



## The Becoming of Non-Linear Knowledge: New Risks, Vulnerabilities, and Hopes\*

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### ARTICLE INFO

Received August 27, 2018  
Revised from September 29, 2018  
Accepted November 15, 2018  
Available online December 15, 2018

#### **JEL classification:**

D81; D83; I23.

**DOI:** 10.14254/1800-5845/2018.14-4.13

#### **Keywords:**

Non-linear knowledge,  
risks,  
vulnerabilities,  
institutional regulation,  
humanistic turn

### ABSTRACT

In the article it is stated that non-linear knowledge is being born and it has come into life due to 'arrow of time' effect (I. Prigogine) according to which all the matter is being developed increasingly quicker and in a more complex way. The author extends this effect to the dynamics of knowledge showing that the modern knowledge acquires the quality of reflexivity, takes on a completely new vector of non-linear development within 'turns' in sciences. The passage from linear to non-linear knowledge produces, correspondingly, more complex manufactured risks including risks of dehumanization that are specially analyzed. The monitoring of these risks implies that value oriented non-linear knowledge should be taken into account that includes not only the achievements of natural, technical and social sciences but also of the humanities. Among new challenges to humanity there appeared modern vulnerabilities manifested in increasing structural dysfunctions of a social complex system and/or a techno-natural system that take forms of 'normal accidents', 'collateral damage', etc. It is stated that main challenges of vulnerabilities lie in the domination of pragmatic values of modern knowledge. Along with changes a new kind of development in the form of metamorphosis, presupposing non-linear transformations, has come into our life that adds much to the complex character of risks and vulnerabilities. The answer to these challenges the author sees in the humanistic turn that might give as a valid knowledge of complex risks and vulnerabilities as well as grounds for better futures that people want.

### INTRODUCTION

D. Bell (1973, p. 212) argues that it is characterized by two basic phenomena: a) *"the sources of innovation are increasingly derivative from reach and development (and more directly, there is a new relation between science and technology because of the centrality of theoretical knowledge"*; b) *"the weight of the society – measured by a larger proportion of Gross National Product and a*

\* **Acknowledgements.** The research was supported by RSF, project № 16-18-10411

*larger share of employment – is increasingly in the knowledge field*". This situation is due to great changes in the nature of knowledge that took place within the development of human civilization.

The Nobel prize-winner I. Prigogine (1997) has worked out the theory of 'arrow of time' according to which all the matter (this concerns as material as well as bio and social worlds) is being developed increasingly *quicker* and in a *more complex* way. He speaks about emergent, dynamic, and self-organizing systems interacting in ways that heavily influence the probabilities of later events. In my opinion, the effect of 'arrow of time' that interprets the complex development of all matter should be extended to *the dynamics of knowledge* that becomes a great factor of change. Knowledge is characterized as a "*generalized capacity to act and as a model for reality*" (Adolf and Stehr, 2017, p. 18).

In ancient times indigenous knowledge was mainly transferred by oral communications in the form of traditions and rituals. So, social changes were slow and mainly linear in character. Nowadays we have a globally circulating knowledge (Giddens, 1990) whose uneven dynamics becomes more *complex*, includes points of bifurcation, gaps, and traumas. As a result a new kind of *non-linear knowledge* is being produced. Modern knowledge guides skilled reflexive actors whose main goal is *wealth* achieved through changes in society and nature while choosing options from many alternatives. In the long run it presupposes *risks* as chances with *hope* and *danger*. It also produces *vulnerable realities* in the form of 'new catastrophes' and 'normal accidents' as side-effects of self-realization of knowledge in technical innovations – so, catastrophic futures gained wider acceptance. But other social goals and practices are possible: *value-added knowledge of humane character* may become a major factor of the passage to a new trend of human development with the hope for *better and secure futures*.

## 1. THE ESSENCE OF THE NON-LINEAR KNOWLEDGE: POWER TO ACT WITH REFLEXIVE AND COMPLEX REALITY

Perhaps, the first evidence of the birth of the non-linear knowledge is expressed in the claim of scientists for *critical non-linear reflection*. The famous American sociologists R. Merton (1993, p. xix) acknowledged that science advances by standing "*on the shoulders of giants*" and at the same time he proposed the adoption of "*the non-linear*". Using this approach the scientist reflected "*the course taken by history in general, by the history of ideas in particular, and, in a way, by the course taken in scientific inquiry as well*". He argued for *re-reading*, in fact, *constant reinterpretation* of masters of Science in the context of time and correspondingly accumulation of *innovative non-linear knowledge*. "*I have long argued that the writings of classical authors in every field of learning can be read with profit time and time again, additional ideas and intimations coming fleshly into view with each re-reading. What is to be found in writings of the past is anything but fixed, once and for all. It changes as our own intellectual sensitivities change; the more we learn on our own account the more we can learn by re-reading from our freshly gained perspective*" (Ibid., p. 45). He continued to develop ideas of non-linear development of scientific knowledge via such concepts as unanticipated consequences, ambivalences (Merton, 1936; 1976), codependence of functions, non-functions and dysfunctions, manifest and latent functions (Merton, 1996) that are up to now useable – they give human power to deal effectively with many challenges of 'arrow of time' effects.

A valuable contribution to the non-linear scientific knowledge was made by T. Kuhn who put into question the traditional notion of the development of science in a linear accumulation of knowledge stating the ideas of *gaps of knowledge* and *scientific revolutions* (Kuhn, 1970). According to him, in a specific period of time the content and essence of science is defined by a *paradigm* as a set of categorical principles recognized by a group of scientists that during *a certain historical period* constitute the particularity of the science's subject matter. However, within some time the scientists begin to face an increase of anomalies that cannot be explained by the existing theoretic-

cal and methodological tools which consequently causes the crisis manifesting itself in gaps of knowledge and ending in a scientific revolution – a transition to a new paradigm takes place. The passage to the non-linear development of scientific knowledge via paradigms evoked *additional constant criticism* of existing knowledge and the acceleration of movement towards non-linear knowledge.

One more step towards the non-linear development of knowledge is connected with the formation of *reflexive social sciences* that meant a more valid understanding of the becoming complex realities taking into consideration both the reflexivity of objective structures and human agency. It gave a start to investigate *improvisations* and *game strategies* that are typical of non-linear knowledge. According to P. Bourdieu, scientists begin to play certain strategies in the academic field struggle over the truth seeking to achieve victories in the game that influences the knowledge and produces competing social conditions for better scientific results (Bourdieu, 1984). To succeed, one must *non-linearly innovate* in working out new empirical, theoretical and methodological tools. No wonder, the *reflexive sociology* enhanced a *higher integrated synthesis* of empiricism and theory (Bourdieu and Wacquant, 1992). Bourdieu argues that agency produces both intentional and *unintended consequences* that become a factor of *unsynchronised emergence*. If indigenous or traditional knowledge results on the whole in intentional consequences and the establishment of synchronized structures and functions, the modern knowledge due to its reflexive nature produces uncertainties and thus *side-effects* that are usually non-linear in character.

Another representative of the reflexive social science is A. Giddens who describes the non-linear changes in knowledge in the context of *'institutionalized reflexivity'* and *'manufactured uncertainties'*. According to him, social actions become knowledge-dependent both on the previous social practices and scientific and expert recommendations. As a result, on the one hand, people are liberated from structures, but on the other – they meet more complex *emergent uncertainties*. He puts it: *"What I call 'manufactured uncertainties' is bound up more with the advance of knowledge than with its limitations"* (Giddens and Pierson, 1998, p. 105). So, the 'manufactured uncertainties' force scientists to rely on instruments based on principles of non-linear knowledge.

Great advances in non-linear knowledge are connected with *'turns'* in sciences. British sociologist J. Urry was one of the first who laid the foundations of non-linear knowledge within *'complexity and resource turns'*. According to him, great changes are taking place in the material world, especially the climates are actually changing. Heavy environmental pressures appear due to innovative technologies that presuppose the production and transportation of much carbon energy. This manifests that the society and the material world are utterly intertwined constituting a *unique socio-environmental reality with new risks and vulnerabilities* that have never existed before – they are the product of global carbon networks that affect the social, material world, including climate change, and humanitarian spheres of human activity. The solutions to these challenges cannot be developed *within a single science*. This encourages Urry for a *'complexity turn'* based on a *new synthesis of scientific knowledge*: *"I embed society, and hence sociology, as a subject within the analyses of climate change, and more generally within a world of objects, technologies, machines and environments. A strong claim is made here that the social and the physical/material worlds are utterly intertwined and the dichotomy between the two is an ideological construct to be overcome"* (Urry, 2011, p. 8). He also argues for a *'resource turn'* presupposing that *"societies should be examined through the patterns, scale and character of their resource-dependence and resource-consequences"* (Ibid., p. 16). These turns imply that in order to develop a valid non-linear knowledge under the conditions of a complex socio-natural reality it is necessary to take into account the potential of even *'insignificant factors'* – they could be studied on the basis of new synthesis of sciences.

The latest contributions to the non-linear knowledge have been made by U. Beck who puts forward *'the theory of metamorphosis of the world'*. According to him, modern turbulences cannot be conceptualized in terms of *change* which implies that some phenomena change but others re-

main the same. Metamorphosis presupposes non-linear transformation in which “*old certainties of modern society are falling away and something quite new is emerging*”. The very theory of metamorphosis is non-linear in character even if compared with his own previous theorizing as it “*goes beyond theory of world risk society: it is not about the negative side effects of goods but about the positive side effects of bads*” (Beck, 2016, pp. 34). I think the process of ‘metamorphization’ has already began, but it should not be overestimated: there might be different types of metamorphoses in the form of as negative side effects of goods as well as positive side effects of bads – their codependence may be a special theme for further investigations. In any case non-linear realities have come into our life and, correspondingly, non-linear knowledge is demanded in order to produce people’s power to adequately act.

Thus, one can see a dramatic shift in scientists’ thinking that focuses on acceleration of the production of *innovative knowledge* and corresponding *innovations*: now they have not to clarify or improve the existing scientific tools, but from the standpoint of innovative theorizing to *constantly ‘rediscover’* as social and environmental realities as well as ways of their transformation. The ongoing need to interpret daily the appearing anomalies is caused by ‘arrow of time’ effects in societies and nature that are global occurrences.

## 2. COMPLEX RISKS: DEMAND FOR VALUE ORIENTED NON-LINEAR KNOWLEDGE

In reflexive modernity the development of knowledge is accompanied by the production of *risks*. U. Beck (Beck, 1992, p. 21) defines risk as a systematic way of dealing with hazards and insecurities induced and introduced by modernisation itself. In its turn modernization is linked with exclusive use of technical innovations that are based on permanent renewing of knowledge. So, “*knowledge implies the risk of change. It confronts people without concern for their wants or what they believe are their needs. It throws the established intellectual and social world into turmoil*” (Crozier, 1982, p. 126).

There appears a tendency: the passage from linear to non-linear knowledge produces more *complex risks* that are staged in character. “‘*Staging’ here, – U. Beck notes, – is not intended in the colloquial sense of the deliberate falsification of reality by exaggerating ‘unreal’ risks*”, that leads to non-linearity between anticipation and reality: “*It does not matter whether we live in a world that is ‘objectively’ more secure than any that has gone before – the staged anticipation of disasters and catastrophes obliges us to take preventive action*” (Beck, 2010, pp. 10-11). Mass-media, mainly expressing everyday knowledge, *dramatizes* events and adds *performances* facilitating the staging of risks. J. C. Alexander (2017, p. 7), the author of the theory of performance, notes: “*Internet technologies are a means of symbolic production, devices that allow for rapid circulation of performance and drama*”. That means that the risk script and its performative staging are absorbed too deeply adding to the complexity of risks.

An important component of the non-linear knowledge is *scientific non-knowledge*. Speaking about the catastrophe in Chernobyl U. Beck (2010, p. 116) argues: “*The nuclear explosion was accompanied by an explosion of non-knowledge... What used to count as knowing is becoming non-knowing, and non-knowing is acquiring the status of knowledge*”. Similar ‘explosions’ occur more or less regularly in *all sciences* – yesterday’s ‘universal’ knowledge in the form of a ‘true’ paradigm nowadays is ‘ageing’ and due to added innovations produces scientific non-knowledge. Here the non-knowledge is not ignorance but a kind of higher knowledge presupposing the existence of *hypothetical risks*. In real life we have a paradoxical combination of various kinds of knowledge and non-knowledge making the dispersion of ‘old’ and modern risks.

These new knowledge phenomena were a significant factor of the birth of complex risks that are different from ‘old’ ones. U. Beck (2010, p. 52) states that the new types of risks that are promoting the global anticipation of global disasters and catastrophes exhibit three characteristic

features:

- “*delocalization*: their causes and consequences are not limited to one geographical location or space”;
- “*incalculability*: their consequences are in principle incalculable; at bottom they involve ‘hypothetical’ risks based on scientifically generated non-knowing and normative dissent”;
- “*non-compensatability*: ...the logic of compensation is breaking down and is being replaced by the principle of *precaution through prevention*”.
  
- Nevertheless, Beck’s (1998) approach fails to take into special consideration the complexities of *dehumanized effects* of risks. Practically all risks are ambivalent and manifest both as *positive* as well as *negative* forces. A. Giddens argues that active risk-taking is a core force in the creation of innovative society, renewal of social life and democracy. Wealth and achievements are eventually due to the people’s choice of *knowledge alternatives and values*. Thus, professional risks are usually portrayed as heroic and socially important. But some risk-choices are made within the values of well-being that increases growth and consumption by all means. As growth is a “*function of inequality*” (Baudrillard, 2017, p. 73) there appeared complex risks of *new segregation*. In any case risks are determined by knowledge within *dominant values*. The risks of modern societies have come into conflict with the orientations of people towards industrial socio-cultural values and the logic of formal rationality, according to which the pursuit of welfare is rational. However, a further increase in growth of the production and consumption of goods will inevitably lead to *even more complex manufactured risks* that might undermine the bonds of human relations. The monitoring of these risks implies that linear knowledge with a pragmatic goal to create wealth and comfort should be replaced by *value oriented non-linear knowledge* that includes in itself not only the achievements of natural, technical and social sciences but also knowledge of the *humanities*. This synthesis might give not only more valid knowledge of complex risks of dehumanization but hopes for a better risk-management.
- There have already appeared shifts in our thinking about how people might resist the *inhumane* aspects in modern knowledge. Z. Bauman (2011, pp. 18-19) pays attention to the fact that some human actions lack their proper *humane characteristics*. In the essay *As the birds do* he metaphorically compares human actions and reflexivity with the birds’ one arguing that ‘Twitter’ is what birds produce when they tweet. Tweeting plays two roles in the life of birds: it allows them to keep in touch with each others, and to prevent other birds from transgressing on the territory they’ve made their own. *Human Twitter* has the same functions: “*Once face-to-face contact is replaced by a screen-to-screen variety, – he writes, – it is the surfaces that come in touch. Courtesy of Twitter, ‘surfing’, the preferred means of locomotion in our hurried life of instantly born and instantly vanishing opportunities, has finally caught up with interhuman communication. What has suffered as a result is the intimacy, the depth and the durability of human intercourse and human bonds*” (Ibid.). The lack of humane phenomena is also expressed in manufactured risks of ‘moral insensitivity’, ‘heartless kind of behaviour’, ‘simulating friendship’.
- Z. Bauman and L. Donskis (2013, pp. 13-14) state that “the function of pain to be an alert, a warning, and a prophylactic tends to be all but forgotten, however, when the notion of ‘insensitivity’ is transferred from organic and bodily phenomena to the universe of interhuman relation, and so attached to the qualifier ‘moral’. The non-perception of early signals that something threatens to be or is already wrong with human togetherness and the viability of human community, and that if nothing is done things will get still worse, means the danger is lost from sight or played down for long enough to disable human interactions as potential factors of communal self-defence...”. These complex risks of dehumanization have appeared not by chance – they are the product of human actions and, in my opinion, they are due to the *lacks of the proper role of the humanities* in the mainstream knowledge.

I’ll also mark two risks of dehumanization evoked by ‘arrow of time’ effects:

- the speed of acquiring formal and practical knowledge performing the function of change to create wealth is much greater than the development of humanistic orientation in our knowledge. Without the proper human ethics the knowledge as a model for better reality is very often opposed to major principles of the civil society and even destroys them (the Occupy protests, the social uprising in the Arab Spring, Black Lives Matter, etc. were determined by knowledge linked with staging performances about ‘happy life’ and ‘real justice’). As one can see choreographed agency may be based on the rapid speed of acquiring dispersed knowledge of unsynchronized individual ‘liberation’ without human ethics;
- in the knowledge of individual actors there is still little understanding that we are dealing with the management of the non-linear developing social-natural systems that function on different principles. It means that “*the complex systems world is a world of avalanches, of founder effects, self-restoring patterns, apparently stable regimes that suddenly collapse, punctuated equilibria, ‘butterfly effects’ and thresholds as systems tip from one state to another*” (Kravchenko and Perova, 2017, pp. 449-459).

Order and chaos, he notes, are in a certain state of balance “*where the components are neither fully locked into place but yet do not dissolve into anarchy. They are ‘on the edge of chaos’*” (Urry, 2003, pp. 237-238). This is a fundamentally new view on social order where the criteria of true and false, norm and anomie are subjected to diffusion. So, *humane approaches* are needed while dealing with complex risks. One should consider that the situation has radically changed: under the conditions of the complexity risk-taking to restore the social order almost always generate further unsynchronised emergences and unanticipated consequences pushing as the society as well as the material world away from the equilibrium. The humanity might have come to the threshold of actual human capacity of reflection transient events that is to *act adequately, rationally*, and most importantly – to make decisions based on *humane purposes*.

### 3. VULNERABILITIES OF COMPLEX SYSTEMS AS CHALLENGES TO HUMANITY

Until recently scientists tended to find causes of disasters among *external* forces such as natural processes or human activities. Now disasters and catastrophes might be also caused by *internal* factors generated by ‘normal’ interactions of people with complex social, technical and environmental systems. In such complex systems internal factors may start to function out of the men’s control producing *vulnerabilities*. In the most general sense, *modern vulnerability* means an *increasing structural dysfunction of a social complex system* (socio-cultural order of a city) and/or a *techno-natural system* (nuclear power plant, water and food production) that under the influence of the *external* agency of people including high-scale knowledge and technology may cause *internal* forces of a system to express its own ‘will’ as a sort of reflexivity that is destructive for the society. In real life, this phenomenon manifests itself in a *potential threat of a catastrophe* and *social fears of people* about emerging uncertainties in systems (Kravchenko, 2017, pp. 3-13). It should be stressed that these complex systems couldn’t have been born before rather a high level of non-linear scientific knowledge came into life (Georgesku and Spataru, 2017). This knowledge carries within itself a kind of pressure towards practical materialization in advanced technologies, enterprises, infrastructures, thus forming complex systems mainly as socio-technical-environmental hybrids that change the character of modern societies. “*Scientific knowledge has been accumulating for a very long period, and had a consistent if frequently unperceived effect in shaping the fundamental character of human societies*” (Fukuyama, 1992, p. 72). Societies with these complex systems become turbulent and vulnerable that presupposes the *catastrophe’s uncertainty in time and space*. Whether it happens or not depends on lots of factors including the potential of the system’s ability/inability to withstand the external and internal burdens of emergent nature. There appeared “new” catastrophes that are facilitated by non-linear knowledge accumulation, the production of non-knowledge and knowledge explosions. They manifest themselves in permanent staging of disasters and ‘liquid fears’. The very discourse of vulnerability means a great challenge

to the humankind's security.

American sociologist Ch. Perrow (1999, p. 5) metaphorically named modern vulnerabilities '*normal accidents*'. By this concept he means accidents and disasters caused not by false management of personnel, but by everyday functioning of complex technical systems that periodically fail 'normally'. That is, as he states, given the system complex characteristics, the "*multiple and unexpected failures are inevitable*" even with the best management. In the new book *The Next Catastrophe: Reducing our Vulnerabilities to Natural, Industrial, and Terrorist Disasters* he demonstrates that vulnerabilities become increasingly complex in their nature: "concentrations of hazardous materials, populations, and economic power in our critical infrastructure make us more vulnerable to natural disasters, industrial/technological disasters, and terrorist attacks" (Perrow, 2011, p. vii). At the same time Perrow (Ibid., p. xxii) stresses that a potential catastrophe is not caused by human errors but by *nature of complex systems* – to minimize their risks people should avoid construction such systems. "*Normal Accident Theory (NAT) argued that if we had systems with catastrophic potential that might fail because of their complexity and tight coupling, even if everyone played as safe as humanly possible, these systems should have been abandoned. Catastrophes would be rare, but if inevitable, we should not run the risk*". The scientist calls for stopping the population growth in ecologically and technologically dangerous areas where industrial extraction of natural resources is carried out simultaneously with the development of agriculture, fisheries, creating social and cultural infrastructure. To prevent vulnerabilities from terrorist threats he advocates closing "*all the holes in our open society*" (Ibid., p. 127) However, he is sure that it is impossible to totally eliminate 'normal accidents' which are attributes of complex socio-technical systems: "*We are not safe. Nor can we ever be fully safe, for nature, organizations, and terrorists promise that we will have disasters evermore. Let us minimize their consequences by minimizing the size of our vulnerable targets*" (Ibid., p. 325).

In my opinion, complex systems in *the forms they exist nowadays* produce great challenges to humanity. But we find the idea utopian to *abandon them as such* or even *limit their functions*: the process of the self-realization of knowledge makes it impossible. Risks of 'normal accidents' should be minimized not by the way of abandonment of complex systems but rather through their *comprehensive humanization* that would let them acquire new forms – *humane-based* development on the basis of the integrity of social, natural, technical and the humanities. To this synthesis traditional and even religious knowledge should be added as it preserves routine social practices and conservative ways of thinking that might balance or prevent *pragmatic risky innovations* (the production of knowledge in human genetics, new means of conducting wars that go out of the men's control). I also believe that main challenges of '*normal accidents*' lie not so in potentially possible catastrophes, but in the domination of *formal rationality* and *pragmatic values* in modern knowledge. There might be complex systems that are based on a kind of high-level knowledge oriented on substantial rationality and existential people's needs.

Essential contribution to understanding of vulnerabilities of the *climate system* as a complex socio-environmental hybrid was made by A. Giddens. According to him, climate change is the result of *pragmatic, mercantile* agencies of people who exploited nature within the knowledge of Man as 'the measure of all things' for a considerable period of time without taking into account *environmental sensitivity*. As a result man-made challenges to humanity were produced. He interprets them in the context of the effect, which he called honoring his name, '*Giddens's paradox*'. The essence of it is that the traditional division of the natural and social environment is now losing its sense. In traditional and even industrial societies challenges in the form of different disasters used to come *from nature*. Now they come mainly from the *people themselves*. Meanwhile, linear thinking and knowledge of climate continue to dominate. In *The Policy of Climate Change* he argues that it leads to a false, distorted perception of contemporary activities of people: they "find it hard to give the same level of reality to the future as they do to the present" (Giddens, 2009, p. 2). It concerns as everyday problems as well as global environmental problems: the representatives of busi-

ness and political elite are well aware of the postponed negative side-effects of their policy regarding nature, but under the influence of pragmatic values in modern knowledge they do not take necessary efforts to transform the situation for the better – ‘organized irresponsibility’ enables climatic changes that are possibly irreversible. As one can see linear knowledge keeps producing challenges to humanity.

The vulnerabilities of the climate system were also analyzed by J. Urry (2011, p. 23) who proposed a valid interpretation of ‘global warming’. In his opinion, ‘warming’ is “*a simplifying term since what may happen in different parts of the world may be very different, with possibly significant cooling occurring in some places. Indeed the problem of the term warming stems from the sheer difficulty in predicting long-term future climates*”. It seems that this is actually a non-linear interpretation of the vulnerabilities of the climate system, the one which emphasizes turbulence, unpredictability of climate change, as well as possible unintended consequences arising from the self-realization of knowledge and the innovative activity of the humanity. The sociologist also notes the interdependence of climate change and the destiny of civilizations, advocating the study of the complex causes of the emerging vulnerabilities in the climate system within “*a framework which emphasizes non-linearity, thresholds and abrupt and sudden change*” pointing to the limits of the linear knowledge on climate: “*it is noteworthy that historical analysis and science did not consider that climate played much of a role in the rise and fall of civilizations. Climate was typically viewed as immutable, not changing much and no being of great consequence for the ways in which special societies develop and change*” (Ibid., pp. 21-22, 24). Really, non-linear and humanistic approaches to the vulnerabilities of the climate system are demanded.

New vulnerabilities have also emerged in the *food system* which is also a complex socio-environmental hybrid. The functionality of global-network agribusiness is much predisposed to ‘normal accidents’ in the form of an ever increasing production of genetically modified products and extension of ‘dead land and water’ (Sassen, 2014, pp. 149–210; Galnaitytė et al., 2017; Czyzewski and Smedzik-Ambrozy, 2015). I believe the minimization of these vulnerabilities can be achieved by the rejection of the obsolete dogma – the more food, the better. In fact people need qualitative nutrition that would create conditions for their physical and spiritual health, empower them with adequate energy to prevent culture-bound syndromes – anorexia nervosa, addiction on fat and sweat food, etc.

Z. Bauman (2011a, pp. 65-66, 68) states that there appeared new vulnerabilities in the form of ‘*collateral damage*’ of man’s activity. This term was used in the vocabulary of military expeditionary forces but under the consequences of ‘liquid modernity’ it denotes unintended, unplanned effects of human actions in general. Thus, while producing knowledge and wealth people didn’t take in account the possibility of *existential insecurity* that accompanies the life in the ‘liquid modern’ world. This type of insecurity is determined by the very life of a big city and expressed in *mixophilia* (attractions it can support and offer) and *mixophobia* (fears that force people into ‘gated communities’). The side effects of these wall-off developments are *vulnerabilities to existential needs* of communicating with one another: people pay a lot of money “*in order to liberate themselves from unwanted company to be left alone. Inside the walls and the gates live loners*” (Ibid.). The need for security can become *addictive*: “*Once you start drawing and fortifying borders, there is no stopping*”. So, one can see ‘*collateral damage*’ in the self-realization of knowledge – unpredictable consequences appear.

I argue that in order to overcome these vulnerabilities people need decisions and actions with *humane character*. There are at least three basic grounds for them:

- up to now the *institutional regulation* of scientific knowledge production is supported by many societies allowing not overstepping the edge of chaos. Institutional control should be more directed toward ‘manufactured uncertainties’ and existential people’s needs;
- the ‘arrow of time’ effects bring a fundamentally *new interdependence of scientists* manifested in a variety of communities whose content may be expressed as in strong ties suggesting their



intensive interactions as well as in *weak ties* that are of particular importance in networks of 'invisible colleges' (Crane, 1969). The total effectiveness of them depends not only on increasing the number of arithmetic nodes included in it, but on increasing the social space in which people are involved. This confirms the truth that in complex systems weak ties can have a great impact on the very *humanization* of scientific and technological innovations as they presuppose *particular network private insurance*;

- the subject matter of many sciences is being changed in *humane direction*: more scholars pass over to the problems of new vulnerabilities treating them as a matter of life, as a need to move in the direction to *existential security of humanity*.

#### 4. HOPES FOR BETTER FUTURES: SEARCHING FOR KNOWLEDGE BASED ON SOLIDARITY VALUES

Nowadays scientists *rediscover* futures on the basis of *non-linear* knowledge taking into account the *demand for its humanization*. The general opinion is that there are no simple linear ways to the 'universal common' future of mankind. If not so long ago the future was seen as an optimistic 'progress' of all mankind, the theme of the Third ISA Forum (Vienna, 2016) was: "*The Futures (plural!) We Want: Global Sociology and the Struggles for a Better World*". Much attention was given to overcoming of 'global humanitarian crisis' while working out the essence of the future – could it be 'human', 'posthuman' or 'trunshuman' (Fuller, 2016, p. 85). I believe that the most important goal is to elaborate *valid* and *humane* ways to possible futures, so that their models could be both *desired* and *realized*. The 13<sup>th</sup> Conference of the European Sociological Association (Athens, 2017) stressed the necessity of new *solidarities* in Europe that demands the overcoming the limits of the existing knowledge: "The project of questioning reality began in Greece, and sociology from the start shared in this task of highlighting dominant forms of understanding in societies (and science) that limit knowledge, by working towards more fitting kinds of understanding" (Welz, 2017, p. 9). To fulfill this task we need to pass to a *humane vector* in the production of knowledge based on *culture and solidarity values* which are already being born producing hopes for better futures.

M. Castells (2015, pp. 2-3, 14) has made great contributions to understanding modern movements that were provoked by "*the cynicism and arrogance of those in power, be it financial, political or cultural, that brought together those who turned fear into outrage. And outrage into hope for a better humanity... Hope projects behavior into the future. Since a distinctive feature of the human mind is the ability to imagine the future, hope is a fundamental ingredient in supporting goal-seeking action*". The results of the study undertaken by a collaborative international research network on alternative economic practices and their cultural foundations that investigated between 2011-2015 allowed to come to the conclusion that there began a social change in the direction of *another economy* that embodied alternative values to formal rationalism, pragmatism and mercantilism: "*the value of life over the value of money; the effectiveness of cooperation over cutthroat competition; the social responsibility of corporations and responsible regulation by governments over the short-term financial strategies... we saw the blossoming of multiple experiences of innovation in organizing work and life: cooperatives, barter networks, ethical banking, community currencies, time sharing banks, alternative means of payments, etc*" (Castells, 2017, p. 1).

At the same time many people fear the alarm discourse of knowledge about the future and they turned toward the past. According to Z. Bauman (2017, pp. 14, 16, 25, 44) there began a 'global epidemic of nostalgia'. In *Retrotopia* he argues that its major factors lie in the *optionality* of human choices among which are as follows: the 'civilizing process' was designed as "a reform of human *manners*, not human *capacities, predispositions and impulses*"; "in the course of civilizing process, acts of human violence were shifted out of *sight*, not out of *human nature*"; "we seem to be settling for a prospect of a continuous and never conclusive war-to-exhaustion between 'good

violence' and 'bad violence'; "we live in a world in which pragmatism is the topmost rationality"; "our world – the world of weakening human bonds". As the scientist considers, in order to overcome the global epidemic of nostalgia people should reject the dogma 'there is no alternative' and realize "chances of success and defeat": "*More than at any other time, we – human inhabitants on Earth – are in the either/or situation: we face joining either hands, or common graves*" (Ibid., p. 167). The humanity has the hope to make a choice of a *humane model* for future.

U. Beck (2016, p. 26) applying to his theory of 'metamorphosis of the world' proposes the idea of '*emancipating catastrophism*' which takes into account the 'positive side effects of global risks'. From this point of view he criticizes the pessimism of representatives of the linear approach to modern disasters. "*We all know that the caterpillar will be metamorphosed into a butterfly. But does the caterpillar know that? That is the question we must put to the preachers of catastrophe. They are like caterpillars, cocooned in the worldview of their caterpillar existence, oblivious to their impending metamorphosis. They are incapable of distinguishing between decay and becoming something different. They see the destruction of the world and their values, whereas it is not the world that is perishing, but their image of the world. The world is not perishing, as the preachers of catastrophe believe, and the rescue of the world, as invoked by the optimistic advocates of progress, is not imminent either. Rather, the world is undergoing a surprising, but understandable, metamorphosis through the transformation of the reference horizon and the coordinates of the action*" (Ibid.).

I argue for a *humanistic turn* in all sciences that proceeds from the premise that the synthesis of natural, social and humanitarian knowledge would result in a humanistic paradigm of complexity presenting a value-added non-linear knowledge that is needed to analyze the complex social, technical, and natural realities. This implies a newer type of scientific knowledge, whereby societies and all matter should be analyzed through the patterns and character of their complexity-dependence and human agency-consequences (Kravchenko, 2013, pp. 3-12; Chuprov, 2016).

As it is known, the representatives of the Enlightenment (Sh. Montesquieu, K. Helvetius, and others), in contrast to religious humanism founded *secular humanism* asserting the self-worth of worldly existence, the dominant role of reason and rationality as the main values. They advocated the need to overcome all forms of unfreedom, considering a person to be *the yardstick of all things* whose omnipotence of intelligence can produce only goodness and morality. In fact, pragmatic principles of humanism of the Enlightenment latently prepared the grounds for *anthropocentrism* producing nowadays complex risks and vulnerabilities. The *anthropocene* as the current period of geological history is characterized by "soaring carbon dioxide levels, a quantum step upward in erosion, wide-spread species extinction, ecosystem disturbance and acidification of the oceans" (Urry, 2016, p. 45). These risks and vulnerabilities could be overcome or minimized only by passing to a new trend of developing knowledge and its self-realization. At the most general level, the humanistic turn deals with the 'arrow of time' effects of socio-cultural and environmental dynamics, synergetically takes into consideration risks and vulnerabilities of society and environment, searching for new forms of humanism adequate to the becoming complex systems of the contemporary world that are economic, physical, technical, political and social (Vancea et al., 2017). At the same time the humanistic turn, rejecting the ideas and practices of anthropocentrism, aims to study the problems of humanization of scientific and technological innovations to maintain the balance between them and key environmental processes, so that the advance of non-linear knowledge would produce as much as possible *controlled* 'manufactured uncertainties'. Through the humane practices, the development of scientific ethos it is possible to establish the principles of *substantial rationality* in modern non-linear knowledge that would make a realistic basis of hopes for futures people want.

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