

From the principles of responsible innovation to the UGO Certification standards

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The paper aims at developing some ground principles around the idea of a possible governance of Responsible Innovation in the organizations. In particular the paper works around a standard named UGO (in opposition to the usual name of management system that are almost alphanumeric string) developed by CISE (Center for innovation and Economical Development) whose goal is to help every kind of organization in projecting, developing and managing any innovation that was targeted to the improvement of quality of life of people that will use that innovation.

The paper consist of two parts: the first one about the consequence of the application of an ethic to the concept of innovation, that suggest the need to temper the concept of limit (imposed by an ethic, whatever, and the consequent responsibility that stems from) and the idea of innovation (limitless by nature); the second about the governance of innovation that, assuming as true the Dilemma of Collingridge, focuses mainly for the need of a governance system that, mixing static elements (the usual requirements of a management system) and dynamic ones (the continuous relationship with the stakeholders), and considering the precautionary principle, could lead to control the critic step between the basic research and the effective production of an innovation, where an effective responsible governance could be applied.

Key words: Responsible Innovation, ethics of Innovation, Governance of Innovation, UGO Standard, Precautionary Principle

1. Why does innovation has to be responsible? The origin of the approach

In the last decades many responsibilities have been assigned to the word "innovation". First of all, it has been appointed responsible to find a new path which would help humanity to overcome the serious crisis affecting contemporary world economy, through the creation of new products, services and even markets. Secondly, it has been assigned the responsibility to re-innovate (innovate again) our society and institutions, to make our life-style more sustainable, efficient and right. Finally, the innovations originated by the scientific and technological research are

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expected to offer us a better and longer life. Thus, innovation is considered as primarily responsible of our future.

From an exclusively economic point of view, the debate is focused on the role that innovation could play in increasing enterprises' competitiveness. In fact, it is clear that businesses operating in extremely "competitive" contexts, such as markets, assign primary relevance to competitiveness, as well as it is natural for them to perceive the ability to make innovations as an element qualifying and improving businesses' performances.

However, today, non-economic factors seem to ever more influence purchase choices of enterprises, institutions and customers. New findings resulting from a Nielsen Report (2012) survey of 28,000 consumers from 56 countries around the world, clearly revealed, for example, that the 46% of respondents, regardless to contemporary international crisis, said to be willing to buy products and services from companies which have implemented programs intended to give back (in different ways) part of the produced income to society.

Also Amartya Sen's work, who received the Nobel Prize in Economic Sciences, focuses on this very topic: he clearly proves that economic development does not simply leads to the increase of disposable income, but in fact it is every day more often associated to the idea of people's better quality of life.² The ability to perceive these expectations, in addition to its primary ethical and social significance, plays an important role also from a mere economic perspective.³ However, apart from the expectations for this field, at least at a national level, no attention is being paid to the kind of innovation necessary to build a better future.

The UGO Standard, developed by CISE⁴, have been created in the belief that innovations, able to allow the realization of such a goal, have to be "responsible", in other words, they have to be able to improve the quality of life of their users, as well as to give competitive advantage to the enterprises which produced them, complying

² See his latest publication, Sen (2010).

³ Other recent research have clearly demonstrated that responsibility applied to business, rather than a do-gooding intuition, is more similar to an event able to impact real economy. For example, in two articles published in the "Working Papers" series, edited by the Harvard Business School, Eccles et al. (2011) unquestionably confirmed two aspects of the phenomenon, so far doubted. In the former article they proved that a positive relation actually exists, for example, between enterprises which adopt responsible management practices and the possibility to obtain credits from banks: out of the confront of these enterprises with a large group of businesses, conducted over a long period of time (16 years), it has emerged that the former could easier obtain credits or larger amount of money than the other ones.. In the second one, referring to the findings of a sample survey conducted on 180 enterprises which adopted responsible and sustainable behaviours, they explained that these enterprises had better performances than their competitors, keeping them unchanged over time, especially in those sectors where there is a direct connection between producers and consumers (Ioannou-Serafeim 2011).

⁴ CISE is the Special Agency of the Chamber of Commerce of Forli-Cesena (Italy).

with some ethical obligations. Boundless and undefined innovations, in fact, do not represent the most appropriate subject to contribute to the progress of our society

At this point, it is necessary to better specify what does an ethics for innovation means and which goal it has to be aimed at, in order to be considered responsible, at least according to the UGO Standard, even if, from an economic point of view, this is not enough. The UGO Standard addresses, first of all, those organizations⁵ producing those innovations which enter citizen's life. In their opinion to innovate means giving new or more efficient answers to meet market's needs. This practice can be described recurring to concepts such as risk, promptness and competitiveness, concepts significantly influencing corporate policies. This is the reason why we need an active governance of innovation, able to manage the process in a clear, inclusive and dynamic way, in order to satisfy society's expectations for innovation. This would need an instrument of government allowing enterprises to acquire or maintain over time a success depending on long-lasting factors, which, at the same time, could generate (and/or recreate) people's trust in the economic system. More details on the topic will be presented in the following pages.

"Responsible innovation" is a concept involving several knowledges and imposes an approach which, starting from the realization of new ideas and then proceeding with the consideration of their impacts, will allow us to design the future the entire society is dreaming of and make our life reaching that quality we have always desired.

However, it presents several difficulties because of the need to promptly face problems, requiring rapid solutions and preventing us from appropriately reflecting even on fundamental questions for our society; in this case, I think, nothing can better explain this situation than the starting lines of one of the most beautiful children's stories: «Here is Edward Bear, coming downstairs now, bump, bump, bump, on the back of his head, behind Christopher Robin. It is, as far as he knows, the only way of coming downstairs, but sometimes he feels that there really is another way, if only he could stop bumping for a moment and think of it» (Milne 1994, p. 1).⁶

⁵ Here the word "organization" is used in its etymological acceptance of "group of people linked by connections established with the aim to reach one or more common goals that separately they would not have been able to reach". For this reason, public administration as well, may be included in this definition, with no intention to reduce the difference existing between institutions, legislative organisms, appointed to issue rules intended to guarantee a peaceful coexistence, and civil society's economic organizations, operating in compliance with the rules established by institutions.

⁶ Quoted from Milne, A. A. (1994): *The complete tales of Winnie-the-Pooh*.

2. Ethics of innovation

Putting the modifier "responsible" before the noun "innovation" means adding an ethical meaning to the innovation process. Innovation in itself represents a morally neutral act⁷; in fact, its ethical dimension depends on the reasons determining its future implementations. Although, philosophy literature does not univocally accept this position. According to Natali C. (1999): *Aristotele: Nicomachean Ethics* (1135a 15-1135b 11), for example, no action can be completely neutral from a moral point of view, as any action expressing an act of will would appear as morally connoted, being it the actualization of a will and of its goals. It is clear that, if considered from this perspective, the moral evaluation would appear as inseparable from any human action, suggesting that no mortally neutral activity could ever exist. However, in order to evaluate acts or actions from a moral perspective (if not totally acknowledging ethical relativism), it would be necessary to refer to a principle allowing consistent evaluations in similar Conditions.⁸ Moreover, even in case there would not be any reference (Hare 1968), we could affirm that any act, from a knowledge, first, and then moral point of view, would remain neutral. An example of what stated above is contained in the following Kantian aphorism (Kant 1970 [1785], p. 91): «Act in such a way that you always treat humanity, whether in your own person or in the person of any other, never simply as a means, but always at the same time as an end». This is a moral rule applicable to each man and in each situation, which is not influenced by anything, neither a prize, for example, nor negatively by a feeling for a behaviour that does not correspond to what indicated in the principle.⁹

Then, defying innovation as "responsible" means identifying the principle referring to which it could be defined as a "positive" (effective) one. Nevertheless, the discover of an innovative field theoretically creates the conditions for the production of ethically acceptable applications, as well as of absolutely aberrant ones.

⁷ The words "ethics" and "morality" significantly overlap as both define the same semantic area, though the former has a Greek origin while the latter has a Latin one. Thus, in this text we will use them as synonyms. Nevertheless, from a closer analysis, a difference between the two terms exists, if considering morality a body of social norms defining the behaviour to adopt and ethics (seen as a branch of philosophy) as the discipline which studies the structures of this very body.

⁸ The identification of those situations, where the moral principle could be appropriately applied, or of that hierarchy, according to which one has to apply principles and pursue regulations in each situation, represents the core of any moral theory which describes the human behaviour. Hauser's research (2007) on the genetic origin of the moral behaviour at the basis of social coexistence has proved that, even if men are able to instinctively adopt morally-oriented behaviours, the contingent situations in which they make such evaluations significantly influence their choices. Thus, judging these situations from a moral perspective seems to acquire a cultural significance.

⁹ Kant 2001 [1787], § 4, p. 16.

As for responsibility, it is a concept belonging to the semantic domain of any definition trying to construct or refer to (one or more) ethics.¹⁰

From an historical point of view, the concept of responsibility appears for the first time in philosophic and legal literature at the end of the XVIII century. As for philosophy, the English Empiricists¹¹ were the first who used it to demonstrate the impossibility to associate the concepts of "absolute need" and "absolute freedom" to any form of moral judgement¹²; in fact, responsibility limits absolute freedom's fields of action, confining it within the borders imposed by the prediction and the following identification among one's own behaviours of possible unacceptable effects, determined by a specific action. Thus, partially limiting the exercise of an absolute freedom in the development of any kind of innovation, represents the funding limit and opportunity at the basis of the UGO Standard; it establishes that any innovation, in order to be considered as ethically correct (as above described), has to aim at «increasing human beings' quality of life».¹³ We have to underline that here the word commitment has a positive acceptation, as suggested by Douglas Hofstadter: it is considered as an element able to create opportunities, as commitments make people taking the most advantage they can from their own creativity, to the point to increase their chances to make innovation.¹⁴ Improving

¹⁰ There are, in fact, some scholars, such as Jonas H. (1990) or Weber M. (1970 [1934]), who seem to be trying to create a kind of special Ethics, the Ethics of responsibility, in the attempt to prove that Ethics has a specific domain associated to responsibility, a domain characterized by unique features. As long as responsibility derives from the Latin word *respondere* and, from a philosophical point of view, being responsible could be interpreted as promising to answer, to somebody or to oneself, for one's own actions as well as for the consequences deriving from them, thus it is not clear why an Ethics, based on rational (in a wide acceptation) prerequisites, even if deontological, could not be responsible. Nevertheless, Jonas has been the one who affirmed the need to pay, in contemporary age, extreme attention (that is responsibility) to the implications that scientific and technological development could have on the future, though distant from now, which turns, then, into an horizon to consider during the exercise of responsibility, even if unknown.

¹¹ See for example Hume (2008 [1740]). Particularly interesting is the Book III, which contains the formulation of Hume's law on the impossibility to logically derive moral principles from the mere descriptions of facts. «In every system of morality, which I have hitherto met with, I have always remarked, that the author proceeds for some time in the ordinary ways of reasoning, and establishes the being of a God, or makes observations concerning human affairs; when all of a sudden I am surprised to find, that instead of the usual copulations of propositions, is, and is not, I meet with no proposition that is not connected with an ought, or an ought not. This change is imperceptible; but is however, of the last consequence. For as this ought, or ought not, expresses some new relation or affirmation, it is necessary that it should be observed and explained; and at the same time that a reason should be given; for what seems altogether inconceivable, how this new relation can be a deduction from others, which are entirely different from it» (ivi, pp. 496-497).

¹² For more details on the philosophical meaning of the concept of responsibility see Abbagnano-Fornero (2005).

¹³ UGO Certification Standard, version 1.1 2012: Definitions.

¹⁴ As for the concept of commitment and the creative potentiality that commitment, in an apparently counterintuitive way, see in particular Hofstadter (1987, 1996). The relation between creativity and the

human beings' quality of life represents, then, the UGO Standard's corner stone and its final aim as well, also from a logical point of view. Considering the quality of life as the core element of the Standard's logical construction could lead to its possible inclusion in the group of the so-called "common goods". Obviously, here we do not refer to natural common goods (forests, atmosphere, water and so on), but to cultural and social goods and/or to those allowing our society to function. In fact, if we adopt the classic acceptance of "common goods" «which all enjoy in common in the sense that each individual's consumption of such a good leads to no subtractions from any other individual's consumption of that good» (Samuelson 1954, p. 387), the concept of "quality of life", as defined in the UGO Standard, seems to perfectly match this definition. The Standard, in fact, defines "quality of life" as «that dimension of existence that, in the constant and dynamic intertwining of relationships, finds the conditions necessary to guarantee free spaces to individuals and community, in compliance with ethical obligations, those guiding obligations that – originated from a rational agreement existing between social actors – aims at distinguishing good from bad, the acceptable from the unacceptable».¹⁵

Notwithstanding the different theories regarding the nature and usability of common goods, there is the possibility and, according to us, the probability that the concept of quality of life belongs to the domain of common goods (see for example Ostrom 2006). Regardless to the acceptance given to them, common goods present, from a theoretical perspective, some unique features: they are inclusive and commonly owned and their preservation is a priority for society. In other words, the quantity of common goods should have to be increased, if possible, or, at least, keep unchanged and possibly never be reduced.¹⁶ This statement, apparently irrational from a strictly economic point of view, is explained by the fact that the decision to reduce the general value of common goods because of economic choices, taken in the name of an alleged rapid profit, would cause to the present and future society collective and probably immeasurable costs of social, environmental and economic nature. An example of the above, is represented by air pollution and the resulting health damages which occurrence leads to some obligations imposed to society, mainly at the expenses of the national health service, then to community itself; a second example consists in the limited access to water for basic needs, as proved by the famous "Water War" which have recently taken place in Bolivia, causing

creation of innovation, terms identifying different phenomena, clearly reveals even if not mechanistically determined. This explains why extending the meaning of commitment beyond the moral dimension of taking on responsibility, the meaning it assumes in this context, it seems to be also relevant with regard to innovation.

¹⁵ UGO Certification Standard, version 1.1 2012: Definitions.

¹⁶ The UGO Standard, in fact, introduces responsible innovation as an element able to improve the quality of life.

substantial costs at the expenses of community, involved enterprises and institutions.¹⁷

Therefore, it is economically reasonable, besides morally appropriate, to preserve the total quantity and quality of the available common goods in the medium and long run.

Citizens, in fact, are now able to clearly distinguish opportunistic behaviours, which endanger common goods, and have started to support ever more often those subjects, who pay attention to those very elements. Then, it will be particularly unwise for enterprises not to include the latter in their corporate policies and strategies.

The foregoing statements are also true as for life quality, which could serve as a synthetic concept able to express the quantity of available and accessible common goods in a specific context.¹⁸

Analysing the definition of "quality of life" presented in the UGO Standard, we can highlight four ethically relevant points:

1. the need to refer to a rational agreement;
2. the identification of a demarcation principle;
3. the assumption of a dynamic and evolutionary perspective;
4. a long-lasting and effective relation with stakeholders to be established by innovating enterprises.

The first point suggests that adopting inclusive approaches, resulting from a rational agreement¹⁹ among the subjects asked to construct and define the innovation, is the essential prerequisite to a responsible innovation. The concept of rational agreement have extensively been analysed by political philosophy, with the

¹⁷ In 1990 the American company Bechtel Corporation privatized water services in Cochabamba, the third-largest city in Bolivia. Water prices tripled, it became necessary to buy a license to access water resources and a licensing system for collecting rainwater was also introduced. After a year, 55 percent of local citizens had not yet obtained the access to water. In April 2000, hundreds of thousands marched on the streets of Cochabamba to protest against the Government, and forced it to revoke the Water Privatisation Law. The contract with the multinational company Bechtel was terminated and the water service concession re-advertised. The conflict, known as the "Cochabamba Water War", became symbolic of the struggles fought to protect common rights, proving that popular participation could have a major influence on decision making in regard to the management of public services.

¹⁸ Evidences of the fact that similar concepts have started to be fully included in the analysis of the different scenarios of economic development are contained in the recent OECD Report (OECD/OCSE 2011) on how to measure society's well-being, as well as in the Stiglitz et al. Commission's famous Paper (2008) on the identification of alternative measures of GDP to use in order to represent contemporary society's conditions.

¹⁹ As for rational agreement in contemporary moral philosophy, see Rawls (1994), accomplishing the statements started in Rawls (1982).

aim to identify the main elements of a fair (and rational) society.²⁰ Interestingly, in philosophic studies the term "agreement" (even when not accompanied by the modifier rational) has often acquired a meaning close to the concept of knowledge; agreeing on something requires a certain knowledge of the very object of the agreement, as stated by Antoine Arnauld and Pierre Nicole (1683), who edited the so-called Port Royale Logic²¹, or John Locke.²²

Then, we will intend rational as a modifier which identifies a process able to lead to an agreement (and create knowledge), only in case it is a free and justified process and every subjects who accept the agreement – reciprocally depending on one another but still keeping their own freedom – prove able to fulfil their own goals. The above described situation would result from a moral condition of mutual respect, based on the impartial acknowledgement of each ones' rights and interests.²³

The second point introduces the possibility to identify a demarcation principle²⁴, helpful in distinguishing a moral innovation (the one we are interested in) from a morally-neutral or immoral one. This principle reveals extremely interesting because of its ontological implications: in order to correctly trace the demarcation line, necessary to distinguish responsible innovations from irresponsible ones, it is important to refer, not to a meaning criterion, but to a "knowledge criterion" which proves helpful in identifying responsible innovations among the wide range of the existing ones.²⁵

²⁰ Again we have to underline that any rational preference is not a priori a moral preference too: it has to meet additional criteria, such as universality and impersonality, meaning that it has to be, at the same time, unanimously acknowledged and independent from the different conceptions of good (Veca 1986).

²¹ «After things have resulted from our ideas, we compare these very ideas and, finding out that some agree and other ones, instead, disagree with each other, we connect and disconnect them, that is confirming or denying, in other terms, judging them» (Log II, 3).

²² Locke (2004 [1690], IV, 1 § 2) defines knowledge as «the perception of the connection of and agreement, or disagreement and repugnancy of any of our ideas».

²³ This perspective is based on the concept of "social contract" developed by Rousseau (2008 [1762]) and further updated from a theoretical point of view by John Rawls.

²⁴ As for the demarcation principle in science philosophy, see Popper (2009) and Laudan (1979).

²⁵ Popper (1972) introduces this concept with the aim to establish a demarcation principle distinguishing scientific theories from non-scientific ones. He uses the term "demarcation principle" to define a principle helpful in distinguishing «empirical sciences' assertions from all the other assertions, religious as well as metaphysical, in other terms, pseudoscientific ones» (ivi, pp. 70-71). Popper proposes the application of the falsification principle in science: «Please, pay attention to the fact that I propose falsification as a demarcation principle and not as principle of knowledge» (Popper 1970, p. 22, note 3); then added that: «falsification separates two kinds of actually relevant assertions: the ones which can be falsified and those which cannot. It traces a line within the language and not around it» (ibid.). The latter meaning of the demarcation principle is the one we actually are interested in, as able to establish a border, even if a fuzzy one, however clearly identifiable and able to distinguish responsible innovations from all the other possible forms of innovation (Popper 1970). We will neither consider here some problems of strictly logical nature caused by falsificationism, nor the debate on such a principle's effectiveness, also from a knowledge perspective, originated by some authors.

Therefore, both the need to derive from a rational agreement and the identification of a demarcation principle result into a "deontological" approach to innovation, in the name of the binding and unchanging principles applied.

The deontological ethics of Modern Age derived from Immanuel Kant's work define an action or a behaviour as necessary simply because "good in itself".²⁶ The analytic philosophy of the XX century describes them as ethics which measure morality not referring to results but to a specific principle.

The third and the fourth points of the definition contained in the UGO Standard, instead, refer to teleological characteristics: the acquisition of a dynamic dimension continually evolving, able to establish a long-lasting relationship among the interested parties to the innovative process.

The second part of the definition refers to a concept which played an important role during the definition of the UGO Standard's structure. We are referring to interested parties participation into the processes intended to establish the guidelines to be followed in the scientific and industrial research.

However, further clarifications, regarding that part of the definition referring to the acquisition of a dynamic dimension are here required. Because of the nature of innovation, a phenomenon trying to cast light on still undiscovered knowledge areas (even if not totally imaginable)²⁷, exclusively imposing the adoption of an ethics which only refers to deontological principles, from a moral perspective could have proved, at least, to be a questionable choice.

As opposed to deontologically ethical theories, the teleological ones tend to «make the right, the obligatory, and the morally good dependent on the non-morally good» (Frankena 1996, p. 64), in other words, to judge moral consequences referring to non-moral consequences, such as happiness, pleasure and usefulness.²⁸

²⁶ In the Groundwork of the Metaphysics of Morals Kant (1970 [1785]) defines the concept of categorical imperative (= moral imperative) as the obligation to realize an action that, being good in itself, reveals as objectively necessary. The categorical imperative differs from any other obligations for three main features: it cannot be influenced (it does not help to reach a goal); it applies to every men in every situations (as it does not depend from any specific action or behaviour); it expresses a pure will (not conditioned or conditionable by contingent events), that is the will to accomplish an action requiring no explanation.

²⁷ Johnson (2011) introduces the concept of "adjacent possible" as the only source of innovation which could be, at the same time, conceived and transformed in applications which can be used by society. In order to explain the concept, the Author provides the example of a series of doors and rooms: opening the first door, we enter a room in which there are other several doors leading to other rooms. The adjacent possible is what we find in the first room and that we can, immediately, turn into innovative applications useful to society. Even though people, in some cases, can open several doors one after another, in consequence of which knowledge will make remarkable progresses, unfortunately in these situations it will be difficult to be able to transform the acquire knowledges into innovative applications, as often there lack the necessary technological or social conditions (or both).

²⁸ As for the differences existing between deontological and teleological ethics, see Abbagnano-Fornero (2005) who provide a definition of the two terms. Another possible distinction between the two

Thus, these two principles make the first two dependent on contingency: the application of the former could not theoretically exclude the possibility that an innovation, even if developed in compliance with the above mentioned deontological principles, could anyway determine undesired effects²⁹, even though the first two principles, at least in theory, could be totally independent from contingency. Paying attention to people's different opinions during every phases of the innovation process, as well as knowing and being willing to understand their relevance, results into a reciprocal relation connecting innovation-makers and innovation-users or those people undergoing its effects, that is an ethically-relevant relationship. It is clear that only a dynamic approach, based on the acknowledgement and adoption of some principles, continuously paying attention to and analysing organizations' activity, could lead to such a result.

This is the reason why the four points listed in the definition of quality of life, presented by the UGO Standard, continually move to and from the deontological and the teleological dimension, trying to offer a possible and reliable moral guide to the innovative process taking place in contemporary society.

The aim of this strategy, in fact, consists in giving birth to a kind of method, or "moral language" in Richard M. Hare's words, which can also be followed as for the development of the UGO Standard³⁰ itself.

3. Governance of innovation

The adoption of the above mentioned "moral language" represents the prerequisite to the construction of a governance system able to create and manage innovation dynamics within organizations, according to the principle stating that innovation has to be guided towards the improvement of people's quality of life. In practical terms, this implies the possibility to establish management strategies intended to guarantee that, when analysing innovation's impacts, attention will be paid, not only to

approaches to ethical theories is presented by Rawls: he defines the first category as the one including those ethics which put the right before the good, while the second one as that including those ethics which put the good before the right.

²⁹ Nevertheless, it appears to be pragmatically impossible to support the existence of a clear distinction, between the above described groups of ethical theories, actually identifiable in human behaviours. Therefore, contemporary moral philosophy tries to preserve the principles (deontological approach) and, at the same time, to pay attention to the results derived from their application (teleological approach). The methodology followed to define the basic principles characterizing the concept of quality of life and, then, the UGO Standard conform to that underlying belief.

³⁰ In Hare's opinion (2006) moral thought's objectiveness does not consist in the transformation of moral questions in practical ones, as this would lead to a relativism binding us to specific cultures and languages. On the contrary, it derives from the generally normative nature of that moral language which could be adopted by different cultures and ages.

economic criteria, but also to other elements which may be labelled as social and environmental ones.³¹

Analysing the question from a mere logical-pragmatic point of view, the first thing to do consists in deciding in which phase of the innovation process would it be more appropriate to exercise this form of control. For the first time in 1980 an English researcher, David Collingridge, asked himself whether it had actually been possible to exercise a form of "social control"³² on the consequences of innovation, especially on those innovations which effects on society could play a leading role in the evaluation of their actual success (or insuccess), with regard to the established goals, giving birth to the phenomenon known as "Collingridge's dilemma". This theory could briefly be explained as such: «attempting to control a technology is difficult, and not rarely impossible, because during its early stages, when it can be controlled, not enough can be known about its harmful social consequences to warrant controlling its development; but by the time these consequences are apparent, control has become costly and slow» (Collingridge 1983, p. 40). The scientific literature agrees with Collingridge as for the huge difficulties met in trying to effectively operate during the innovation process's first stage; in fact, during that phase, which can be defined as "creative", researchers and decision-makers have very few instruments (with limited effectiveness and efficacy) at their disposal to use, in order to identify the possible negative effects that innovation, in its early stages, could determine. In this regard, one of the most important available methodological operators, also adopted by the UGO Standard, undoubtedly is the Precautionary Principle.³³

Here we will try only to in-depth examine one of its most critical elements: we will try to identify the conditions which could lead to its application to decision-making processes. The complete (or sometimes partial) lack of knowledge in decision-making processes could, at least in theory, assume four different connotations as shown below:

³¹ While planning and making innovations, paying attention to such variables represents an important step to take in order for any organization to adopt a responsible approach to innovation.

³² We can define social control as a process including all those activities intended to conform people's behaviour with the aim to make them complying with collective regulations and satisfying collective expectations. Here, the reference group is represented by society and, then, the expectations to be considered are those deriving from it. Referring to what already stated in the first part of this contribution, the hypothesis, here considered as preliminary, states that life quality improvement could be included in the group of social expectations, and adds that society itself, according to the definition of social control above reported, could try to influence and guide organizations' behaviour towards the creation of innovations which could contribute to this goal.

³³ For more details on the origin and the evolution of the precautionary principle, see Comitato nazionale per la bioetica (The National Bioethics Advisory Commission 2004), Sisiti-Olivato (2010), Wynne (1992), Hunyadi (2004).

1. decisions under conditions of risk;
2. decisions under conditions of uncertainty;
3. decisions under conditions of ignorance;
4. decisions under conditions of indeterminacy.³⁴

As for decisions to take under conditions of risk we refer, for example, to a contingency in which we know both the impacts and the probability for such impacts to occur; then the decision to take, on the basis of essentially known information, regards the level of risk that one is willing to take on. Obviously the acceptability of these risks will be conditioned, apart from by social variables, also by economic considerations based on a cost/benefit analysis.

In case of decisions to take under conditions of uncertainty, we know its possible effect, although we ignore both the probability for the phenomenon to occur and the forms it could take.

In case of decisions to take under conditions of ignorance, instead, we neither know the possible negative events nor whether and how the latter could eventually occur.

Finally, in case of decisions to take under conditions of indeterminacy, apart from ignoring all the aspects listed in the previous lines, we neither know the socio-cultural context which will be affected by the effect caused by decisions, nor we know the future expectations on the variables to consider; in other words, we are not able to evaluate the acceptability of any impact. If this analysis is right, the Precautionary Principle comes into play in cases of uncertainty and ignorance (2 and 3); on the contrary, it could prove not much effective when making decisions under conditions of kind 1, while it reveals completely ineffective, as any other method or predictive instrument, under conditions of kind 4.

The UGO Standard defines the Precautionary Principle as «a standard of conduct intended to identify the point of compatibility between technical- scientific development, necessary to humanity, and the management of the revealed or assumed menaces brought along by such development». This definition, which also tries to analyse the principle from a cognitive perspective, presents as the first element able to guide research approaches, especially those adopted in the initial phase of the innovation process. However, being it an instrument applied in conditions of uncertainty or ignorance, its chance to responsibly guide the innovation process present well defined limits. At its best, once identified possible areas of uncertainty or ignorance, the application of the Precautionary Principle could contribute to determine possible conducts to assume, in case a possible situation realizes. Moreover, as the only application of this principle is not able to make the above described situation real, it is necessary to implement complementary

³⁴ For more details on the meaning of this taxonomy see Wynne (1992), who first suggested it.

measures, intended to speed up research and to decrease the degree of uncertainty which prevents responsible innovation to realize. In fact, if on the one hand the innovation process usually reveals unquestionable, with regard to economic reasons, on the other one, it is not as such when taking into account ethical reason and final users' opinions. Therefore, it is necessary to find a dynamic balance between these opposed positions, as underlined by the Precautionary Principle too.

At this point, it still remain unsolved the problem consisting in the implementation of a system able to manage the second phase of the innovation process, when the innovative applications created spread in society, causing non-considered or non-conceivable impacts.

This lead to two necessary actions to take: managing those externalities determined by the innovation process and promptly and effectively contributing to the decisions intended to spread the produced innovations on the market.

As for the first action, we are focusing on the problem represented by the acceptability of science and of its products by society, which assures that innovation's possible impacts have been appropriately and correctly evaluated. In this situation, extremely important reveals the concept of "independent research"³⁵, which identifies a research method that each organization would have to adopt in every phases of the innovation process: it would give the possibility to access in many different ways knowledges and different opinions, unconditioned or conditioned by the success (on the market or in society) of the created innovations.

As for the second action, instead, we have to consider two more aspects. The first one consists in the collection of data thanks to which it would be possible to classify those elements, playing an important role in externalities management; then, the second one, consists in the possibility for these elements to effectively influence the decision-making processes which lead to the development and/or possible correction of the applications deriving from the created innovations.

The UGO Standard identifies the construction of a structured and long-lasting relation with stakeholders as the necessary starting point for the creation of an effective control system able to manage externalities. Simone Arnaldi's contribution (compare supra) has highlighted that, when there is no relationship, then no dialogue, with stakeholders, innovations risk to be rejected by society: he suggests

³⁵ The UGO Standard explicitly mentions the concept of "independent research" in case it is necessary to apply the precautionary principle in one of the field undergoing innovation (requirement 4.1 D). More in general, this concept could refer to every phases of the innovation process, as the possible benefits deriving from it, also in economic terms, acquire extreme importance for some reasons: 1. the reduction, from the very beginning, of the possible risks determined by ignoring some relevant points of views, opposing the main perspective adopted by the organization during the innovation process; 2. though economically challenging in the short-term, taking into account the possible negative consequences and the externalities that could take place, at the expenses of organisations, in case this approach is not adopted, it will reveal extremely advantageous in a long-term perspective.

that the absence of any form of communication between innovation-makers and innovation-users would «give the impression that there is something wrong in technology itself». In this regard, extremely important reveals the role played by organizations in the spread of information among stakeholders, regarding the very innovations being developed or spread; in fact, this could «rise their awareness of the actual of possible consequences which could be determined by the introduced innovations».³⁶ Therefore, apart from containing the above mentioned possible negative effects, organizations could increase their chances to receive from parties feedbacks on the actual or perceived impacts – originated by the application of the introduced innovation –, based on an objective background and not only deriving from a priori or ideological stances.³⁷

Moreover, it is important to give start to this process from the very early stages, in order to guarantee the promptly application of corrective actions, which, in turn, would avoid to pay exorbitant amount of money for their implementation, as it happens in case innovative applications start spreading before a similar relation and control system has started to work.³⁸ Though these actions are necessary to produce responsible innovations, they cannot guarantee it on their own; in fact, in order for corporate government model to effectively contribute to the above mentioned goal, strategical and operative decisions have to "actually" be influenced by the information given to stakeholders and the relationships established with them; moreover, these decisions have to be "perceived" by society as deriving from the very relations established among stakeholders and organizations.

In fact, there exists a huge difference between the exclusively informative involvement of stakeholders and their active participation to innovative processes. For informative involvement we refer to all those unidirectional activities (from

³⁶ UGO Certification Standard, version 1.1 2012, requirement 5.8.

³⁷ The possibility to have a grounded critical judgement directly depends on the knowledge of the very object to be evaluated. In other words, in order to judge something, it is necessary to, at least, partially know it. This explains the need to spread the information regarding a specific phenomenon recurring to the widest range of possible methods and forms. Obviously, there are different kinds of information regarding the produced innovations and it is important to exactly know the difference existing between the ones to spread and those, instead, not to disclose, as referring to specific technical features identified in corporate environments as trade secrets. Nevertheless, there have to exist other solutions in the in-between space separating the two poles (total information and zero information), able to help stakeholders to form their own opinions. In his latest work James S. Fishkin (2009), who has been studying the dynamics through which citizens express grounded judgements on public policies, proves that groups of citizens, chosen on a statistical base, are perfectly able, recurring to the deliberative polling, to not only understand the topics involved, but also to analyse the scenarios and then take grounded decisions even in those cases requiring an in-depth and topic-specific knowledge.

³⁸ Though it reveals actually difficult to implement effective control systems during the creative phase of the innovation-making process, it is possible, at least in theory, to adopt a managing system since the very beginning of the so-called applicative phase, able to guarantee the production of actually responsible innovations.

innovation-makers to possible innovation-users or people undergoing the effects of their applications), consisting in presentations, publications (of sustainability reports, for example), the opening of debates, on-line forums etc., mainly occurring when «the decisions as for the adoption of a specific innovation have already been taken» (Pellegrini 2010, p. 306). On the contrary, we define participation as the possibility for people involved in innovative dynamics to directly contribute to the debate which is developing on a specific technical-scientific question [...]; in other words, the term participation implies the entrance in the debate of different points of view, others than technical ones, such as ethical, social and economic ones, which could be taken into consideration during the decision-making process regarding technological-scientific innovations (ibid.).

In this regard, the UGO Standard asks organizations to identify the most important areas in the activities undergoing innovation and to adopt methods allowing to constantly verify whether the goals they autonomously established meet stakeholders' expectations in these very sectors.³⁹

The UGO Standard governance system also includes some specific performance requirements to be satisfied by certified organizations during the implementation of a control system regarding the application and spread of responsible innovations. They require to invest every year, at least, 5% of the added value produced by the organization in research activities and, in case the Precautionary Principle is applied, to invest, at least, 1%⁴⁰ of the turnover obtained thanks to the production of products or services, which have required the application of this Principle to the independent research, aimed at reducing the uncertainty and ignorance characterising some of the above mentioned decision-making processes connected to innovation.⁴¹

The foregoing requirements, together with a set of indicators (describing the specific domains interested by innovation and its applications), a government model (able to interpret and keep under control these indicators⁴²), an effective methodology (allowing to spread relevant information and to listen to stakeholders' opinions and consider them in decision-making processes⁴³) give birth to a complete

³⁹ UGO Certification Standard, version 1.1 2012, requirement 5.4 and 5.5.

⁴⁰ Ivi, requirement 4.1.

⁴¹ As already affirmed, the UGO Standard asks organizations to prove their attempt to take relevant actions aimed at collecting information, which will prove useful when making decisions regarding innovative policies. Thus, investing in activities giving helpful indications in the decision-making process, especially in those case when the Precautionary Principle have been applied, or in research or development activities, is an important step to take. Obviously, the amount to invest in both cases have been calculated taking into considerations some sector-specific benchmarks and on the basis of non-rigorous mathematical calculations, but rather recurring to "good sense".

⁴² UGO Certification Standard, version 1.1 2012, requirement 5.3, 5.4 and 5.7.

⁴³ Ivi, requirement 5.8.

system able to guarantee an effective and responsible governance of innovation , thanks to a continuously operating action-feedback mechanisms.

This can happen thanks to the possibility, given by such a system, to promptly and effectively correct or eliminate undesired externalities which could accidentally originate.

As for its general structure, the UGO Standard presents a static component, including structural requirements which impose some limits which corporate innovative activities have to respect, and a dynamic one, including the relationships established with stakeholders and the ability of these relationships to significantly influence organizations' innovative choices. The uniqueness of the approach introduced by the UGO Standard consists in the fact that the dynamic component plays a significant role also in determining the static component, or better, in identifying some of the established requirements. The static component, instead, represents the reference framework able to assure a dynamic and creative innovation process, putting some limits to its development, in order for it to responsibly contribute to the established goal (to improve the "quality of life") and requires to pay attention to stakeholders' opinions (the actual dynamic activity).⁴⁴

Extremely helpful in understanding this concept reveals the asbestos cement industrial production history. The construction industry has been extensively using asbestos cement, this mixture of asbestos and cement characterized by high insulating capacities, since the beginning of last century. In medical literature, for the first time in 1906 the asbestos dust was linked to lung cancer and in 1930 in the United Kingdom medical research first proved that the exposure to asbestos could increase the risk of mesothelioma, findings which led to the introduction of a compensation laws for workers suffering from asbestos-related diseases. Although the Italian law, together with many other countries all over the world, eventually introduced a prohibition regulation banning the use of asbestos in any form, because of its dangerousness, only in 1992! If the UGO Standard had been adopted by the enterprise which produced asbestos cement on a large scale, first of all it would have had to invest in independent research aimed at better analysing the connection existing between the production and use of asbestos cement and asbestos-related diseases (as some suppositions had already been made), and then it would have imposed a requirement (Static Component), demanding to pay attention to stakeholders' opinions, in order to obtain some information on the impacts determined by the innovation produced. The collection of feedbacks (Dynamic Component) would have probably make the enterprise reconsidering its industrial strategy and, on the basis of the above described continuous interaction with parties,

⁴⁴ As for the relevant role played by constraint in creative processes compare supra, note 15. It refers to the fact that the UGO Standard does not show organizations how to describe the innovation process, but asks them to highlight the domains and to provide the indicators able to better describe this process; nevertheless, also these actions require to responsibly act.

the corrections made would have led to a new constraint, put on production and controlled by stakeholders.

Unfortunately, during the large-scale production of asbestos cement in Italy (from 1907 to 1986) very few information had been spread, allowing the enterprise to long keep in secrecy the risk of mesothelioma deriving from the inhalation of asbestos dusts. A similar behaviour would not have been possible today, thanks to the extensive use of different technologies able to widely spread information, as well as to people's solid and well-established opinions.

This situation has made the adoption of an approach, similar to the one introduced by the UGO Standard, ever more compelling, also from a strictly (and we could add cynically, with regard to the previous presented example) economic point of view. In fact, because of legislative evolution, in curt the principle of restoration of starting conditions is ever more often applied in those cases when the ecosystem in which the enterprise operates has been endangered (as it happened in the above described case); moreover, ever more importance has started to be given to the compensations for damages to be paid to those people who have suffered the effects caused by possible negative externalities, resulting from organizations' activities; unfortunately, this could never compensate neither for the victims of asbestos-related diseases nor for the problems caused to their relatives.

Therefore, we can consider this approach able to contribute to solve the "Collingridge's dilemma", thanks to the possibility to control the effect determined by innovation on society. The English researcher defined the phase during which innovative applications spread as the one in which it would be possible to more effectively apply an audit system, able to manage the possible externalities produced by this very process.⁴⁵ The UGO Standard, though paying attention to the creative and theoretical development⁴⁶, focuses on innovative application government strategies, asking organizations to establish, control and reconsider their goals on the basis of the feedbacks collected among stakeholders, in order to contribute to the creation of responsible innovations (responsible with regard to the extensively analysed goal). This represents a desirable and verifiable situation for society. This, in fact, also explains why CISE decided to create the UGO Standard as a voluntary Certification, issued by independent third parties, according to the management standard systems, usually adopted by organizations. The UGO Standard approach, in fact, is characterized by «the choice to ascribe its action to the sphere of behaviors adopted, on a voluntary basis, by companies and belonging to the so called "soft law

⁴⁵ In order to solve those problems which make it difficult to control the applications originated by the innovation process, the decision-making process originating them has to acquire «flexibility, controllability, corrigibility or insensitivity to error» (Collingridge 1983, p. 40).

⁴⁶ See the above reported discussion on the application of the Precautionary Principle.

regulation”», and by «the adoption of the principles and categories of management systems implemented by organizations».⁴⁷

Finally, we could argue that the UGO Certification summarizes apparently opposed concepts. Some examples of the latter are represented by the already mentioned dyad static-dynamic, which describes the standard general structure, or the formal opposition existing between the deontological and teleological approach, presented at the beginning of this contribution when taking about general ethical theories. Another interesting conceptual dyad contains the terms innovation and responsibility, as the latter (in the name of a goal to achieve) tries to limit the former, though impossible to be limited by its nature.

Therefore, it emerges that, together with a declared goal, the improvement of the "quality of life", the UGO Standard also tries to achieve a second aim: the search of balance. The importance of the latter though, could not be understood at a first sight, as it would not lead to measurable results: it consists in the attempt to create a new approach to knowledge, able to take into consideration the complexity of that knowledge which originates innovations, including notions, not only deriving from the technological- scientific or economic domain, but also from the moral and social ones.⁴⁸

In conclusion, the UGO Standard is based on a difficult challenge and an ambitious programme. Nevertheless, we believe that the funding idea which originated this project presents evidences proving its appropriateness and relevance, as well as its strategic and economic importance in the long term.⁴⁹

⁴⁷ UGO Certification Standard, version 1.1 2012, Foreword. This choice has been based on mere practical reasons, as these instruments, because of their specific features and application, could be better understood and adopted by organisations.

⁴⁸ Morin (2012) claims that the complex concept at the basis of contemporary society always consists in the union of two opposed concepts. In his last work the French philosopher- sociologist affirms that the bigger are the situations, the more relevant are the reactions to them. Notwithstanding the fact that pessimism is what clearly emerges from contemporary contingent situation, the relevance of the reactions to this tough moment generates optimism.

⁴⁹ Apart from that contained in the already mentioned strategical documents produced by the OECD and those by the French Presidency, we can also report here the definition of responsible innovation given by the European Commission: «a transparent, interactive process by which societal actors and innovators become mutually responsive to each other with a view on the (ethical) acceptability, sustainability and societal desirability of the innovation process and its marketable products» (European Commission 2011, p. 9); then, that of social innovation given by the Bureau of European Policy Advisers (BEPA 2011, p. 33): «we define social innovations as new ideas (products, services and models) that simultaneously meet social needs (more effectively than alternatives) and create new social relationships or collaborations. They are innovations that are not only good for society but also enhance its capacity to act». However, more relevant have proved the innumerable sectoral or transversal initiatives, conferences and publications organized on the topic during last years, mainly at an international level, proving the contemporaneity and urgency of the topic itself.

Bibliography:

- Abbagnano, N. – Fornero, G. (2005): *Dizionario di filosofia*. (Dictionary of philosophy.) UTET, Turin.
- Arnauld, A. – Nicole, P. (1683): *La logique ou L'art de penser: contenant outre les regles communes, plusieurs observations nouvelles, propres à former le jugement*. G. Desprez, Paris.
- BEPA – Bureau of European Policy Advisers (2011): *Empowering people, driving change. Social innovation in the European Union*. Publications Office of the European Union, Luxembourg.
- Collingridge, D. (1983): *Il controllo sociale della tecnologia*. Editori Riuniti, Rome. (Original edition. The social control of technology, Frances Pinter, London, 1980).
- Comitato nazionale per la bioetica (The National Bioethics Advisory Commission) (2004): *Il principio di precauzione. Profili bioetici, filosofici e giuridici*. (The precautionary principle. Bioethical, philosophical and legal profiles.) Available at: www.governo.it/bioetica/pdf/principio_precauzione.pdf. Download date: 2nd August 2012.
- Eccles, R. G. – Ioannou, I. – Serafeim, G. (2011): The impact of a corporate culture of sustainability on corporate behaviour and performance. HBS *Working paper* 12.
- European Commission (2011): *Towards responsible research and innovation in the information and communication technologies and security technologies fields*. Publications Office of the European Union, Luxembourg.
- Fishkin, J. S. (2009): *When the people speak. Deliberative democracy and public consultation*. Oxford University Press, Oxford – New York.
- Frankena, W. K. (1996): *Etica. Un'introduzione alla filosofia morale*. Edizioni di Comunità, Milan. (Original edition. Ethics, Prentice-Hall, Englewood Cliffs, NY, 1963).
- Hare, R. M. (1968): *Il linguaggio morale*. Astrolabio, Rome. (Original edition. The language of morals, Clarendon, Oxford, 1952).
- Hare, R. M. (2006): *Scegliere un'etica*. Il Mulino, Bologna. (Original edition. Sorting out ethics, Oxford University Press, Oxford, 1997).
- Hauser, M. D. (2007): *Menti morali*. Il Saggiatore, Milano. (Original edition. Moral minds. How nature designed our universal sense of right and wrong, Ecco, New York, 2006).
- Hofstadter, D. (1987): *Ambigrammi. Un microcosmo ideale per lo studio della creatività*. (An ideal microcosm to study creativity.) Hopefulmonster, Turin.
- Hofstadter, D. (1996): *Concetti fluidi e analogie creative*. Adelphi, Milan. (Original edition. Fluid concepts and creative analogies, Basic Books, New York, 1995).
- Hume, D. (2008): *Opere filosofiche. Vol. 1: Trattato sulla natura umana*. Laterza, Rome-Bari. (Original edition. A treatise of human nature, s.e., London, 1740).
- Hunyadi, M. (2004): La logique du raisonnement de précaution. *Revue Européenne des Sciences Sociales*, XLII, 130, pp. 9-33.
- Ioannou, I. – Serafeim, G. (2011): The impact of corporate social responsibility on investment recommendations. HBS *Working paper* 11.
- Johnson, S. (2011): *Dove nascono le grandi idee. Storia naturale dell'innovazione*. Rizzoli, Milano. (Original edition. Where good ideas come from. Natural history of innovation, Allen Lane, London, 2010).

- Jonas, H. (1990): *Il principio di responsabilità*. (The imperative of responsibility.) Einaudi, Turin. (Original edition. Das Prinzip Verantwortung. Versuch einer Ethik für die technologische Zivilisation, Suhrkamp, Frankfurt am Main, 1979).
- Kant, I. (1970): Fondazione della metafisica dei costumi. (Groundwork of the Metaphysics of Morals.) In Chiodi, P. (ed.): *Scritti morali*. UTET, Turin. (Original edition. Grundlegung zur Metaphysik der Sitten, Hartknoch, Riga, 1785).
- Kant, I. (2001): *Kritik der reinen Vernunft*. (Original edition. Hartknoch, Riga, 1787).
- Laudan, L. (1979): *Il progresso scientifico. Prospettive per una teoria*. Armando, Rome. (Original edition. Progress and its problems. Towards a theory of scientific growth, University of California Press, Berkeley, 1977).
- Locke, J. (2004): *Saggio sull'intelletto umano*. Bompiani, Milano. (Original edition. An essay concerning human understanding, The Buffet, London, 1690).
- Milne, A. A. (1994): *The complete tales of Winnie-the-Pooh*. Penguin, New York.
- Morin, E. (2012): *La via. Per l'avvenire dell'umanità*. Raffaello Cortina, Milano. (Original edition. La voue, Fayard, Paris, 2011).
- Natali, C. (1999): *Aristotele: Nicomachean Ethics*. Laterza, Rome – Bari.
- Nielsen (2012): *The global socially conscious consumer*. Report, March, New York.
- OECD/OCSE (2011): *How's life? Measuring well being*. Paris, November.
- Ostrom, E. (2006): *Governare i beni collettivi. Istituzioni pubbliche e iniziative delle comunità*. Marsilio, Venezia. (Original edition. Governing the commons. The evolution of institutions for collective action, Cambridge University Press, Cambridge, 1990).
- Pellegrini, G. (2010): Governance delle nanotecnologie. Coinvolgimento e partecipazione del pubblico (Governance of nanotechnologies. Public involvement and participation. In Arnaldi, A. – Lorenzet, A. (eds): *Innovazioni in corso. Il dibattito sulle nanotecnologie, fra diritto etica e società*. (Innovations in progress. Law, ethics and society in the public debate on nanotechnology.) Il Mulino, Bologna, pp. 301-320.
- Popper, K. R. (1970): *Logica della scoperta scientifica*. (The Logic of Scientific Discovery.) Einaudi, Turin. (Original edition. Logik der Forschung, Verlag von Julius Springer, Wien, 1935).
- Popper, K. R. (1972): *Congetture e confutazioni*. Il Mulino, Bologna. (Original edition. Conjectures and refutations. The growth of scientific knowledge, Routledge, London, 1963).
- Popper, K. R. (2009): *Poscritto alla logica della scoperta scientifica*. Il Saggiatore, Milan. (Original edition. Realism and the aim of science, Hutchinson, London, 1983).
- Rawls, J. (1982): *Una teoria della giustizia*. Feltrinelli, Milan. (Original edition. A theory of justice, Cambridge, MA, 1971).
- Rawls, J. (1994): *Liberalismo politico*. Edizioni di Comunità, Milano. (Original edition. Political liberalism, Columbia University Press, New York, 1993).
- Rousseau, J.-J. (2008): *Il contratto sociale* (The social contract). Feltrinelli, Milan. (Original edition. Du contrat social: ou principes du droit politique, Marc Michel Rey, Amsterdam, 1762).
- Samuelson, P. A. (1954): The pure theory of public expenditure. *Review of Economics and Statistics*, 36, 4, pp. 387-389.
- Sen, A. K. (2010): *L'idea di giustizia*. Mondadori, Milan. (Original edition. The idea of justice, Belknap Press of Harvard University Press, Cambridge, MA, 2009).

- Sisiti, E. – Olivato, I. (2010): Nanotecnologie e Governance responsabile. Oltre il Principio di precauzione. (Nanotechnologies and responsible governance. Beyond the Precautionary Principle.) In Arnaldi, S. – Lorenzet, A. (eds): *Innovazioni in corso. Il dibattito sulle nanotecnologie, fra diritto etica e società*. (Innovations in progress. Law, ethics and society in the public debate on nanotechnology.) Il Mulino, Bologna, pp. 203-215.
- Stiglitz, J. – Sen, A. K. – Fitoussi, J-P. (2008): *Report of the Commission on the Measurement of Economic Performance and Social Progress*. Available at: www.stiglitz-sen-fitoussi.fr.
- Veca, S. (1986): *Una filosofia pubblica*. (A public philosophy.) Feltrinelli, Milan.
- Weber, M. (1970): *L'etica protestante e lo spirito del capitalismo*. (The Protestant Ethics and the Spirit of Capitalism.) Sansoni, Florence (Original edition. Die protestantische Ethik und der Geist des Kapitalismus, Mohr, Tübingen, 1934).
- Wynne, B. (1992): Uncertainty and environmental learning. *Global Environmental Change*, 2, 2, pp. 111-127.