General Systems Theory
An Introduction

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General Systems Theory

An Introduction

Lars Skyttner

University of Gävle/Sandviken, Sweden

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Preface

As a lecturer in Sweden working within the area of informatics and systems science I have many opportunities to present and recommend international papers and literature. This task is especially stimulating when I act as supervisor for my final-term students as they prepare their degree theses. However, both my students and I are aware that the suggested books are for the most part hidden in some far-off university. The few books that are to be found in the local bookstores and libraries are devoted mainly to the presentation of a single theory and give only a hint of all of the many other theories.

I therefore embarked on the task of presenting a summary of the most prevalent systemic ideas and concepts, well aware of the importance of facilitating access to contemporary theories, especially for those students preparing their theses. In the early phase of this work I also became aware of the lack of easily accessible introductory books within the area. My original intention had then to be revised so as to allow for a presentation of at least the most important subareas of the somewhat dispersed knowledge in informatics and systems science. One of these subareas is information and communication theory. Another is cybernetics, which today is part of General Systems Theory and is defined as 'communication and control in man and machines'. The need for knowledge about basic concepts in information and communication theory is obvious here. This and other main knowledge areas related to systems theory are therefore presented in their own chapters.

Although the selection of theories for this book is inevitably subjective, I hope that my years as a lecturer have given me a reasonable feeling for what should and should not be included. While the following pages are written for students of systems science, they should also appeal to students of related disciplines who want to examine the relevance of this field of knowledge to their own specialism. My hope is that the contents of this book will also offer something of interest for the general reader.

Do we really need system theories? Their claim to be part of a universal science has evoked criticism: a 'theory of everything' has no real content and must of necessity be superficial. However, to be honest, the attempt to gain more abstract and general comprehension must sometimes be made at the expense of concrete and particular exposition. But it is also true that the most general theory, which explains the greatest range of phenomena, is the most powerful and the best; it can always be made specialized in order to deal with simple cases.

The why and how in defence of Systems Theory is presented in the following chapters. When applied sensibly, this theory will make us conscious of the far-reaching interconnections and complexity of our existence. It will show the consequences of adopting solutions that are too spontaneous and too simple and

should help us to speak in terms that are understandable in fields as removed from each other as agriculture and astrophysics. Furthermore, it should be recalled that systems theory and its applications emerged out of a need to solve real world problems.

All who attempt to solve problems, make recommendations and predict the future, need theories, models and, as a starting point, concepts, which represent the backbone of the task. Theories introduce order and meaning to observations that may otherwise seem chaotic. Good theories should provide a simplified presentation of complex ideas by establishing connections between hitherto unrelated phenomena. They enhance a growing understanding and help us to guide future research. Those searching for useful ideas among these pages must however realize that the benefit of a certain theory has nothing to do with whether it is 'true' or not – 'truth' is a quality that is undefinable. What we can define is usefulness in relation to our need; different needs obviously demand different theories.

To students asking for a definition of what a good theory is, I recommend the following uncomplicated 'theory'. A good theory is a model that helps you to explain in a simple manner what you are striving to achieve. More scientifically, a theory may be defined as a model concerning our inner or outer environment (or most often a part of it) and some rules which relate entities in the model to observations of reality. The theory can be seen as good if it both satisfies a careful description of a large amount of observations based on a few arbitrary elements and makes reasonable prognoses of future situations. Nearly always, simplicity is the mark of the good theory. But beware – there is no way to prove that a better theory does not exist.

What has not been explicitly written in the chapters of this book, but possibly can be 'read between the lines', is quite naturally a main concern for the author. That this regards a world view where human existence is not guided by a blind faith in computer 'fixes' and 'big' science will, it is hoped, be understood by the observant reader. If the reader feels comfortable with the theories and approach of this book, he or she is running the risk of becoming involved. Any such involvement will further enhance the meaning of this venture.

Finally, I feel compelled to confess two misjudgements when this book was planned: underestimation of the work effort involved and overestimation of my own working capacity. Without these misjudgements this book would never have been written, an experience no doubt shared by many authors. So now the book exists; whether for good or ill can only be judged by the reader.

Lars Skyttner
Helgeåkilén 1995