Summary

The exercise to construct a toolbox for operating on change and sustainability was undertaken out of the concerns voiced over the last two decades about the rapidly reorganising world which seems to move away from promising to sustain the human race (and much else). The pressures on sustaining environmental quality and environmental health form a major concern in the west and north, while a concern for survival forms a major concern in the east and south. At institutional levels and even individual levels there is an ever increasing effort to comprehend and manage change to sustain the level. While civilisations of the past have used several tools, they have not succeeded in sustaining themselves. This treatise is therefore motivated to explore and design the tools that can operate on the domain of change and therefore of sustainability.

In an exercise to construct a toolbox containing tools operating on the domain of change and sustainability, it is first necessary to examine the nature of the tools that are commonly resorted to in order to address the question of change and sustainability. How can indeed such tools be compared? What are the benchmarks which allow us to evaluate a tool? It is these questions that can give us insights into designing new tools. Every concept is a tool. Tools are characterised (or can be described) by their structural domain. The real world on which the tool can operate (the functional domain) is restricted by its structural domain. Tools can therefore be evaluated for their adequacy to operate on a functional domain of choice. They can also be evaluated for themselves being based on other tools (which can come to be questioned) or for restricting the scope of the tool by containing secondary propositions in their structural domains. Tools can allow the users to “observe” only within the scope of the mapping of the structural domain onto the functional domain. Thus while opening up the possibilities for observation, they restrict the users to the domain addressed by the tool.

Change is the only constant thing in the universe. Observers can observe change in the form of events with the aid of the “tools” they are equipped with. Civilisations strive to sustain a desired order. Order itself is changing. The question of sustainability is therefore the question of change management. The typical tools to address the order (and manage change) are the tools of problem solving, knowledge systems and systems.

The tools of problem solving are equipped to look at problems. Problems are relative to an observer, with a set of tools and in a particular setting. If any of these changes, as they inevitably have to, problems may no longer be problems. At best solving problems is displacing them to another system or into the future. The result is inevitably a problem-solution spiral. Such tools are therefore inadequate to address the question of change management or sustainability.

The tools of knowledge systems are equipped to collect in great detail “knowledge” and “information” about highly specialised subjects. Since one person can not possibly store, access and use (asses) such knowledge, collective “knowledge accumulators” are found (or coding in the form of specialists, computer data banks etc.). This tool (strategy) of overcoming the inherent limitations of any individual (or device) to accumulate knowledge by coding, ironically leads to recursive amplification by mappings being based on other mappings. Additionally such mappings
are not free of problem solving tools themselves. There is no guarantee of relevance in using recall for knowledge or information in such systems. It is obvious then that such tools can be inadequate by virtue of irrelevance to address the management of change and sustainability.

The tools for systems identify functional units of reality. They thus operate on elements which are of direct functional significance. The tools however do not specify a means to identify a functional unit and leave such definition to the analyst. There is thus little possibility to share an understanding, or even express its scope. Some tools of systems are themselves based on other tools or have secondary propositions in their structural domain. They therefore not only restrict the scope of their operation but also rely on the correctness of the tools they are based on. It is therefore that these tools (in their present form) are likely to be inadequate to address the management of change and sustainability.

For reasons of the inadequacy of the existing tools, some of which are described in part one, new tools were designed to address the domain of change and therefore of sustainability. The toolbox contains these new tools: Syslogic (or the logic of systems) and the general theory of organisation of systems. Syslogic is a tool which specifically allows to identify systems in a fashion that their identification can be shared. It also allows to explore the potentials of such systems once they are identified. It can thus be possible to trace whether desired potentials lie within the realisable potential or even the potential of a system.

Syslogic identifies systems as comprising of actors. If a list of actors engaged in some relationship can be specified, a system is defined. Each change in relationship of the same actors represents a reactivity-isomorphic system. Each actor responds to events through inscripts. Identical systems with actors having different inscripts are response-isomorphic. Having identified a system with Syslogic, different isoforms that are felt to be prevalent can be investigated. Syslogic provides a means to identify the influence of internal and external actors on realising the potential of the system. It presents reality as experienced by each participating actor. Using Syslogic pictorial models of systems can be constructed. These models can then be transferred to a mathematical form using the computer language, NOW (designed specially for models in Syslogic), that makes the mathematics transparent to a large extent. A software, the visible toolbox, has been designed, with an interpreter for the language NOW, to enable explore simulations of models in Syslogic. It can serve as a research laboratory, teaching tool, communication aid and managers support system.

Since systems are themselves in constant change and Syslogic cannot account for changing systems it became necessary to develop the general theory of organisation of systems. The general theory of organisation of systems originates in the need to seek building blocks of all organisation irrespective of the physical composition (nature). The theory is built on the nature of all existents. The laws of organisation attribute an identity, role, characteristic and conservation to every existent. Each existent being an actor, events become actors themselves. The reactivity of each actor dictates and restricts the nature of organisation (or reorganisation) that can take place when a group of actors interact with each other. The orgatom (simplest unit of organisation) is the existent (actor). It becomes clear that organisation itself cannot be created or destroyed but only reorganised. A system then is defined by the interacting actors and by their reactivities. We have then a building block basis for all organising systems. The theory can therefore be used for design of organisation in a synthetic manner rather than only as an analytic tool to understand systems.

The general theory of organisation of systems is a tool which allows to explore the life cycles of organisation of a system. It provides a building block for all organisation, irrespective of the physical nature of the analysis as well as descriptive complex structures to be.

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physical nature of the organising substance. Such building blocks can then be used for both analysis as well as design. Like bricks or atoms, building blocks are tools that offer a variety of complex structures to be built. It is outside the scope of this treatise to encompass all of these.

The tools leave the burden of use on to the user of the tool. These tools can be applied to all systems and organisations, known or unknown, irrespective of their physical characteristic. The tools can be applied for understanding, communicating or even managing the organisations and/or systems they operate on. That is precisely why the consequences for operating on the world for purposes of understanding, communication and management are presented.

The general theory of organisation of systems points out that the observer (or analyst) needs to have reactivity to what is observed. The important consequences of this requirement are that at worst irrelevant observations could be highlighted and at best one can learn about the potential of a system if the observation does not alter the isoform being “observed” into another isoform. The possibility to use this tool synthetically makes it possible to construct organisations and explore their stability as well as possibility of existence. Self-Awareness as identified by the theory is the reactivity to ones reactivities. Learning is the ability to add reactivities. Environmental issues arise as a consequence of organisation of systems. It is therefore doubtless that the first step in managing the environment needs to understand organisation. Environment in the theory is the system. It thus brings questions to manageable sizes. The theory points out the contrast between sustaining a system and evolution.

With Syslogic it is possible to distinguish three levels of management: the management of states, the management of change and the management of relationships. The event-driven state manager can explore the alternatives for state management using the tool of Syslogic. The change manager can explore different response isoforms in realising the potentials of his system. The relationship manager can explore different reactive isoforms. With the theory of organisation of systems it is possible to distinguish yet another level of management: the management of organisation. Organisation managers explore the possibility of different systems in a constantly reorganising world.

The tools of the toolbox complement the tools of traditional science by allowing the exploration of the consequences of systems with inscripts of objects understood by traditional sciences. While some complementarity is illustrated the application of these tools to important systems like personal organisation for individuals to large scale multinational businesses is left for future research.

While creating important possibilities for understanding, communication and management of the universe, especially “environmental questions”, the tools also have important implications for design of automata and “artificial or machine intelligence”. Four of the six appendices summarise the technical aspects of the tools and the toolbox. The other two appendices present a structured reformulation of two common systems tools to facilitate comparison and illustrate their scope.

These tools, like all tools, do not expect to be exempt from the laws of change. What is presented here is the first version, and does not claim to be “final” in any form at any time. Like everything else, tools will also organise themselves to newer versions or newer tools through time.

In conclusion the toolbox is literally a toolbox for tomorrow. Organisations define tomorrow. If tomorrow were to be possible for human systems, we need to understand organisations and the principles of organisation. Here are the building blocks for all organisations. They are presented
with the hope to help organise functionally relevant and humane organisations for generations to come.