A conceptual and methodological comparison with the field of child resilience

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Abstract. The label resilience has been used in the field of child psychology and of child development to identify the way in which children could cope with adverse events of their past, in order to live (to develop) "normal" lives. In this field, the following definition is in use: *"children resilience is a universal capacity which allows a person, group or community to prevent, minimize or overcome the damaging effects of adversity."* (Grotberg, 1997). It is interesting to note that the concepts as discussed in the collective book on resilience engineering (Hollnagel, Woods & Leveson, 2006[1]) share some similarities with the methodological and theoretical developments found in the child resilience field. Three examples of these similarities are discussed here. First we discuss the cross disciplinary nature of the child and organisational resilience. Secondly, we discuss the similarities between the risk factors versus resilience factors in both fields. And finally, we introduce the importance of the cognitive and social construction of safety.

1 INTRODUCTION

1.1 What is our domain of application?

The discussions contained in this article are based on practices and researches developed mainly in the chemical and petrochemical industry around the questions of the human, organisational and systemic contributions to major hazard prevention. Our researches raise several type of questions regarding our ability to model safety (and accidents). They also question our ability to create useful knowledge for practitioners, based on what is currently known about the systemic dimension of safety and accidents in the literature. The fields of learning from experience, of installations and equipment design, but also the field of auditing are concerned by these current developments. One question is how organisations or socio-technical systems[2] maintain a visibility of the

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[1] Hollnagel E., Woods D.D. & Leveson N. (2006). Resilience Engineering: concepts and precepts. Aldershot, UK: Ashgate.

[2] By choosing "organisation", we target the system of actors employed by the company and working in the plant. By choosing "socio-technical system" we target other actors such as regulators, the sub-contractors, the corporate, the public. We can use the "socio-technical system" expression for a more global perspective of the organisation, within its context and interactions. This has strong implication for fieldwork and safety or accident modelling. In our research, we deliberately included the organisation within a socio-technical system, so when we use "organisation" in this paper, we mean the organisation

changing conditions, and how they adapt to them? These fields have led us to strongly stress the importance of bringing a time and cross level dimension for modelling accident but also for modelling safety (Le Coze, 2005). It appears that the field of resilience engineering, in 2006, opens the way for a similar dynamical approach of safety, including a diachronic dimension by taking into account evolutions of organisation and socio-technical systems.

1.2   What do we retain from the engineering resilience discussions?

Two of the main aspects that we retain from the resilience engineering discussion for the purpose of this paper concern first the will to shift from the study of the systemic aspect of accidents to the systemic aspect of safety, so moving from the systemic insight position to the systemic foresight one (Hollnagel, 2006). The second aspect is to be able to better grasp the brittle versus the resilience side of organisations, namely that if events reveal factors that played negative roles in the accidents genesis (the brittleness side), these factors were also positive ones in achieving the success of the organisation as a whole. One of the difficulty is therefore to be able to better identify when a factor that is a resilient one, becomes a brittleness one, and in which contexts.

These two aspects of resilience bring epistemological questions (related for example to determinism, the nature of causality) but also methodological and practical ones (for example how to collect data and make generalisation across various cases regarding the factors).

1.3   Warnings

The resilience concept has been developed for some years in the field of child resilience. We thought it could certainly provide interesting inputs regarding the questions contained in the current development of resilience engineering, a domain that we call organisational or socio-technical resilience in this paper. However this comparison must be understood within its limits. The field of child resilience and organisational resilience are different and do not cover the same phenomena. In that respect, the comparison is made at a rather macro level, regarding the epistemological and methodological levels. Some issues will certainly require much more developments in the future if we find useful to carry on the comparison with specialists of the domain. It must indeed be stressed that we are not experts in the field of child resilience (we have no practice in this field), and relied on the literature to get into it.

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within its socio-technical system. In an approach acknowledging the complexity of safety and accidents dynamic, such a perspective is unavoidable.

2. CHILD AND SOCIO-TECHNICAL RESILIENCE: FROM THE PHYSICAL TO THE BIOLOGICAL, THE HUMAN AND THE SOCIAL PHENOMENA

2.1 The limit of an analogy with the physical world

Both approaches share their metaphor from the physical world, from the property of matter. The resilience is seen in physics as the ability for a material to get back to its initial shape, following an external shock. It is also the measurement of the quantity of energy that is necessary to break a metal. In the field of child resilience, it becomes the ability to cope with adverse events. We can however wonder how much relevant the metaphor is for biological, cognitive, psychological and social phenomena, where we feel naturally that the processes underlying resilience are of a different kind[3].

On one side we have a material behaviour, based on properties of matter, and on the other we have children. The latter are living purposeful biological organisms and individuals, evolving and opened to their energetic and informational, social, cultural, environments. This difference has some consequences on the scientific approach of the phenomena. As Cyrulnik, a prominent scientist in the child resilience field, stated it (2003):

> "*Physics was a model that helped us to become scientific. We moved on from physical objects to human models and here, I believe that the jump is a bit perilous because in the human realm, we constantly evolve. We belong to a specie which evolves all the time until death, even on the biological side.*"

This type of question leads to epistemological questions regarding the status of a definition of resilience, that is necessarily a interdisciplinary concept, from a genetic and biological perspectives of the child to its individual (psychological and cognitive insights) through its historical, sociological and cultural dimensions.

One of the major differences when we jump from the physical resilience to the child resilience is the evolving nature of the latter. This evolving nature implies a contextual nature of the phenomena. The presence of a context limits considerably the traditional scientific methods as found in physics, and in natural sciences in general. Experimental techniques do need to isolate phenomena to generate reliable a knowledge. However, these conditions can't be easily met for biological, human and social systems that are intrinsically linked with their contexts. By suppressing the context, a huge relevant part for the understanding of the phenomena disappears. As Jacob said "Life is not studied in laboratories". The same applies to human and social phenomena. This problem is clearly found in the field of child resilience but also quite clearly in the organisational resilience. More generally, this problem is expressed in many fields dealing with open systems.

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[3] This example of migration of concepts from one field to the other (from natural science to biological and social ones) is another example of the tendency for metaphors and analogies to travel from one domain to the other. History of science is rich of these examples of analogies becoming very useful outside their initial field.

2.2 An interdisciplinary or transdisciplinary field

Recent discussions, in 2004, between Cyrulnik and Morin (a philosopher of science) have made explicit that looking at human nature requires for various disciplines to be articulated. We often find transdisciplinarity, interdisciplinarity, multi disciplinarity or pluri disciplinarity advocated for looking at phenomena that cut through single disciplines. The different expressions refers to different practices, although it is sometimes not straightforward to distinguish them. It is indeed not always clear for example when the multi or pluridisciplinarity stops and when the interdisciplinarity starts.

- We define for this paper the multi or pluri as the need for adding disciplinary views on an particular event, but without specific effort to articulate them.
- The interdisciplinarity is understood as the process of articulating views in order to create a new point of view, that does not belong to the input disciplines anymore, but belong to a new discipline, resulting from the articulation of the other disciplines. This requires for individuals to be poly-skilled.
- Transdisciplinarity would define the models and theories cutting through various domain of science, such as the properties of system and self-organisation (that are found in physics, biology, cognition, societies and leading to the field of complexity), but also mathematics which can potentially be and have been applied across a wide range of domains.

Such approaches have been fruitful in many domains[4].

The fields of child resilience proceed with a multidisciplinary approach and tend towards an interdisciplinary field when the emerging concepts and models create problems and solutions that can be answered only by adding disciplinary views. In his work Cyrulnik (2002, 2004) articulates concepts, models and findings from genetics, neurosciences, ethology, psychology, psycho-sociology or socio-education in order to cover a wide range of dimensions that help to define, interpret and explain child resilience. In doing so, he brings a much richer picture of the complex dynamical process underlying the evolution of the child in his or her context. Without the inputs from these various fields the interpretations would be limited to only one aspect of the resilience phenomena, although it is a systemic phenomena. A similar approach is required for understanding the organisational resilience. Psycho-cognition, psycho sociology, sociology of organisation, management, political sciences but also engineering are inputs required for an interesting description and interpretation of the global dynamic underlying safety (but also accidents). This point is developed a bit more practically in a next part, when introducing concrete factors.

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[4] Like ergonomics, cognitive ergonomics, and others disciplines, who have emerged from an inter-disciplinary process. But, the use of different sources of knowledge is a challenge that necessary have to share resources (people, time and thus money). This challenge seems also to be related to conceptual, theoretical, semantic and methodological characteristics of each original discipline, which have to meet or mix with the others. Currently, in the domain of major hazard prevention, we think that there is a need in this direction.

2.3   Linear causality and determinism in question

Questions related to the type of causalities (non linear versus linear) implied by child resilience and linked with the status of determinism ("Can we predict how a child will get resilient or not?") are also challenged when moving from the physical to the biological and social world. The field of child resilience started from trying to predict the future of children from risk factors at the genetic and psychological level (a rather endogenous level) but failed to do so (Anaud, 2005). The evolution and open nature of children lives do not allow for a prediction to be accurate in the long run (the cause-effect relationships are complex). Genetic or psychological features interact with familial, social and cultural characteristics (a more exogenous level), so that children behaviour can't be predicted based on a limited set of initial factors.

A similar problem is faced by organisational resilience when it comes to predicting behaviours. Uncertainty about the way things will evolve is intrinsic to any modelling. Some endogenous features (for example the organisational structure) interact with exogenous features (for example market constraints). It doesn't mean that prediction is not to be attempted and performed, but rather that sensitivity to changes in the predictions made should be high in order to cope with uncertainties and unexpected events shaping in a different way what was expected.

3.   BETWEEN BRITTLENESS AND RESILIENCE: A COMPARISON OF SAFETY AND RISK FACTORS

Child resilience scientists, as a consequence of this cross disciplinary field, approach resilience throughout several levels of factors, addressing these multiple dimensions. Questions regarding the duality of a brittleness side versus a resilient side, and a duality and combination of risk factors and protection factors are also debated (Anaud, 2005). The history of child resilience developments reveals that initially, only the risk factors were looked at. However gradually, with counter examples accumulating, it appeared clearer that risk factors did not have full predictive power and could not be sufficient for understanding the child development and therefore resilience. The need for identifying protection factors pushed researchers to produce dynamical and resilience features of the child development.

It is interesting to see how the field of organisational resilience, has as a theoretical background similar discussions with for example the normal accident and high reliability organisation models debates, and then with the developments of ideas around the bright side and dark side of organisations (Sagan, 1993, Vaughan, 1999). To illustrate more concretely this comparison, we suggest to introduce the factors from the child resilience field, and then to attempt to do the same with the organisational resilience, and see where it gets us. Anaud (2005), throughout her presentation of the field of child resilience, introduces many of the risk factors and protection factors available, and also suggests that they combine to create resilience. Here is a table containing these factors (table 1). These factors do not need much description, they

speak for themselves at this level of discussion. But, they can't of course be used without deep knowledge of their theoretical and empirical background.

Table 1: Risk and protection factors in child resilience (summary)

	Risk factors	Protection factors
At the individual level	Premature baby, light weight, cognitive defect, early maternal separation etc	Active attitude, nice mentality, high IQ, self esteem, humour, attractive for others etc
Family configuration	Violence, parental separation, alcoholism, chronicle disease of a parent, single mother or teenager mother, early death of parents…) etc	Parental warmth, good parental relationships etc
Social and environmental factors	Poverty, socio economical weakness, lack of employment, migrant parents etc	A supporting social network, academic successes etc

We intuitively understand that the resilience is the result of a complex dynamic combining various features requiring a global perspective. The same applies to organisational resilience. We can try to put together various factors that would be extracted from various sources (see a list of these sources in Le Coze 2005).

Table 2: Risk and protection factors in organisational resilience (this is just an attempt based on the literature and our own practices)

	Risk factors	Protection factors
Individual & collective level	loss of competencies, excessive performance ambition, tight coupling-complexity of installations, particular miss of resources, production pressure, limited time for discussing safety matters, burden of rules	Sensitivity to operation, reluctance to simplify, preoccupation with failure, channelling to experts, redundancy,
Organisation level	Turnover, silo culture (conflict of interests), blame culture, unstable tradeoffs regarding safety matters at management levels, risk blind top management, production pressure, complexity of organisation (high level of outsourcing)	Organisational learning, independence, competence and empowerment of safety department, group meeting with open attitude towards safety issues, safety as priority, requisite imagination (of what could go wrong)
Environmental level	Overlapping of regulations creating administrative burden, high competitiveness on the market, board with strong financial policies, not strategic plant, poor quality of	Corporate level aware of risk issues and with engineering background, quality of authority inspection on the risk issues involved, market leadership, proximity of elite

	inspections	

The methodological questions regarding the way in which these factors are identified but also the way in which they combine is in both fields a common research agenda but also a very complicated one, between generalising across cases and remaining specific to acknowledge diversity of each situation. It is indeed not only a list of factors or a blank check list to be used but a knowledgeable way of combining them into dynamical patterns, specific to the history and the features (technological, cognitive, social, political) of the complex phenomena under study. This really brings to the forth the degree of expertise required to formulate a judgment for a specific situation.

4. HOW INTERPRETATIONS CONSTRUCT AND ENACT WHAT'S REAL

The ability to create a theory life, of what is happening to the child by him/herself (but also with the help of educators) has been emphasised as an important feature of child resilience. As Cyrulnik puts it "*It is the external points of reference that give coherence to the flow of our internal pictures. Otherwise the souvenirs would accumulate as tangled up images where sense would be difficult to make (…) images are insane when you can't locate them and put them into a story*". Resilient child are able to transform, or to reframe their world in order to build confident spaces where they can grow and develop self-esteem from their past experiences.

We can find here a similar phenomena in organisational resilience. Indeed, the ability for an organisation to reflect on its success as well as on its failure (an incident or an accident), and to reframe their past, is a key process of resilience. This process is key because many interpretations are always possible, and therefore the resulting actions will also be different. As it has been emphasised in the engineering resilience collective book "*the obstacles to learning from failures are nearly as complex and subtle as the circumstances that surround a failure itself. Because accidents always involve multiple contributors, the decision to focus on one or another of the set, and therefore what will be learned, is largely socially determined*" (Woods & Cook, 2006). This process will depend on the knowledge and on the experience of the individuals put together for the investigation. A safety engineer, an operator, a human factors or an organisational factors expert or a manager will not have the same viewpoints. As a consequence, the nature and the scope of information collection and of their interpretations will be a construction elaborated by the people who take part of the process. This will be also under influences of the tools used and of the management choices, that will emphasise some factors and eliminate others. This selective is not always clear when it comes to identify the factors that would be the most useful for a proactive safety management. The purpose is not only to understand but to improve or maintain safety.

5. CONCLUSION

With the help of these three items, it is believed that the history of developments of child resilience as a scientific field provided an open window to discuss the issues of

socio-technical resilience. This first comparison helped us to highlight the same inter disciplinary dimension of the two fields, and their relationship with determinism and causalities. It also proved useful for discussing the brittleness/resilience factors that can be identified in both field, and that can be combined in different context. Finally, the importance of constructing explanations out of past events is in both fields recognised as a core process, that can lead to different futures.

REFERENCES

Anaud, M. (2005). *La résilience. Surmonter les traumatismes*. Paris: Armand collin.

Cyrulnik, B (2002). *Un merveilleux malheur.* Paris: Odile Jacob.

Cyrulnik, B. (2003). Comment un professionnel peut il devenir un tuteur de résilience? In B. Cyrunlik & C. Seron, *La résilience ou comment renaître de sa souffrance?* (pp. 23-42). Paris: Editions Fabert.

Cyrulnik, B (2004). *Les vilains petits canards.* Paris: Odile Jacob.

Cyrulnik, B. & Morin, E. (2004). *Dialogue sur la nature humaine*. La Tour d'Aigues: éditions de l'Aube, collection Aube Poche Essai.

Grotberg, E. M. (1997). The International Resilience Project: Findings from the Research and the Effectiveness of Interventions. in B. Bain, et. Al. (Eds) *Psychology and Education in the 21st Century: Proceedings of the 54th Annual Convention of the International Council of Psychologists.* Edmonton: IC Press, 1997. 118-128.

Hollnagel, E. (2006). Resilience – the Challenge of the Unstable. In E. Hollnagel, D.D. Woods & N. Leveson, Resilience Engineering: concepts and precepts (pp. 9-18). Aldershot, UK: Ashgate.

Lecoze, J.-C. (2005). Are organisations too complex to be introduced in technical risk assessment and current safety auditing? *Safety science, 43,* 613-638.

Sagan, S.D. (1993). *The limits of safety*. Princeton: Princeton University Press.

Vaughan, D. (1999). The Dark Side of Organizations: Mistake, Misconduct, and Disaster. *Annual Review of Sociology*, 25, 271-305.

Cook, R. I. & Woods, D. D. (2006). Distancing through differencing : an obstacle to organizational learning following accidents. In E. Hollnagel, D.D. Woods & N. Leveson, *Resilience Engineering: concepts and precepts* (pp. 308-316). Aldershot, UK: Ashgate.