

“Sustainability Calling: Underpinning Technologies”

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Introduction

“Sustainability Calling” is focused on the definition of new paradigms to define a new concept of sustainability. Pierre Massotte has worked for IBM in Quality Assurance and then Advanced Technologies. He spent several years in IBM’s research and development laboratories in the USA, then became Scientific Director in EMEA Manufacturing to improve the competitiveness of IBM’s European manufacturing plants and Development Laboratories. He joined the École des Mines d’Alès, France, as Deputy Director. His research and development topics are related to complexity, self-organisation and issues of business competitiveness and sustainability in global companies. He is the co-author of several books in production systems management. He is now involved, as senior consultant, in various ‘inclusive society’ projects. The second author Patrick Corsi is an international consultant based in Brussels, Belgium, and an Associate Practitioner in intensive innovation at

the Centre de Gestion Scientifique at Mines ParisTech in France. Previously, he had an extensive career with IBM Corporation and the European Commission as well as successful start-up experience in artificial intelligence.

In this book are outlined a set of key concepts and models to support a new notion of sustainability that takes into account the ever increasing complexity of today’s world. Sustainability has been primarily focused on environmental issues, however the authors expand the concept to society, economics, politics, welfare, innovation, competitiveness and everyday life (**Figure 1**). A novel formalism is necessary to redefine this new concept of sustainability and the authors bring the notion of transformative research to apply models already used in different scientific fields to the concept of sustainability.

Resilience and Sustainability

In Part 1, resilience and sustainability are proposed as the main drivers for innovation at a global scale. In Chapter 1 the authors introduce the concepts of scale and time in nature and the law of correspondence. Any system can be divided into levels or subsystems, for example macromolecules, cells, tissues, organs, organism, population, communities and finally biosphere. Each of the subsystems can interact and influence all the others, and the authors propose that to take into account such complexity metamodelling is required. Examples of metamodels are: cross-cutting that focuses on the interactions between lower and upper levels; and the ‘one level method’ in which

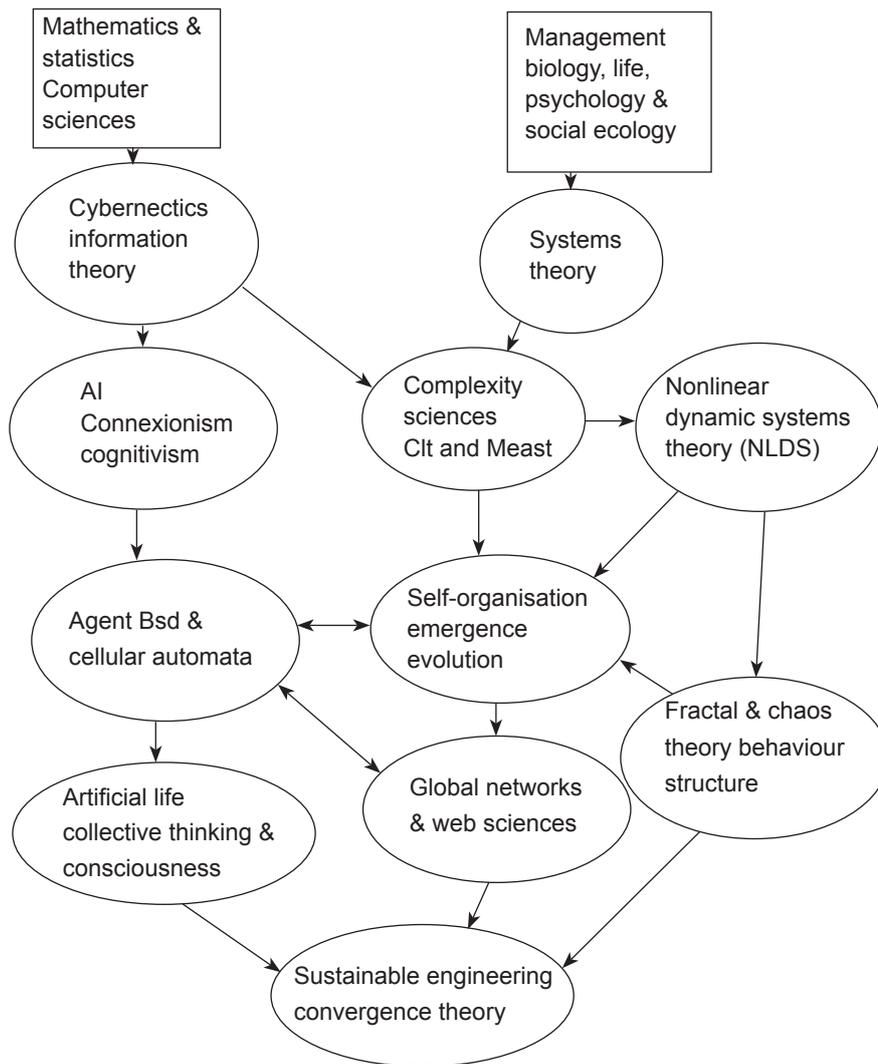


Fig. 1. A global and advanced vision for gathering and linking together the different theories and technologies for solving production or sustainability problems (Copyright John Wiley & Sons, Inc)

generalisations must be applied to create models applicable to each subsystem.

Chapter 2 asks whether globalisation is really new. This chapter characterises globalisation and explains some of its features. It evaluates how big paradigm changes, or disasters, impact human behaviour, influencing our mind and thoughts, conscience and modes of governance. The authors explain that globalisation is similar to economic evolution and any phenomenon in globalisation is always associated with the emergence of spontaneous orders, whose unexpected consequences are far beyond what could be imagined by looking at historical events. They put forward their argument from a geographical point of view and present a map of the trading posts in ancient Rome, as well as describing the economic rise of developing

countries like China, Russia, India, Korea, Indonesia and South Africa. They say that such phenomena are necessary for the evolution of humanity. As soon as a big disturbance occurs in a society, globalisation implies three main factors in the current context and biosphere: the impact of events on human beings; risk management under unpredictable conditions and uncertainties; and modes of governance. The example is given of an earthquake hitting Haiti in January 2010 and how the country showed changes in governance and management levels and achieved extraordinary outcomes. The chapter also classifies the tools and methods used in industries: anticipation and prediction and concludes that cooperation, emergence and self-organisation are three particularly important concepts of the science of complexity.

Chapter 3 unveils the notion of disturbance in the decision-making process and in nature in general. The authors introduce three notions: asymmetry, Coriolis and chirality that have previously been formalised only for physical systems but are applied here in the context of sustainability. Asymmetry is a strong driver in the decision-making process. In a company all the interactions between different entities that bring a disparity of information can lead to an asymmetry of the parts and can lead to the wrong decision; however most of the decisions taken are mostly determined by external pressure. For example political and emotional pressures have a strong effect during the decision process and they are difficult to take into account in a model. Similarly Coriolis forces influence the movement of fluids on the earth's surface, however to model the effect of the Coriolis forces the model has to use an inertial frame of reference that is not needed when the system under investigation is of a smaller scale. In this chapter the utilisation of fractal theory to model complex systems is proposed, however a simplification similar to the 'one level method' has to be made.

Chapter 4 studies aspects of issues raised by project managers related to information, information systems and decision-making, linking the contexts of time, quantum fluctuation and entropy. It first focuses on the concepts of time and space, and then moves to the perception of space and impacts related to these, different antagonisms, time reversibility and entropy to better understand the future challenges humanity will face. The authors explain that the perception of situation involves sensorial organs, the mind, ideas, feelings and time. However perception of time is different for people and perception of event duration is different depending on context. It is also explained that perception of time and space changes as new developments in technology arise. The chapter concludes by saying that failures and crises are not the result of lack of time or the presence of time-irreversible problems, but the result of either lack of skills or societal evolution.

The Notion of Competitiveness

Part 2 revisits the notion of competitiveness that in the industrial and financial system is often reduced to profitability. The authors point out that decisions based only on profitability can compromise long-term planning. More examples of transformative research are presented: DNA mutations are presented as

disturbances which increase the survival likelihood of a species by flexibility, however if the mutation rate increases over a threshold dictated by the birth rate the survival rate will be negatively affected. Similarly, disturbances in a competitive world can increase the survival of a business. In a global scale the aging, death and survival of businesses finds correspondence to a biological ecosystem, a quick interchange of individuals and species can increase the survival rate of the ecosystem, while in a business ecosystem it can promote innovation.

In Chapter 9 the authors explain people's reactions to new emerging technology and how its benefits and weaknesses surface after varying lengths of time. The internet is used as an example: it is an unstable and interactive system that makes communicating and exchanging information very easy, even governments have favoured the emergence of this system although they cannot control it. The chapter highlights that applications such as Snapchat (Snap Inc, USA) and Confide (Confide Inc, USA) can restrain the resilience of information. The notion of temporary data is interesting for the future because it avoids malicious people using confidential or private data against others. It also protects email or social communication in the organisation. The authors conclude that using this concept of social networking on the internet leads to scaling and organisation network problems whereas using the 'transient web' can lead to obtaining a sustainable system.

The next chapter is a reminder about the complexity of systems and presents the basic principles required to understand system complexity. Examples are given of biomedical and metabolic pathways in a cell and the Krebs cycle is used to explain the complexity of the system. The chapter also details some advances applicable to the evolution of networks which are relevant to so-called 'network theory'. In the chapter, a network is considered a complex system and the concept of sustainability is applied to the growth of networks and how their capabilities change over time.

Chapter 11 looks at issues raised by the project managers at the Project Management Institute (PMI). According to the authors, the only current way to measure the sustainability of a system is to measure the 'entropy generation' of the system. In the chapter, issues related to information, information systems and decision-making are linked to notions of time, quantum fluctuation and entropy. It is proposed that networking

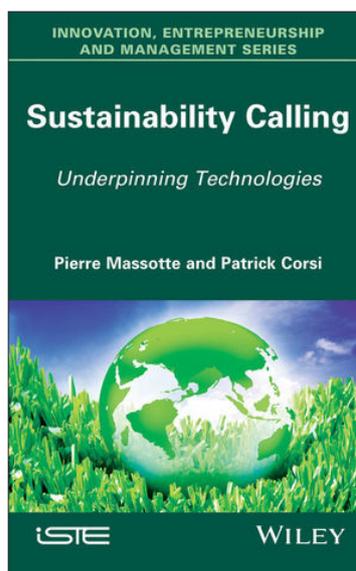
and self-organisation are contributing factors for reducing entropy generation.

The final chapter is about defining certain terms used throughout the book, like ‘consciousness’. The authors say that “Pre-cognition, self-recognition, reflection, understanding and planning some meanings and actions are fully linked with consciousness”. The chapter discusses the law of accelerating returns, telepathy and telesympathy and differentiates the concepts of telepathy and telesympathy. Two applications are detailed to understand their impact on system sustainability: how to implement sustainable communications; and metadesign of a collaborative development platform.

Conclusions

The book is an interesting source of new concepts to redefine sustainability and how to use it in the decision-making process. The authors give an overview of the complexity of today’s world and provide new ideas and tools to help tackle this complexity. While the book can be of interest to a wide public, a wide range of notions are covered and further details to understand the profound interconnections between all the different concepts are presented in previous publications by Massotte (1–3).

Overall, the book is likely to be interesting for professionals working within industry who wish to maintain the sustainability of their organisations in a changing world. It explains complex systems associated with sustainability and answers questions raised by professionals. For people interested in the subject, the book will provide in-depth knowledge of sustainability on a global level.



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