

Preface

The word ‘system’ is in constant use in business and science, public life and administration, professional practice, education and everyday life. The word can refer to objects great and small, live or inanimate; it might be applied to complex organizations, entities composed of many parts, items whose design calls for many different disciplines, and structures whose operation integrates a variety of different things. It seems that everyone is, or should be, concerned about systems!

This book addresses three kinds of readers: practising professionals (managers, engineers, scientists and administrators) whose job it is to develop, operate and manage complex systems; students (both undergraduate and postgraduate) whose courses demand an integrated study of several disciplines; members of the interested public who would wish to know what makes sophisticated systems tick, and why some important systems fail.

The book presents the ‘Product/process (P/p) methodology’: a coherent collection of generic but readily understandable concepts, rigorous but applicable methods, and principles of reasoning. The methodology assists in understanding *any* system, and helps in the formulation and effective solution of complex problems, regardless of the field in which they arise, and irrespective of the specialist disciplines needed for supplying the solution.

Problem solving demands effective communication among *all* concerned: customers and suppliers, professional problem solvers and financial controllers, managers, administrators, journalists and the general public. The P/p methodology enforces clear and unambiguous communication through precise and hierarchically organized definitions and the use of a graphical modelling language.

In the P/p methodology the principles of reasoning are rational, based on a systems philosophy, with firm foundations in engineering. However, recognizing that many aspects of problems and problem solving situations do not lend themselves to ‘hard’ scientific methods of representation and reasoning, the P/p methodology allows for ‘soft’ representations, and can even deal with ideas *prior* to their being expressed. It is a particular strength of the P/p methodology that its concepts and methods blend the ‘hard’ and ‘soft’ elements.

The P/p methodology adopts the simple notion of systems theory that all real world entities and phenomena may be modelled as systems, either black box or structured. The methodology discriminates between two sorts of systems: products (an

instantaneous view) and processes (objects with non-zero duration). Both are represented as entities and relationships over them.

Rooted in engineering, the P/p methodology deals with facts, and – as far as possible – with decisions based on facts. For this, measurement is fundamental. Hard systems are measurable, soft systems are not. The P/p methodology unites the two by providing a path between them: identify a concept, define a concept, measure a concept. In this way characteristics of systems become attributes, and attributes become measurable.

Once a real life entity is modelled in terms of its well-defined measures, attributes may be compared and judgements made. Measures might arise from direct observation or intuition, they might represent facts or express value judgements, or else they might be derived theoretically from specialist contributions. The concepts, models and methods of the P/p methodology integrate all such contributions.

Understanding systems through their models and measures leads to the ability to control and improve them. Here we enter the field of general management and quality management. The structural models of the P/p methodology can represent the project plan as well as the operation of the problem solving activity in progress. Explicit, measurement-based plans aid the prevention of delays and difficulties, and the process models support early diagnosis of non-conformance. Process models also facilitate tracking any change in customer requirements, thus avoiding deviation between conformity and customer satisfaction.

The formal models and measures of the methodology allow for optimization of the performance of processes and continuous improvement of the quality of products and services. Thus, the use of the P/p methodology leads to enhanced maturity of organizations, integrating general management and quality management.

P/p methodology thus supports all levels of endeavour in a wide field of human activity and, when applied, should reduce risk and eliminate many sources of system error and failure.

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