

of computing, communications, engineering and management. The framework – comprehensible to the client, the specialists, and even to members of the interested public – would guide the management of the project: its planning, organization and control, the acquisition and development of human and material resources, the oversight of implementation, the management of risk, the assurance of quality.

Such is the approach needed for specifying, procuring, developing, operating and maintaining complex systems of assured quality. It is also the foundation of a *systems profession*.

## 1.5 Systems for all!

Systems matter not only to the problem solver and the specialist, but also to the whole constituency of any major project:

- the *client* who owns the problem, originates the project, provides the resources, will be the owner of the system, and hence stands to benefit from the success of the undertaking,
- the *systems professional* who cooperates with the client in defining the problem, is in charge of the over-all solution, and coordinates the contribution of the specialist experts,
- the *specialist experts* and *subcontractors* who cooperate in supplying the detailed skills and implement all components of the solution,
- the individuals engaged in the project: the *employees* of the customer who must use and operate the emerging results and whose working life will be changed, of the suppliers who participate in the project, and of the operators and maintainers who will look after the solution to assure its long life in useful service,
- the '*end users*': the people for whom the client's organization provides goods and services, whose indulgence might be requested while work is in progress to change over from the old to the new, and who must be convinced that the new is worthwhile,
- the *informed public*: people who seek insight into the world around them, are willing to invest effort to gain a measure of understanding of issues, and deliberately contribute to the formation of public opinion,
- the *public at large*: the man on the Clapham omnibus, people whose environment might change as a consequence of the new development, and who stand to benefit indirectly from the success of the projects, and whose taxes will be used ultimately to pay for failure or disaster,
- local or national *government* whose task is to guard the interests of the public and see to it that resources are effectively deployed,
- the *academics* in university departments who endeavour to educate the systems professional, and currently offer specialist or interdisciplinary education,
- the *students* on systems courses and on specialist courses.

The 'systems community' embraces the whole of this broad constituency. Only a few sectors of the systems community will need deep insight into systems and sophisticated systems skills, but each member would benefit from a fair degree of insight. Understanding systems is truly for all.

## 1.6 This book

This book sets itself the task to present a systems paradigm in a language that is precise and readily understandable, accurate enough to describe the problem and represent the solution to the various stakeholders in as much detail as they demand and are willing to absorb.

The book has a dual aim:

1. to inform the interested lay reader or members of a specialist profession, and
2. to contribute towards the formation of a 'systems profession'.

It presents a systems outlook, defines key concepts, and outlines the principles of characterizing systems. It introduces a language of expressing requirements and solutions, together with related collection of models, measures, methods and tools.

The key methods are Product/process (P/p) modelling and model-based measurement. P/p modelling affords the clear representation of any kind of entity as a system, be it simple or complex, man-made or natural, active or passive, hard or soft. It may be used for representing the problem, the solution, the organizations involved, or the *processes* of obtaining, managing and operating the solution. It can describe the system as a complete whole or as a structure of parts, and allows each part of a complex system to be characterized in any degree of detail, while keeping complexity under control.

At an *introductory level*, the language of P/p modelling is simple enough to be learned quite rapidly. Thereafter, anyone can use a P/p modelling to create a representation of a system, and anyone can read and interpret the representation created by others. Thus, the language of P/p modelling can be used throughout the constituency of a project, facilitating the expression of ideas and serving as the means of communication between all concerned.

The skills of P/p modelling can be refined into a *professional skill*. The systems professional can use P/p modelling and model based measurement in eliciting from the client the specification of the problem and the required solution, devising solution strategies, creating, analyzing and verifying over-all designs, guiding and managing system development, and interfacing between systems models and other, specialized methods and professional formalisms. P/p modelling also serves in assuring, controlling and enhancing quality throughout the project and in course of the utilization of the solution.