other alternative except opting for new agreements. They are processes, issued by a social or technical change, which induce new costs and benefits (social, economic, politic, etc.) (Leroy 2005). In two other situations, compromise and consensus (Bellenger 1998), the initial situation keeps progressing and its evolution is so slow that it is not noticed as a distinctive change. Contrary to the changes made by conflict, these are minor improvements and adjustments (transitional) that do not change the system's core (transformational) and that occur as the system naturally grows and develops (Levy 1986). In management and organizational transformation discussion, those which are transitional are ascribed as the *first-order change* and those which transformational are ascribed as *second-order change* (Hernes 1976).

Table 1: The characteristics of first and second-order change in organizations (Levy 1986)

First-Order Change	Second-Order Change
Change in one or a few dimensions, components, or aspects.	Multidimensional, multicomponent change and aspects.
Change in one or a few levels (individual and group	Multilevel change (individuals, groups, and the

level).	whole organization).
Change in one or two behavioral aspects (attitudes, values).	Changes in all the behavioral aspects (attitudes, norms, values, perceptions, beliefs, world view, and behaviors).
Quantitative change.	Qualitative change.
Change in content.	Change in context.
Continuity, improvements, and development in the same direction.	Discontinuity, taking a new direction.
Incremental changes.	Revolutionary jumps.
Reversible changes.	Irreversible change.
Logical and rational change.	Seemingly irrational change based on different logic.
Change that does not alter the world view, the paradigm.	Change that results in a new world view, new paradigm.
Change within the old state of being (thinking and acting).	Change that results in a new state of being (thinking and acting).

Transformational changes are characterized by discontinuity of continuous processes. Any stable system can, on hitting an instability threshold, go through radical changes that culminate in a new structure based on a new ordering principle (Zeeman 1976). If the capacity of the society to adapt to the changes in its environment (i.e. technological, institutional etc.) is not compatible with the speed of the change, then dysfunctional elements of the society would disrupt the social stability. Thus the social term "stability," which bears the sense of sustainability in sociological matters, does not carry only the sense of maintenance but also resilience and flexibility reflecting the capacity of the society to adjust itself to changes. Transformation is defined not by any reference to what it really is, nor by reference to any physical cause of the change, but by the giving of a set of operands and a statement of what each is changed to (Ashby 1956/1999). To identify the extent to which a change in the product system is relevant to the social stability, we repeat Strauss's (1993/2017) question: "how is (the) change related to (social) order or disorder?" or more particularly "what is changing, what aspect of it, in what direction (for worse or for better) and at what rate?" These questions are concerned with what happens, not why it happens.

3.3. Preferences and action

In most views, the objectivity and authority of science is not threatened by epistemic, but by contextual (non-cognitive) values (Reiss and Sprenger 2017). In this section we discuss two matters of subjectivity: that of the researcher and that of the effect of social values on the responses the population provides at the time of data collection. Social aspects can be highly diverse and are weighted very differently by different interest groups and in different countries and regions (Grießhammer et al. 2006). What a given society regards as true or false, scientific or unscientific, right or wrong, lawful or unlawful, beautiful or ugly, is conditioned fundamentally by the nature of the dominant culture. Based on the classification of societies by Sorokin (1959), societies are either "ideational" (based on truth of faith) or "sensate" (truth of senses) or a mixture of the two which is designated as "idealistic" (based on truth of reason). In each culture, the

other two are considered to be wrong. Thus, claiming the rightfulness of a society's (working, living, institutional) conditions based on another society's values would be invalid. Hofstetter et al. (2000), have proposed considering the cultural perspectives (archetype) in modeling the value sphere in the context of LCA. Social facets are even more influenced by context than environmental or economic facets (Sierra et al. 2017). The matter of identification of cultural context is particularly relevant at the time of choosing indicators for a social analysis. While the individualized indicators offer a robust approach to assessing quality of life at the individual level, they are less useful when community and other social relations are the focus of analysis (Siltaniemi and Kauppinen 2005). Granovetter (1985/2000) who sees individuals' actions embedded in social structures, affirms that sociologic approaches based on norms, roles and values, like the economic theories of market, are far from the context of action and thus have the tendency of minimizing its influence. Individuals' behavior can't be explained neither by their interest nor by structural constraints, but we should take into account the concrete reciprocal social relations and the social context where the individuals are involved (Bernoux 2004/2010).

Nonetheless, concerning the 31 sub categories of assessment described by UNEP/SETAC (2009, 2013), for general applicability this method requires large amounts of data which is not always available, and there is a large influence of the subjectivity of the individual researcher (Blom and Solmar 2009; van Haaster et al. 2017). The focus on values and subjectivity in S-LCA is extremely valuable not only for S-LCA but also for other methods, most notably LCA (Grubert 2016). To effectively communicate the criteria for whom and what was included in and excluded from the assessment is a major credibility factor (Swarr, 2009). Within the S-LCA framework, stakeholder participation increases the legitimacy (and credibility) of results (von Geibler et al. 2006; Mathe 2014). A participatory approach of data collection is usually based on the principle that there is no one more adequate than the people involved in the sector to determine what is good and what is bad for themselves. Although, (in the majority of cases) the scope is driven by the discipline represented by the monitoring team, rather than by the interests of all affected parties (Berkes, 1988). Different mechanisms are applied based on the empowerment and capability of society members. We have to make sure that the categories of indicators that we are considering to evaluate the social impact of the society are valid for that particular society. For instance, in some societies the fact that a child works (and gains his/her living) is appreciated. One might say that the international organizations' agreements are one good indication of social values that have to be respected by all its member countries. These values are, however, normative ideals that are anticipated to become universal. Some societies might be far in terms of attainment of goals of the agreements signed by their countries' representatives. On the other hand, the absence of one quality should not be translated as a weakness since other qualities, not considered in the assessment, may compensate. Therefore, the social (and socio-economic) impacts to be covered in an assessment and the way this should be done needs to be case and context specific (UNEP/SETAC, 2009). A literature review carried out by Petti et al. (2014) shows that some S-LCA authors have used, among social indicators, elements which are the characteristic indicators of a given sector to better characterize the context in which a company operates (although not present in the Guidelines), which would have little meaning if considered within a different context. The value laden nature of the social indicators justifies the context based methodology of S-LCA. That does not, however, mean that the data has to be collected from each actor separately, but the social indicators have to be sought in the society where the assessment is being carried out. On a global scale one could avoid confronting the stakeholders with "Western-imposed social benchmarks" (Pelupessy cited by Grießhammer et al., 2006).

The matter of subjectivity is relevant to both perspectives. The weight of subjectivity in the well-being perspective is on the social values of the research population and in the societal quality perspective on the researcher's personal values. Weber (1904/1949) rejects the point of view on which both positivists and subjectivists agree: the absence of

presuppositions. He found it "necessary" that the social scientists formulate presuppositions in order to give order to the chaos of infinite multiplicity, enabling the social scientist to choose a part of concrete reality which is interesting and significant to us (Hekman, 1983). We have to figure out to what extent the economic action is embedded in structures of social relations. Neither should the embeddedness be considered over-socialized nor under-socialized. In order to reduce the involvement of the researcher in the selection of social impact indicators, one should discover the preference of the research population by examining the actions they conduct. Based on "strategic actors' theory" (Crozier and Friedberg 1980), peoples' preference is reflected in their actions. They are rational agents who, despite their cognitive limitations, would decide the optimal choice available in the structures of their environment. Therefore, by studying the trends of actions of the target society, we would realize the main issues that are important to the society. By such, we include social values such as equality, fairness and freedom or even deeper concepts such as justice and dignity in the structures of the environment. We presume that actions are based on rational decisions considering all elements of the context which are known to the decision maker. Nevertheless, declared preferences, such as "what would you do if …", are idealistic in that they are not necessarily in line with the structure of the society. The common criticism of life satisfaction, as well as related indicators such as happiness or malaise as measures of well-being, is that they measure only individual states of mind based upon psychological theories, which is not necessarily helpful for measuring the quality of society as a whole (Abbott and Wallace 2012). Etzioni (2018) in his book *Happiness is the Wrong Metric* has addressed the influence of social norms on the dynamics of society:

> "*The societal structure and culture considerably influence the lifelong struggle between the pursuit of happiness and the quest for affirmation. These collective forces, rather than individuals' preferences and actions, greatly affect whether the quest for affirmation or the pursuit of satisfaction, or a carefully-crafted balance between the two, guides individuals' conduct and societal dynamics. That is, individuals have much less agency than several influential social scientific theories, major ideologies and the general public assume. It follows that those who seek to understand the components of, and attempt to form a good life and a good society should grant greater importance to social action, in which individuals act in unison and draw on shared norms and institutions, than to individual agency*".

Individuals' preferences reveal the distance of the desire of each individual from the normative ideal that he/she has in mind. Though the preferences are social products that can be collectively modified (Etzioni, 2018), though it does not tell whether the society itself has or does not have the characteristics. Nevertheless, it is essential to track citizens' subjective sense of happiness and life satisfaction to improve societal conditions and maximize the fulfilment of human potential (Diener et al. 2018). The pragmatist paradigm of sociology has defined preferences in another perspective: that of the meaning that people give to each action. In this regard, social impact is based on three 'premises' that define its scope and mark out its distinctive analytical stance: (1) people act toward things based on their meanings; (2) these meanings arise in social interaction; and (3) conveying and changing meanings demands that people define and interpret situations (Blumer 1969). The security of the system implies that the actors coordinate their actions and each personally try to adapt him/herself to the system with coherent actions (Crozier and Friedberg 1977).

To conclude, what is expressed in questionnaires or interviews is not what one really believes, but actions reveal the veritable desire of people. Sociological methodologies mainly rely on the action (and interaction) of people while well-being studies pertain to psychological analysis which measures the satisfaction and preference of the people.

3.4. The rebound effect

The uncertainty of human behavior arises from the fact that the consequences of each individual's action may affect the behavior of other actors. Paraphrasing the LCA terminology, the adoption of a societal perspective implies that a *ceteris paribus* assumption does not hold: interrelations exist that need to be evaluated (Zamagni et al. 2011). Even in the environmental impact assessment, where the future is assumed to be predictable, some authors have challenged this mechanistic and equilibrium-centered view, arguing that there will always be surprises (Berkes 1988).

Each change in the production system may have its particular effect on the society and each effect, in turn, may create its own consequences (e.g. change in socio-cultural relations). This stems from the fact that every product is accompanied by a particular production-consumption culture. The social domain (compared to natural sciences) is complex due to the existence of strong interactions between factors leading to multiplier effects (Rey and Cunninghum 2003). Sierra et al. (2017) outlined that social sustainability assessment has two aspects:1) the social contribution in terms of how interventions interact with their context and 2) the potential benefit distribution effects on a long-term basis balanced with its short-term contributions. The impact of a single technology at the macro level is generally small, but could potentially be large (van Haaster et al. 2017). In the case of a major innovation, as Shumpeter has held up, it is always accompanied by other issues, which leads to modification not only of the economic relations, but also social, political and cultural relations which contributes to a larger change (Bouchard 2006).

Weidema and Thrane (2007) define rebound effects for production and consumption changes as derived changes in production and consumption when the implementation of an improvement option liberates or binds a scarce production or consumption factor (money, time, space and technology). They distinguish three types of rebound effects; that of 1) the production-consumption of the product under assessment, 2) overall production-consumption, 3) behavioral and organizational changes (socio-cultural rebound effects). Each rebound effect will in turn create another series of changes resulting in an endless rippling effect. Smetanin and Stiff (2016) have included "induced" and "systemic" impacts in addition to direct and indirect impacts of investments. For instance, in the case of a new investment, the intended (direct) impact is to increase the profit of the company, of which its byproduct (indirect impact) is creation of new employment. This increase in real wages, employment and productivity would induce impacts on the local economy as those newly employed spend their income buying product and services offered by local enterprises, which leads to new investments and also additional taxation revenues for the government. Systemic impacts, however, endure footprint generated by investments (or its absence) on the shape of the environment where the individuals interact, addressing more particularly the connections among agents and industries.

3.5. Aggregation of social data

After the categories of analysis have been decided on, the researcher must decide whether or not to bring the disparate categories into one aggregate indicator. According to the UNEP/SETAC (2009) guidelines "the action of summing or bringing together information (e.g. data, indicator results, *etc.*) from smaller units into a larger unit (e.g. from inventory indicator to subcategory) in S-LCA -aggregation of data- may be done at the life cycle inventory or impact assessment phase of the study and should not be done in a way that leads to loss of information about the location of the unit processes." Weidema (2006) has proposed modeling or aggregating the results of the subcategories in order to present one overall indicator of well-being. Nevertheless, the pathways connecting the inventory data to the impact categories are not yet fully identified to aggregate them as a single result. Kruse et al. (2018) have classified socio-economic indicators between two main categories of additive and descriptive indicators. The additive indicators are aggregated with a scoring system in type I (S-LCA methodologies with no causal relationship) characterization model (Wu et al.

2014). Weighting, as described in ISO 14040 (2006), is converting and possibly aggregating indicator results across impact categories using numerical factors based on value-choices. The fact that the data prior to weighting should be available is also emphasized in the ISO 14040 (2006). Presenting the initial data would bring transparency and may reduce the confirmation bias, but the main problem still remains, which is the meaning that the accumulated data convey. Nevertheless, weighting requires comparisons with benchmarks and the act of mental comparison and selection of benchmark are both arbitrary. do Carmo et al. (2017) proposed an approach based on customized value function to overcome the linearity problem of weighting social indicators. However, this approach is also based on the S-LCA expert's judgment, which may solve the linearity problem but amplifies the subjectivity associated with the expert's value judgment.

While thinking about aggregating indicators, we have to consider the fundamental principle that objective and subjective dimensions are separate entities that normally bear little or no relationship to one another, and so must be separately measured (International Wellbeing Group, 2013). It is very common to confound this rule even though the researcher admits it in advance. The subcategories to be covered in S-LCA inspired by ISO 26000 (2010) are not of one single nature (subjective and objective). The assessment of social impacts involves several hundred specific indicators. Therefore, aggregation is, if not impossible, at least heavily value-laden and, therefore, not recommended (Hunkeler 2006).

Unlike the natural scientist, the social scientist is not interested in the common or average aspects of the facts under consideration; rather the social scientist is interested in their characteristic traits, their cultural significance, and their meaningful interrelationships as defined by the problem at hand (Hekman, 1983). The statistical feature of social indicators of sustainable development is to reflect the detail of distributions under different arrangements and not average or modal situations (Antoine 1999 in Rey-Valette and Cunningham 2003). An increase or decrease in the level of social indicators should neither be considered negative nor positive. The value of the change is relative to the future plans of the region, and whether that change complies with that plan or not. Nevertheless, the evaluation of social experiments need not be in terms of the degree to which they have fulfilled our *a priori* expectations, rather we can examine what they did in terms of what we now believe to be important (March 2006).

It seems clear at this time that indices which use an additive functional form and arbitrarily weighted variables are of little value (Wish, 1986). Studying each single indicator separately can be a solution to avoid the aggregation problem. Either this comparison is carried out between two alternatives or the situations of the case study before and after the change in the product system. Another solution can be simply limiting the assessment to a single end point indicator. Endpoint indicators have the advantage that they can reflect the potential damage or benefit to the AoP, having the advantage, in theory, that no subjective weighting is needed (Jørgensen et al., 2008).

4. Discussion

Whether the aim of S-LCA is to pinpoint the effects of a change in the activities of a value chain on the wellbeing of individuals or that of the society in which they live (Macombe 2013) makes a great difference in the approach we adopt to analyze the effects. The disproportion of S-LCA studies regarding the two perspectives of individualistic and holistic encouraged us to examine the features of S-LCA, particularly that of the boundaries of product system, based on the holistic perspective. The richness of S-LCA literature in individualistic perspective allows us to compare them with that of the prospective holistic features of S-LCA.

When O'Brien et al. (1996) first introduced the integration of social analysis into LCA, they were aware of the particular characteristics of a social cycle as being an "unstable process with complex and shifting boundaries". Nevertheless, they contend that combining engineering and social science data and, to a lesser extent, perspectives makes the process of assessment more transparent and more complete. Two conceptual views of the system exists, and often coexist, in S-LCA literature; one technical approach, defining life cycle stages in terms of technical processes related by material or energy flows, and one description of the system in socio-economic terms, selecting organization as system units (Dubois-Iorgulescu et al. 2018). As described by Lagarde and Macombe (2013) in addition to product, material or energy flows of LCA, the system links organizations by a flow of services that create interdependence.

The precedence of the environmental assessment to the social one influences the S-LCA system boundaries. For those studies that realize both environmental and social LCA, the system created for the LCA is used as a starting point for S-LCA's system (Dubois-Iorgulescu et al. 2018). A second layer (Parent et al. 2010) referring to organizational context is proposed to be added to the initial environmental system to include the social stressors. Employing an identical or an equivalent system boundary (van Haaster et al. 2017) to that of LCA for S-LCA is valuable in the sense that it gives more objectivity to the boundaries, the life span of the product and the stakeholders involved. In life cycle sustainability assessment, the common principle is the life cycle thinking. The UNEP/SETAC (2009) guidelines indicates that the calculation basis shall be as consistent as possible. However, consistent does not mean identical and system definition and cut-offs made in LCA are based on environmental relevance, which can differ from social relevance (Kruse et al. 2009). LCA and S-LCA studies of the same real system will be coherent, even if the descriptions of the system and the rules of fixing the boundaries differ, provided they reflect the same scenario (Lagarde and Macombe 2013). Emphasis on adjusting social analysis to an engineering perspective would limit the sphere of the study to the changes that the process of production would cause for individuals directly engaged in the production. As "the whole is other than the sum of the parts" (Reynaud 1997), even if we include all the stakeholders engaged in the process of production (organization, foreground and background processes) into the boundaries of the product system, the objective of a social assessment from the holistic point of view would not be satisfied. In the following sections we develop the concept of the social system based on the sociological perspectives.

4.1. Social life cycle and its actors

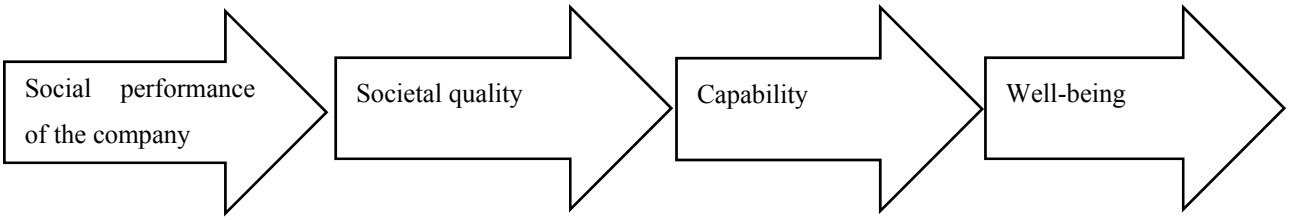
There are similar concepts to life cycle with almost the same meaning, and one has to be careful to find the nuances: product system and value chain. They all describe the articulation of flows during the making of a good (Macombe 2016). The concepts of value chain defined by economists imply the idea that, in case one actor falls out, another actor would substitute, ignoring the actor who has been eliminated. For example, a supplier of raw materials negotiates with several customers to define the optimum price and eventually chooses the best option to maximizes benefits. However, the idea of a (social) system, covers all those who are inside the system, no matter whether they are a supplier, a consumer or neither, they would be influenced by the overall functioning of the system, comprising those who are excluded due to a change. Actors may not explicitly announce their non-interest in contributing to the system, but neither do they refuse to be part of it. They may be considered neutral members of the product system. Nevertheless, they should not be omitted simply because they have (apparently) no contribution to the system. They would be affected by the social context that is shaped by active members. All of them, together, shape the society. The presence of each actor determines the characteristics of the society all together. In economic terms, "free riders" and those affected by "externalities" (either positive or negative) should be included beside the actors of the value chain.

By accepting the well-being perspective, the social analyst, besides measuring the well-being of the actors (or stakeholders), has to include others who, due to the change, have dropped out or those who have been included in the game in the new arrangement. In the societal quality perspective, however, both the actors (before and after the change) and those involved in the material life cycle are included by simply considering the change in the context in which the interactions take place. This requires looking at the relationships between the individuals rather than the individuals themselves. An individual is an actor (as a labor, manager, consumer, …) and at the same time he/she is a part of a structure (such as cooperatives, factories, consumers, …). Individuals may even assume several roles at the same time in an individual or collective capacity (being a worker, consumer, member of workers' union and participant in public debate).

The action of exchange between actors within the system determines the system's social sustainability. There are implicit motivations that are not expressed by actors (at the time of survey) and which go beyond the economic drivers of exchange. No matter whether or not the services and goods received are compatible with what has been provided (economic cost/benefit analysis), if actors continue to conserve the interaction the exchange is socially viable. Thus, engaging in a social interaction is an indicator of social acceptance. Or in other words, the fact that the interaction takes place justifies it socially.

Finally, we can go further and consider actions as institutions as said by Reynaud (1997): "what the actors produce are not choices but rules, they are not decisions adapted to what the equilibrium of system requires, they are the system itself[3]". The actions shape the social organization and develop by interaction. The regular interactions will augment the individuals' capacity to act and employ its capabilities to reach a state of well-being. According to the discussion of this paper, we position societal quality (Fig. 2) as a direct effect of company's performance and one of the factors which leads to a state of individual well-being. In other words, a stable society where organizations act in accordance to the contextual conditions creates an environment of personal development which increases capabilities (in sense of Greek *Arete* meaning great effectiveness) and leads to human well-being (in its eudaimonic sense as human flourishing).

Figure 2: The position of societal quality perspective among other S-LCA AoPs



4.2. Time, space and society

Introducing a cut-off criterion has the objective of limiting the study to a feasible scope. The percentage of studies in S-LCA that do not clearly state their cut-off criteria (15 out of 31) and those who explicitly indicate the data availability (7 cases out of 31) (Dubois et al. 2018) can be an indicator that S-LCA practitioners continue evaluating the social effect up to the point that the time and research budget allows. The social significance that has been suggested by Grießhammer et al. (2006) as the S-LCA cut-off criteria follows the ISO 14044 (2006) recommendations to set the boundaries of LCA based on environmental significance of production processes. In 9 out of 31 cases that have been reviewed by Dubois et al. (2018), the concept of social significance has been used, however, employing different methods to identify it (quantitative, qualitative and semi-quantitative). It should be acknowledged and understood that

[3] Translated from French : « Ce que produisent les acteurs, ce ne sont pas des choix mais des règles, ce ne sont pas des décisions conformes à ce que demande l'équilibre d'un système, c'est le système lui-même ».

LCA will never be able to faithfully model reality, because it will always be affected by inevitable (and somewhat arbitrary) assumptions and cutoff rules (Fullana i Palmer et al. 2011).

The term social system is commensurate with environmental life cycle of the product in the sense that both may be created and abolished (the idea of cradle to grave). Although society is not created and abolished the same way as a material, the socio-economic culture that is shaped around a product can be transformed to another socio-economic arrangement. As with environmental LCA, the ripple effects in the social life cycle of the product are difficult to determine. It is hard to see where the effects of social interaction finally diminish. Since the scope of the studies is quite large, it is impossible to truly assess the entire life cycle (UNEP/SETAC 2009, p. 9). Without declaring boundaries and defining where the effects become negligible, the studies would be almost unfeasible. Therefore, the matter of where to draw the line or the boundaries of social life cycle is crucial. It is hard to justify empirically or even logically which interactions should be included in the S-LCA case studies. The guidelines (UNEP/SETAC 2009) suggest using the "social significance" as the cut-off criterion. A method used to evaluate social significance among those who have employed a cut-off criterion for their S-LCA is through social hotspot assessment (Dubois-Iorgulescu et al. 2018). The measurement of Social Hotspot Index (SHI) is based on the best practice observed in different countries. The average of the indicator in the target country is compared to that of the best (or worst) practice allowing the practitioner to measure the situation of the target region regarding that particular indicator. The cut-off criterion of significant dependency has been used by Lagarde and Macombe (2013) to define the system in S-LCA in systematic competitive models employing the logic of including organizations in the boundaries of S-LCA study which their behavior is significantly affected by the changes. Jorgensen et al. (2008) adds the researcher's judgment to the cut-off criteria of the social system. It is to acknowledge, also, that one's perspective as a researcher is incomplete and thus in need of other perspectives, expert and otherwise (Freidberg 2018). It should also be stressed that the way in which an instrument is implemented will lead to different results in terms of social impact (Rey-Valette and Cunningham 2003).

The "art of cutting" (Roy 1985) is a cycle which is based on the necessity of understanding a matter to be able to cut and to cut well to understand (Mermet 1992). It indicates that the S-LCA practitioner, like a painter, like a cinema director, like a novelist also has to have the art to keep as much necessary material to tell the story of the social effects of a particular product system while not making it too complex to be incomprehensible. Simplifying the image of social arena to the extent which can clarify enough evidence to prove the hypothesis is the social scientist's goal. However, one has to take caution not to mix actors in different time slots. If a picture is going to be presented, we should be careful not to include effects that pertain to another period than that of the time of the exposure. So the relevance between three items of time, people and space are to be checked. If we are willing to show the pathway of the effects, our study has to function as a video picturing time, space and appropriate people. If we are searching the final impact, we would present two pictures of before and after the change of the relative space and people.

The importance of defining the time and space boundaries of the assessment originates from the unstable picture of a society with constant changes. From there rises the significance of identifying loops where the interactions occur repeatedly and a rhythm which can be observed and registered. Treating society as structured, patterned, or stable is a reification because society, like individual actors' interactions and experiences with one another, is constantly in flux (Carter and Fuller 2015). Lefebvre (1974/1991) discusses that space is a product of society which exceeds the definition of private property (conceived space) and enters the domain of "lived spaces". He considers space as a cultural being and thereby has a history of change. The geographies in which we live can have both positive and negative effects on our lives. They are not just a dead background or a neutral physical stage (Soja 2010). The boundaries of the study need to include those loops of interaction that define social processes that have been modified by the change in the

product system. By identifying loops of interaction between actors that are repeated continuously in a specific place, we may define a social system that can be the object of the S-LCA.

5. Conclusions

The objective of reaching social acceptance of a product has directed research toward the identification of methodologies suitable for measuring and evaluating the impacts of product systems. The LCA practitioners' attempts to incorporate a social dimension is facing challenges. The variety of S-LCA methodologies implies that the term *society* and its derivatives (social and societal) have been interpreted differently. The sociological perspectives reviewed in this paper can bring insights into S-LCA methodology. Everybody agrees that the goal of S-LCA is to assess the social impacts of products along their life cycle, but what should be included as social impact and the definition of social life cycle is to be decided. It is the definition of the term "social" that specifies the employment of individual based or community based indicators. Whether the society is considered as a "sum of individuals" or as "an independent entity" determines our approach as individualistic or holistic. We agree with Kühnen and Hahn (2018) on that the S-LCA needs to reach a normative consensus on what definitional characteristics constitute social performance along product life cycles, before designing technically measureable indicators. Addressing issues of health, human rights and working conditions as impact categories of the assessment and taking human well-being as the AoP shows the individualistic approach of S-LCA. Nevertheless, the sociologists' approach to investigate social phenomena target the relations between individuals.

In human well-being methodologies (subjective well-being and welfare analysis) individuals are the subject of the assessment while in methodologies classified in this paper in the category of societal quality methods, which are discussed mainly by sociologists, each addressing the subject from a specific angle; the social structures (structuralism), the functions attributed to each social group (functionalism) and the meaning that people give to their relationships (interactionism), the subject is the relations between individuals. What is common in these sociological perspectives is the primordial role given to human action. In opposition, the well-being methodologies reside on the psychological preferences of individuals. This paper holds that the subject of S-LCA should not be the actors themselves, but the relations between them. The power that keeps them together (relations) in a format of society/ organization/ value chain, can be weakened or strengthened through the new coordination as actors adapt to a change in the product system. These adaptations are reflected in turn in physical environment, institutions, social order (opposite to disorder). The examination of sociological perspectives brought insights to answer the challenging debates repeated in S-LCA. The hope of developing a quantitative tool standardized by ISO (Kloepffer 2008) may not be reached through the marriage of sociological perspectives with S-LCA but "it's better to have a rough approximation but right, rather than a very detailed prevision but wrong" (De Jouvenel 1993).

S-LCA is not simply a matter of checking company's compliance with human rights. Any violation of human right needs to be recognized by legislative authorities which have the power to sanction the lawbreaker for not respecting the minimum standards: issues such as minimum wages, safety of working environment and child labor. The topics covered in S-LCA should go beyond human rights and target the conditions of human society. It should advocate the rights of all humans like that of LCA which deals with the environmental conditions such as climate change, emission of greenhouse gases *etc.* which effects not just some individuals but entire generations. The social costs of a product system confronting product system change, from this point of view, would be those institutions, organizations, norms

and culture which they have accumulated over the years and have to give up to free up space for the new institutions to be replaced.

In the well-being approach, analysis of actors is limited to those who are along the defined life cycle of the product. Conversely, in the sociological perspectives everybody residing in the society/community where the change in the product system has been introduced are considered involved, and thus counted as potential actors and/or receivers of social impacts. When analyzing the well-being of individuals, little emphasis is put on inter-relations between people.

We suggest that S-LCA covers the social interactions that have been changed due to a change in the product system and discuss to what degree the change would create social disorder (or order). It is clear that in the process of change, those who are more prepared (empowered in that regard or flexible or resilient) undertake less social cost and benefit relatively more. The matter of empowerment and capability are more fundamental issues that require further discussion which goes beyond a social assessment. Another issue that requires further discussion is the indicators employed for the social assessment of the product life cycle change. In the social context, issues such as inequality, democracy, social exclusion, and many others are implicitly engaged. There is none among them that is less important and can be excluded from the social assessment. The changes in their states due to a change in the product system needs to be emphasized in the social assessment. The characteristics of S-LCA's AoP which have been discussed in this paper suggest retreating a step in our assessment to observe a larger picture of the society and the effects that the change in the product system would have on the organization of society. We should initially seek the social AoP's among basic factors that their absence would put into question the existence of society. The social AoP needs to emphasize facts that keep the society together. We may search among those factors that made individuals gather and shape a society in the first place such as protection (security) and division of labor. These factors, however, change appearance in different contexts, through time and space.

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