

## **Interrogating Resilience. Safety management, Social structuralism and Systemic adaptation.**

Specht Maryline<sup>1</sup>, Poumadère Marc<sup>2</sup>

<sup>1</sup>Université René Descartes Paris 5 – Sorbonne, France  
maryline.specht@univ-paris5.fr

<sup>2</sup> Institut Symlog, Paris, France  
poumadere@wanadoo.fr

*"Something new has to be built to abolish the previous narrowness, because no reform by itself can destroy a system which, in spite of its shortcomings, can fulfil given requirements - or else it would not exist – in the absence of any system above it which could do better"*

*Pavel Florenski, 1905.*

**Abstract.** In this article we propose a theoretical discussion around the resilience concept and practice. Based upon a safety managerial trend aiming to diffuse safety culture through training within a pharmaceutical industry, analysis are initiated to define how organizational resilience (attached to safety culture) interweaves with risk factors and can be developed through training. Classical safety management aims at developing various systems, technical as well as organizational, to prevent and protect against dangers. Training, in this case, is a matter of risk assessment development. We suggest a new perspective stemming from *human management*. Its axis is to identify the frame of psychological resilience and to consider how it can be sustained. Psychological resilience appears to be a three-dimensional phenomenon less linked to risk assessment than to cultural structuralism and systemic adaptation. Along with the discussion, the question of training towards psychological resilience is discussed as well. It appears that resilience is questioned by uncertainty, ambiguity and complexity, and framed by structural, symbolic and relational systems; risk factors awareness, prudence and justice standards, along with systemic adaptation, altogether can sustain flexible and adaptative responses.

### **1 DIALECTICS**

As specified by Woods and Hollnagel (2006), resilience engineering tries to make a major step forward, not by adding an additional concept to the existing vocabulary (e.g. human error, organizational failures, safety culture, complacency...), but by proposing a completely new vocabulary, and therefore also a completely new way of thinking about safety.

The writing we propose here is a theoretical discussion originated in a study performed during the 2006 year. Sanofi – aventis as a leader among chemical industries has launched an organisational learning trend in order to enhance organisational resilience. The ENSMP (Ecole Nationale Supérieure des Mines de Paris) and the University of Paris 5 – Sorbonne have developed within this frame a training program for the technical staff, aiming to spread safety awareness through the organization. Choice has been made to go through the introduction of risk assessment in chemical process mastering. Because risks factors have been thus originated in the chemical process, appropriate resilience has been define as enhancing the technical staff ability to assess those risks. *The meaning of risk factors has induced the meaning of resilience.* Following this case, it appears that discussing resilience leads to tackling risk factors. Interrogating resilience clearly questions the possibility and the means of mastering risks factors. Therefore we will discuss the interweavement of risk factors and resilience.

## 2 INTERWEAVEMENT OF RISK FACTORS AND RESILIENCE

The risk literature suggests a definition of risk factors as any organisational event or characteristic introducing complexity, uncertainty, and/or ambiguity; and organisational resilience can be defined as any organizational ability for novelty and innovation allowing reviving and regenerating. Resilience engineering is a paradigm that focuses on how to help people cope with complexity under pressure to achieve success. One measure of resilience is therefore the ability to create foresight – to anticipate the changing shape of risk, before failure and harm occur (Woods, Hollnagel, 2005). We all know the pessimistic approach of Perrow (1984) for whom complexity leads to “normal accident”. From that point, the issue for organisations appears as the potential of resilience confronted to the potential of risk factors. Furthermore, we believe to be correct in saying that a crucial discussion for resilience engineering is how resilience interweaves with risk factors, how it can be developed and flow throughout the organization.

Risk factors can be designed as part of a tri dimensional frame crossing structures, relations and symbols (Jacques & Specht, 2006). There can be structural risk factors as well as relational or symbolic ones. Risks inherent to the chemical process are part of structural risk factors. The sanofi - aventis training program therefore addresses only partially the resilience issue. The training program itself is a secondary matter<sup>1</sup>. Classical definitions of chemical process are presented to the technical staff along the protocol of risk mastering: dangers identification, dangers evaluation, risks assessment and barriers definition. The core of training is changing the frame and sustaining awareness. Risks factors are pictured in so many subjective ways so that resilience remains unstable unless appropriate framing becomes accessible. Training is from one to the other hand a dialectic protocol. Trainees have to elaborate new systems of

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<sup>1</sup> The program can only be presented briefly for confidentiality reasons. It organises three sets of knowledge: dangers characterisation, impacts evaluation, risks analyse and barriers definition.

thinking which will be confronted to past ones. Nevertheless, the problem is that the deeper the system is rebuilt the more unconscious thinking is involved.

*Thinking immediately perceives the insufficiency of the created instant, the misery of the given organisation, the inadequacy of the system with its pretensions; the system doesn't support the load of what is building on top of him, and after some development, it disperses and collapses. [...] This circumstance encourages the creation of a new following system [...] Learnt knowledge requires prior knowledge. This pre dialectic knowledge exists indubitably, because if that wasn't the case, there will be no raison for initiating a dialectic process. [...] The knowing men can not speech out his knowledge, he knows, as quoted from Dostoievski, "without consciousness", and, still, this knowledge shall not be inexistent.*

*Pavel Florenski, 1905.*

Regarding the foregoing paragraph, the real ambition of training to resilience appears to be the development of structural, symbolic and relational resilience. From normal framing to incident diagnostic, the level of risk relies upon the mixing of complexity, uncertainty and ambiguity.<sup>2</sup> Training for better resilience challenges those three issues within the frame of structures, relations and symbols.

### **3 WALKING THE FORKING PATH OF CAUSES, SYMBOLS AND SYMPTOMS MITIGATION.**

#### **3.1 Structural resilience: the question of safety management facing causes**

A global definition is proposed by Villemeur (1992) for safety as performance being the "ability of an entity not to cause, under given conditions, critical or catastrophic events". The above definition clearly positions risks and resilience inside causality inherent to the organization and mixing: Process factors (e.g. SEVESO Regulation); Stability factors (e.g. Organizational changes, Technical innovations); and Initiating factors (e.g. Human errors, Technical defaults).

Staffs usually consider that resilience against those risk factors relies on barriers against process factors, procedural update against instability factors and sanctions against human factors. Goal for safety management is to substitute to the candour of those beliefs new ways of thinking. Training, through multiple examples of process factors, debates and suggestions, questions whether it is possible or not to handle the course of actions. The discussion is echoing the analysis which follows.

In one hand, *The summa Theologica* denies that God can undo, unmake what once existed. Links between ends and origins are so strengthen that even God can not disentangle it. In the realm of crises and/or catastrophes, what has once occurred is to be repeated. It is therefore not humanly realistic to avoid catastrophes. It is only

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<sup>2</sup> Risk factors are more usually diagnosed through risk ranking. Tedious cross examination of the different graduations (gravity and frequency) used within industries only shows us the needs of technical safety to rationalize risks, but misses the necessity of managerial diagnoses to draw lines of progress from systemic and altogether precise modelling.

conceivable to mitigate crises. On the other hand, fortunately, *the tangled concatenation of causes and effects which is so vast and so secret that it is possible that not a single remote event can be annulled, no matter how insignificant, without cancelling the present*. It appears then that the course of actions is never precisely twice the same. And, an infinitesimal change has potentially major impacts. This assumption is the *raison d'être* of the necessarily delicacy and refinement of mitigation processes which are nonetheless crucial. One does not require to act extraordinary to avoid crises. In that perspective, resilience is not a matter of costly and mechanical adaptation processes (be it physiological or psychological), it is rather linked to the propensity of many tiny actions and their multiple combinations.

The unresolved question is how (where and when) invisible changes are to be made. Crises' mitigations remember us the eternal search for origins. Potentially, all bits of circumstances, any characteristics to act on may have their proper propensities and, all the combinations being possible, it adds even more possibilities. Afterwards, origins are retraceable. But their meanings and developments remain unpredictable. Anticipation appears then defective. Resilience resurfaces as a matter of facing uncertainty; uncertainty referring to unpredictability and uncontrollability.

Borges' tale (Borges, 1998) *The lottery in Babylon* provides an illustration for how complexity and ambiguity may be drawn from uncertainty. "The lottery in Babylon" describes how rules of loss and gains for everyday life are in a fantasy substitutes to uncertainty. Eventually, it shows the complexity and non sense deriving from organizational excess based on the multiplication of rules which, once they are superimposed, become monstrously unintelligible and incoherent.

The conclusion we propose is that structural resilience has to be built through awareness (of dangers characterisation, impacts evaluation, risks analyse and barriers definition) for collegial and flexible adjustments to process, stability or initiating factors. Woods and Hollnagel (2005) comment how hindsight affects safety management. Focusing on errors might be misleading as well (Hollnagel, 1983; Rasmussen, 1983). It remains the question of enduring awareness and allowing collegial and flexible adjustments. One response, if only one response exists, lies on symbolic resilience.

### **3.2 Symbolic resilience: dealing with symbols and social structuralism**

Symbols are background unconscious knowledge, otherwise called myth by Roland Barthes (1957). To this author, myth is underneath the triangulation between significance, reality and signs. Within the scheme of risks, myths refer to social pacts (Giddens, 1994) and origin themselves in historical as well as cultural backgrounds. Myths are numerous, sustaining or weakening safety, so that as a first focus of the training, myths have to be unveiled and readjusted. Risk perceptions as roots of accidents and disasters emphasise the impacts of social structure as relationships between different individuals or groups, enduring relatively stable patterns of relationship (Levi Strauss, 1958). Organisations appear as labyrinths of symbols and resilience's issues as embedded into structurally related groups or sets of roles, with different functions, meanings or purposes. Eventually, the only way to face uncertainty is through sense making (Weick, 1986) and cultural processes (Specht, 2006). But, even

if symbolic attribution of significance is a fundamental process for human adaptation, crises in particular invoke further archaic symbolic processes (Dejours, 2000): Dreams and Melancholy.

*The images in dreams, wrote Coleridge, figure the impressions that our intellect would call causes; we do not feel horror because we are haunted by a sphinx, we dream a sphinx in order to explain the horror we feel.*

Jorge Luis Borges, 1998.

When a catastrophe occurs or is supposed to occur, the involved persons are numerous to express they sense the reality as dreams or nightmares. In such case, dreams are close to actions. And, as a close companion of dreams, melancholy is the inevitable process leading from dreams to nightmares that is to say the picturing of death. It is easy to foresee the challenges of resilience building under such influences.

*The picturing of death can be seen as vulnerability and as the centre of melancholy.*

Paolo Virno, 1994, 2002.

Facing risks is facing dreams, melancholy and eventually vulnerability. Whatever structural barriers and defences, when encountering danger, resilience depends upon handling vulnerability. Observing a terrifying avalanche, safety comes across vulnerability (Kant, 1790). The disaster is foreseen as a set of particular dangers and an absolute threat. The first one is conceivable and controllable through structural barriers while the second one requires symbolic resilience: reassurance feelings based on moral confidences. Vulnerability is suspended upon concrete remedies and existential values. Safety values sustained and diffused through training create forms of safety culture providing shelter from absolute risk. Two types of risk, particular and absolute, call for two types of remediation: structural and symbolic resilience.

Dialectic between fear and anguish is enclosed within the frame of vulnerability and resilience. Characterized dangers are less unpredictable and unequivocal than absolute threats which in addition are much more intricate. Fear refers to precise danger, anguish to diffuse stressors (Heidegger, 1927). Ambiguity, uncertainty and complexity generate anguish. As immediate consequences of vulnerability and threat, anguish is a most difficult emotion to deal with. Praxis and collective actions are therefore limited. Fear is traceable and mastered within collective experience and through the inherited ethos. Anguish surfaces from the disjoint temporality of threat. *The time is out of joint. O cursed spite, that ever I was born to set it right* (Shakespeare, Hamlet, Act I, Sc. V, v 196-7). The symbolic quest for safety is confronted to the unforeseen. For the human animal, life is a heavy duty for which disorientation has to be decreased (Gehlen, 1940). Prudence and justice answer altogether resilience needs.

Thomas d'Aquin exposes the question of prudence in the first article of the 47th question of the second part of the Summa Theological<sup>3</sup>: *Whether prudence is in the*

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<sup>3</sup> Second part of the second part (QQ. 1-189); Treatise on prudence and justice; On prudence. (Questions [47]-56); Question 47: Of prudence, considered in itself (Sixteen articles).

*cognitive or in the appetitive faculty?* Objections are exposed to place prudence within appetitive faculties and arguments are developed to place prudence within the cognitive faculties.

*Objection 1: It would seem that prudence is not in the cognitive but in the appetitive faculty. For Augustine says (De Morib. Eccl. xv): "Prudence is love choosing wisely between the things that help and those that hinder." Now love is not in the cognitive, but in the appetitive faculty. Therefore prudence is in the appetitive faculty.*

*Objection 2: Further, as appears from the foregoing definition it belongs to prudence "to choose wisely." But choice is an act of the appetitive faculty, as stated above (Question [13], Article [1]). Therefore prudence is not in the cognitive but in the appetitive faculty.*

*Objection 3: Further, the Philosopher says (Ethic. vi, 5) that "in art it is better to err voluntarily than involuntarily, whereas in the case of prudence, as of the virtues, it is worse." Now the moral virtues, of which he is treating there, are in the appetitive faculty, whereas art is in the reason. Therefore prudence is in the appetitive rather than in the rational faculty.*

***On the contrary, Augustine says (Questions. lxxiii, qu. 61): "Prudence is the knowledge of what to seek and what to avoid."***

*I answer that, As Isidore says (Etym. x): "A prudent man is one who sees as it were from afar, for his sight is keen, and he foresees the event of uncertainties." Now sight belongs not to the appetitive but to the cognitive faculty. Wherefore it is manifest that prudence belongs directly to the cognitive, and not to the sensitive faculty, because by the latter we know nothing but what is within reach and offers itself to the senses: **while to obtain knowledge of the future from knowledge of the present or past, which pertains to prudence, belongs properly to the reason, because this is done by a process of comparison. It follows therefore that prudence, properly speaking, is in the reason.***

*Reply to Objection 1: As stated above (FP, Question [82], Article [4]) the will moves all the faculties to their acts. Now the first act of the appetitive faculty is love, as stated above (FS, Question [25], Articles [1],2). Accordingly prudence is said to be love, not indeed essentially, but in so far as love moves to the act of prudence. Wherefore Augustine goes on to say that "prudence is love discerning aright that which helps from that which hinders us in tending to God." Now love is said to discern because it moves the reason to discern.*

*Reply to Objection 2: **The prudent man considers things afar off, in so far as they tend to be a help or a hindrance to that which has to be done at the present time.** Hence it is clear that those things which prudence considers stand in relation to this other, as in relation to the end. Now of those things that are directed to the end there is counsel in the reason, and choice in the appetite, of which two, counsel belongs more properly to prudence, since the Philosopher states (Ethic. vi, 5,7,9) that a prudent man "takes good counsel." But as choice presupposes counsel, since it is "the desire for what has been already counselled" (Ethic. iii, 2), it follows that choice can also be ascribed to prudence indirectly, in so far, to wit, as prudence directs the choice by means of counsel.*

*Reply to Objection 3: **The worth of prudence consists not in thought merely, but in its application to action, which is the end of the practical reason.** Wherefore if any defect occur in this, it is most contrary to prudence, since, the end being of most import in everything, it follows that a defect which touches the end is the worst of all. Hence the Philosopher goes on to say (Ethic. vi, 5) that prudence is "something more than a merely rational habit," such as art is, since, as stated above (FS, Question [57], Article [4]) it includes application to action, which application is an act of the will.*

It appears that prudence is necessary to foresee uncertainties. Based on knowledge from the present and the past, prudence leads reason in decision and action. It highlights hindrance and help. Its worth is in the foundation of actions as an act of the will. Prudence is right reason applied to action. It is attached to justice. The 58th question: *Of justice* (Twelve articles) exposes in its first article, the problematic of: *Whether justice is*

*fittingly defined as being the perpetual and constant will to render to each one his right?*

*Objection 1: It would seem that lawyers have unfittingly defined justice as being "the perpetual and constant will to render to each one his right" [\*Digest. i, 1; De Just. et Jure 10]. For, according to the Philosopher (Ethic. v, 1), justice is a habit which makes a man "capable of doing what is just, and of being just in action and in intention." Now "will" denotes a power, or also an act. Therefore justice is unfittingly defined as being a will.*

*Objection 2: Further, rectitude of the will is not the will; else if the will were its own rectitude, it would follow that no will is unrighteous. Yet, according to Anselm (De Veritate xii), justice is rectitude. Therefore justice is not the will.*

*Objection 3: Further, no will is perpetual save God's. If therefore justice is a perpetual will, in God alone will there be justice.*

*Objection 4: Further, whatever is perpetual is constant, since it is unchangeable. Therefore it is needless in defining justice, to say that it is both "perpetual" and "constant."*

*Objection 5: Further, it belongs to the sovereign to give each one his right. Therefore, if justice gives each one his right, it follows that it is in none but the sovereign: which is absurd.*

*Objection 6: Further, Augustine says (De Moribus Eccl. xv) that "justice is love serving God alone." Therefore it does not render to each one his right.*

*I answer that, the aforesaid definition of justice is fitting if understood aright. For since every virtue is a habit that is the principle of a good act, a virtue must needs be defined by means of the good act bearing on the matter proper to that virtue. **Now the proper matter of justice consists of those things that belong to our intercourse with other men, as shall be shown further on (Article [2]). Hence the act of justice in relation to its proper matter and object is indicated in the words, "Rendering to each one his right," since, as Isidore says (Etym. x), "a man is said to be just because he respects the rights [jus] of others."***

*Now in order that an act bearing upon any matter whatever be virtuous, it requires to be voluntary, stable, and firm, because the Philosopher says (Ethic. ii, 4) that in order for an act to be virtuous it needs first of all to be done "knowingly," secondly to be done "by choice," and "for a due end," thirdly to be done "immovably." Now the first of these is included in the second, since "what is done through ignorance is involuntary" (Ethic. iii, 1). Hence the definition of justice mentions first the "will," in order to show that the act of justice must be voluntary; and mention is made afterwards of its "constancy" and "perpetuity" in order to indicate the firmness of the act.*

*Accordingly, this is a complete definition of justice; save that the act is mentioned instead of the habit, which takes its species from that act, because habit implies relation to act. And if anyone would reduce it to the proper form of a definition, he might say that "justice is a habit whereby a man renders to each one his due by a constant and perpetual will": and this is about the same definition as that given by the Philosopher (Ethic. v, 5) who says that "justice is a habit whereby a man is said to be capable of doing just actions in accordance with his choice."*

*Reply to Objection 1: Will here denotes the act, not the power: and it is customary among writers to define habits by their acts: thus Augustine says (Tract. in Joan. xl) that "faith is to believe what one sees not."*

*Reply to Objection 2: Justice is the same as rectitude, not essentially but causally; for it is a habit which rectifies the deed and the will.*

*Reply to Objection 3: The will may be called perpetual in two ways. First on the part of the will's act which endures for ever, and thus God's will alone is perpetual. Secondly on the part of the subject, because, to wit, a man wills to do a certain thing always. and this is a necessary condition of justice. For it does not satisfy the conditions of justice that one wish to observe justice in some particular matter for the time being, because one could scarcely find a man willing to act unjustly in every case; and it is requisite that one should have the will to observe justice at all times and in all cases.*

*Reply to Objection 4: Since "perpetual" does not imply perpetuity of the act of the will, it is not superfluous to add "constant": for while the "perpetual will" denotes the purpose of observing justice always, "constant" signifies a firm perseverance in this purpose.*

*Reply to Objection 5: A judge renders to each one what belongs to him, by way of command and direction, because a judge is the "personification of justice," and "the sovereign is its guardian" (Ethic. v, 4). On the other hand, the subjects render to each one what belongs to him, by way of execution.*

*Reply to Objection 6: Just as love of God includes love of our neighbours, as stated above (Question [25], Article [1]), so too the service of God includes rendering to each one his due.*

Facing absolute threat and handling awareness suppose therefore for an organization to develop *prudence* and *justice*. But this doesn't tell us how it can be done. Eventually, processing resilience becomes a matter of relational resilience.

### **3.3 Relational resilience: Symptoms and Systemic adaptation**

Symptoms clinical definition implies signs of profound dysfunctions which are to be cured. Resilience represents therefore recovery from dysfunctions. In his article, *Effects of Conscious Purpose on Human Adaptation*, Bateson (1972) suggests that in complex systems, a subsystem unable to regenerate has the tendency to develop an exponential spin. Resilience represents the necessity of an organisation to encompass systemic adaptation. Woods and Cook (2005) provide a new class of adaptative behaviour (the decompensation event pattern) following the start of one class of adaptative behaviour (cross-check processes) by Paterson and al. (2004). Systemic adaptation can be retraced from those behaviours and be developed beyond, as proposed Vithoulkas' vision of systemic medicine (2000).

Looking upon atopic diseases, systemic medicine postulates that there is a kind of regulating *set point*. It is not important that the set point does not exist as such but is an expression of interconnected recursive processes. In the same way, we are used to postulate a consistent perception even though perception is not the result of a homunculus living in our brain, but is a structural phenomenon. Systemic adaptation is the changing of the self organisation, structurally, when responding to perturbations. Clinical and psychosocial systems act and react similarly.

There is but one similarity between clinical and psychosocial observations. Another similarity is the initial deterioration of the equilibrium coming from systemic adaptation. Outlying the linear assumption of progressive symptoms' suppression, remediation starts strangely by weakening the system. The initial deterioration in a way is a proof of systemic adjustment.

*If we find overshoot or false start – as is the case in many physiological phenomena – we may expect this be a process in an open system with certain predictable mathematical characteristics.*

Ludwing von Bertalanffy, 1952.

Dealing with crises, a crucial problem for the management is to know whether some system discrepancy is an initial deterioration announcing a systemic process of resilience or an emergency signal of worsening. Some hints are given by the so called Hering's rules. Hering (Hering, 1836, 1865) was the first to systemise observations of



the course of therapies highlighting rules which have been refined later but are still connected to his name. Those rules, based on a phenomenological description of processes, explain how processes go strengthening or weakening. They comprise four statements. The first two statements are imperative; the last two statements are more or less guidelines.

**First rule: From the interior to the exterior.** This is basically the reversal of suppression. A therapy goes well, if more severe symptoms vanish and less severe symptoms appear. If asthma becomes better the worsening of the eczema is a good sign. If depression gets better, stomach pain is a good sign and should not be treated or suppressed. If stomach pain gets better back pain might arise and is a good sign. Or if in a common cold the bronchitis is getting better coryza could become worse. This is still seen as amelioration. There are some quite sophisticated ideas of what is seen as ‘inner’ and ‘outer’ (Vithoukas, 2000). If disease develops the other way, it is a suppression and should be treated immediately.

**Second rule: From chronic to acute.** From chronic to acute: This is quite similar to the former. As a chronic disease is considered a consequence of suppressed acute disease, the outbreak of an acute bronchitis with fever in a patient with chronic asthma is seen as a step forward. The same is true for an acute headache in chronic migraine, but also for virus infections in a state of fatigue. The initial deterioration could be seen as an acute exacerbation of a chronic state.

**Third rule: Backwards in time.** First, more recent symptoms have to vanish, then the older ones. Old symptoms and diseases, even if they lay some decades back, might reappear, and is seen as a good prognostic sign.

**Fourth rule: From top to bottom.** Symptoms should reappear or vanish from top to bottom. *I had a patient who didn't know Hering's rule, who had started with headache, and within some weeks the pain went down the spine, the legs and left her finally with a pain of the nails of her toes. Although this is seen as a prognostically good sign, rule 3 and 4 are not handled very strictly.* (Vithoukas, 2000).

Relational resilience within organisation consists therefore in the mastering of systemic adaptation. Organisational symptoms, as said before, are uncertainty, ambiguity and complexity. Adjustments to threats can be evaluated through a close watch of those symptoms.

Eventually, training to relational resilience is a matter of reconsidering risk factors. Resilience against process factors is limited to prevention and protection dedicated to the reduction of the accidents' probability and gravity. As to initiating factors, they are much too numerous and insignificant when isolated, to rule resilience. On the contrary, resilience against stability factors is proper to reduce vulnerability. Deep adjustments, as safety culture, leadership, or decision process response as well to concrete and absolute threat. The planning of collective elaboration (Poumadère & Mugnai, 2006) appears then necessary to foresee causality as symptoms embedded in multilevel systems. On behalf of Moscovici (1982, 1983), collective elaboration can be structured around the distinction between *origins* causality and *trends* causality. Origins are retraced while trends are interpreted along with the systemic adaptation of the organisation.

#### **4 CONCLUSION: WHAT WE HAVE TO LEARN IS TO FORESEE THE UNFORESEEN<sup>4</sup>**

Scientific work on resilience is connected with philosophical problem that justify theoretical analysis. Organisational resilience applies not only to the structure but to the social level as well. Thus, psychological resilience can be seen as the core of resilience. Psychological resilience involves ecological, economic, cultural, ethical and other social dimensions and values. Sustaining and developing this social capital will be a prerequisite for adaptability and transformability. Resilience Engineering looks for ways to enhance the ability of organisations to create processes that are robust yet flexible, to monitor and revise risk models, and to use resources proactively in the face of disruptions or ongoing production and economic pressures

Organizational renewal is not as important as the paths that led to it. Organizations have to walk their paths themselves – which calls some specific organizational learning. To go beyond this apparent paradox, and as this presentation indirectly suggests, it is important to consider what is required on the part of individuals and groups who are involved in organisational resilience development. Resilience practitioners are part of the process, and not merely managers of a training program they observe from the outside. Further research on this area could bear on a better understanding of the various levels of involvement encountered when improving organisational resilience.

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<sup>4</sup> Ce qu'il faut toujours prévoir, c'est l'imprévu. Victor Hugo. *Les misérables*. Livre 14.

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