Systems, processes, differences

In the first of three articles, **David Hoyle** examines the relationship between systems and processes to give a wider understanding of their properties

At a time when we are more conscious than ever of the interconnectedness of our actions, the ISO 9000 family of standards and their derivatives appear slow to reflect advances made in systems theory and process management since the 1950s. Although the properties of mechanistic systems and fabrication processes are well understood, when it comes to social systems and business processes, flaws in the way concepts are currently being expressed and applied prevent us from managing processes and systems effectively.

The new edition of ISO 9001, published in 2008, contains interesting statements that suggest there is a move towards recognising the true properties of social systems and business processes, but the intent expressed in the introduction is not reflected in the requirements. For example:

- There are no requirements for the system to enable the organisation to fulfil its purpose, only that this system conforms to the requirements of the standard
- There is no requirement for all processes to be defined and managed only for quality management system processes. This implies there are processes in an organisation that do not interact with the result-producing processes
- There are no requirements for managing process interactions, only for describing them
- There are no requirements for taking account of changes in the business environment, only for maintaining the integrity of the system when changes to the system are planned and implemented
- There are no requirements for producing desired outcomes, only for demonstrating the ability of processes to achieve planned results.

And if this is not enough, the explanations of a process approach in ISO 9001 and of a systems approach in ISO 9000 are both inconsistent. This means they are therefore unhelpful in enabling organisations to manage their systems and processes effectively.

Systems and processes are simply conceptualisations formulated to explain observed phenomena. This means that we create communication difficulties when we use the same labels for different concepts, but this happens repeatedly as we try to redefine what a system or a process is.

Defining a system

A scan through management literature will reveal many different definitions of a system. For example:

- Bertalanffy described a system in 1968 as a set of components that work together for the overall objective of the whole
- In 1971, Ackoff defined a system as a set of interrelated elements
- Senge, in 1990, defined a system as a set of variables that influence one another
- Deming, in 1994, defined it as a series of functions or activities within an organisation that work together for the aim of the organisation.

These definitions illustrate the problem with comparing definitions. Bertalanffy wrote in the context of biological systems, Ackoff wrote in the generic context, recognising that there were both what he referred to as abstract systems and concrete systems. Senge wrote in the context of mechanistic and social systems, whereas Deming wrote only in the context of social systems.

It is therefore unhelpful that ISO 9000 defines a system as either interrelated or interacting elements. This is because it suggests that when applied to management systems, they can legitimately exist in two different contexts: as a system of related concepts with no interaction and as a system of related objects where there is interaction between them in the system's environment. This misunderstanding has led to thousands of organisations thinking of the management system as a set of documents rather than as a set of processes that function together to deliver business outcomes.

There are different types of systems. Some systems are reactive, such as an air-conditioning system, whereas others are responsive, such as a computer system. There are purposeful systems that can choose their goals and adapt to their environment. Clearly a system in the context of ISO 9000 is intended to be a purposeful system, a system that determines the mission from an analysis of stakeholder needs, adapts to its operating environment and enables the organisation to deliver outcomes that satisfy its stakeholders, but it is difficult to draw the conclusion that a quality management system might be one of these types of systems.

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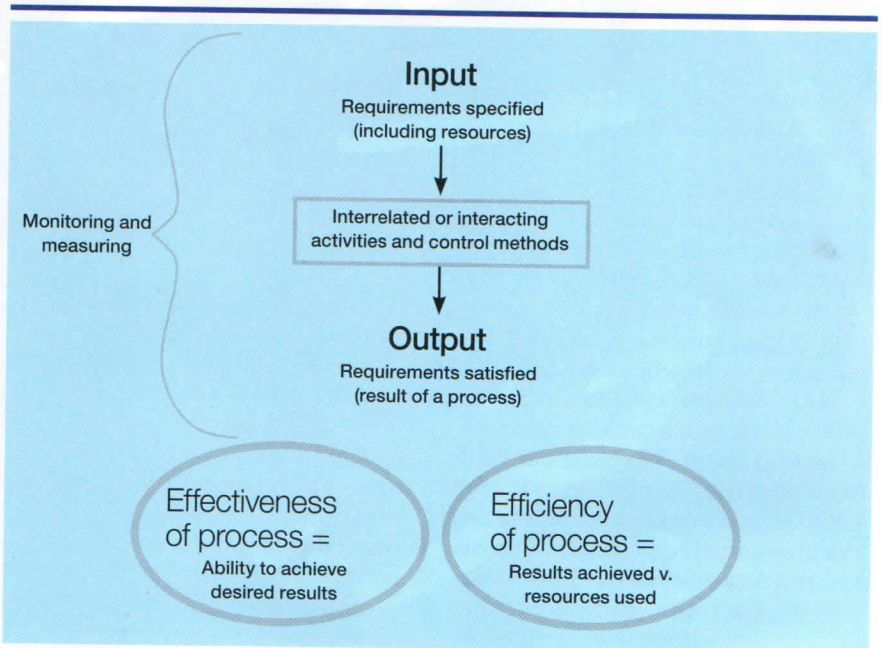
Defining a process

Similarly, there exist many different definitions of a process. For example:

- In 1985, Ishikawa defined a process as a collection of cause factors
- Juran, in 1992, defined a process as a systematic series of actions directed to the achievement of a goal
- In 1993, Davenport defined a process as a structured measured set of activities designed to produce a specified output for a particular customer or market
- In the same year Hammer defined a process as a collection of activities that takes one or more kinds of inputs and creates an output that is of value to the customer
- ISO 9000, published in 2005, defines a process as a set of interrelated or interacting activities that transforms inputs into outputs.

In all but the ISO 9000 definition there is recognition that processes create results. The impression given by ISO 9000 is of a sheet of metal being transformed into a component, but the diagram of a process on the ISO website, reproduced in figure 1, implies something different. The inputs here are requirements and the outputs are satisfied requirements, which implies that requirements change their form as they pass through the process. This is of course absurd. What is missing from

Figure 1: The ISO process model



the ISO definition is the recognition that processes create results not necessarily by transforming inputs.

ISO 9001 contains a diagram that portrays a model of a process-based quality management system, as shown in figure 2. However, it is flawed for several reasons:

- The elements within the ring imply processes, but they are in fact the headings of sections 5, 6, 7 and 8 of the standard. Some of the requirements are deliberately placed in section 8 because the only section where exclusions are permitted is section 7. Hence product measurement and nonconformity control, which would be part of product realisation, are included in section 8 and not section 7
- Management responsibility is not a process but a series of obligations
- Separating measurement, analysis and improvement implies that the output from product realisation is not measured because product measurement is addressed in section 8 of the standard not section 7
- The continual improvement element that sits outside the ring implies that it is outside the system when it is already addressed by the measurement analysis and improvement element as well as the requirements of section 8
- The diagram omits other stakeholders upon which the delivery of outputs depend such as suppliers, employees and investors
- There is no indication of the influence of the business environment mentioned in clause 0.1 of the standard.

This model is often used in quality manuals in response to the requirement clause 4.1 of ISO 9001 to determine the interaction of processes. This, however, shows a complete misunderstanding of interactions because at best the diagram only shows a flow of product and information.

The aim

Returning to the notion that a system is a conceptualisation of phenomena, it is not a physical object except in the mind of the researcher or observer. As Ackoff observes, the configuration is dictated by the particular interests of the researcher and consequently the same phenomena can be conceptualised as different systems.

We create models of our organisations in order to better understand how they work and imagine the models reflect reality. However, appearances can be deceptive. In the context of ISO 9000, the phenomena being observed is the organisation but each of the different management system standards forces us to look at the organisation from a different perspective – such as quality, safety, the environment or security – which encourages us to create multiple systems none of which consider the whole organisation and the environment in which it operates.

The models created to respond to various management systems standards look as though a management system is established for each group of policies or objectives and a person is appointed to manage it, as illustrated in figure 3. These standards are encouraging organisations to break the whole into parts then manage the parts as if they are managing the whole. This is called reductionist thinking. These types of systems appear as systems of documentation that do not reflect the dynamic behaviour within organisations. We have to question their credibility in enabling us to manage the organisation effectively.

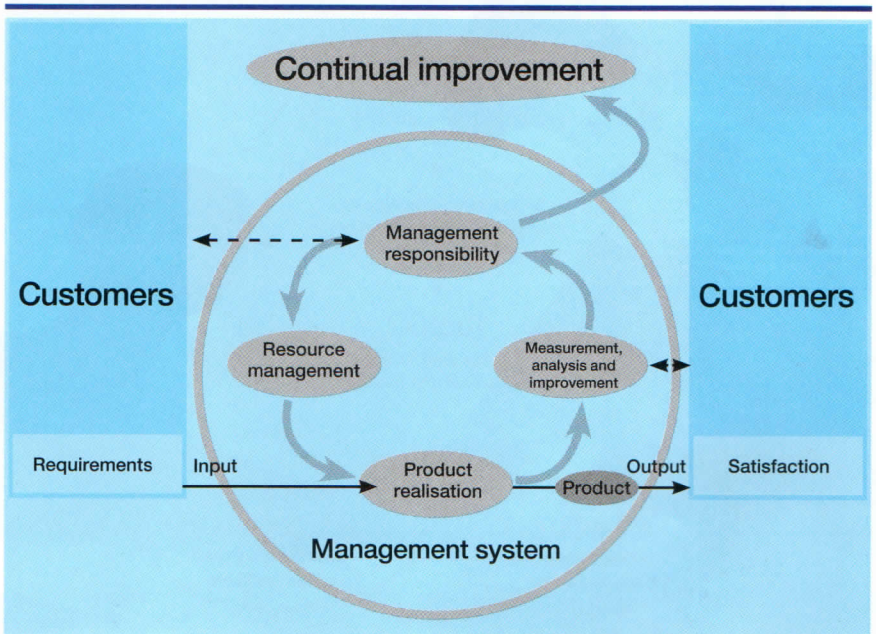
Types of systems

Instead of breaking the whole into parts, we should be trying to understand how the organisation works as a whole. This is known as holistic or systems thinking. Ackoff identified four types of systems:

- **Physical or mechanistic** systems such as a power station, aircraft or computer
- **Biological or animate** systems such as animals, humans and other life forms
- **Social** systems such as societies, tribes, groups of people and organisations
- **Ecological** systems such as a coral reef or rainforest with all its living and non-living entities, surrounding environment and all that impacts on it.

We can see that physical or mechanism systems are static – they can't adapt to the environment without human intervention. They exist until their use expires and is superseded by a new

Figure 2: ISO 9001 perception of a process-based quality management system



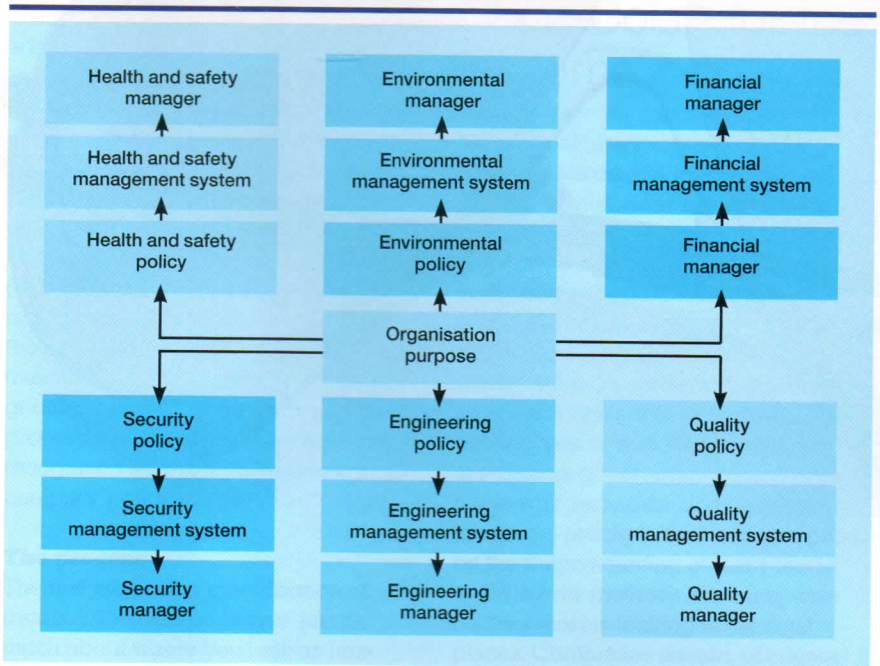
system. We need to recognise that organisations are social systems rather than mechanistic systems but even social systems are being managed as if they were mechanistic, as Gharajedaghi identified:

- A mechanistic system is mindless in that it has no purpose of its own except to create profit for its owner. This type of social system was prevalent in the 18th and 19th centuries when entrepreneurs organised labour to create and operate the machines of the industrial revolution. Even Adam Smith eventually recognised that such systems were counter-productive in the long term
- A biological system that is uni-minded and has a purpose of its own, dictated by an executive. Its growth is the measure of success, profit the means to achieve it and although the system has a choice, the parts don't. This is representative of the typical 20th century command and control structures where a board of directors dictates purpose and direction and a workforce implements the strategies and policies of the directors
- A socio-cultural system that is multi-minded, with a choice of ends and mean. The parts share values and work by consensus. The culture is the DNA that integrates the parts into the whole. This type of social system is not yet common but is growing in popularity as our society moves away from deference, with its automatic respect for authority, towards consensus management and mutual responsibility.

Gharajedaghi used the metaphor of a car and a horse to illustrate the profound difference between the biological view and the socio-cultural view. The uni-minded system: if a driver decides to run a car into a wall, the car will hit the wall without any objection. The multi-minded system: if a rider decides to jump a horse over a wall, success depends upon the bond between the horse and the rider.

If your organisation is like a car being driven at a wall by a crazy chief executive, you have no choice but to hit the wall and suffer the consequences. In a socio-cultural organisation you can influence the direction in which the business is going and the way it deals with the obstacles it encounters. But the metaphor has another implication. It shows there is an interaction between the management processes (the rider) and the operational processes (the horse) and for the combination to be successful, these interactions need to be managed effectively

Figure 3: Systems of documentation



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QW USEFUL READING

***General Systems Theory* by L von Bertalanffy, George Braziller (1968)**

***Process Innovation: Reengineering work through Information Technology* by T H Davenport, Harvard Business School Press (1993)**

***Reengineering the Corporation* by M Hammer and J Champy, Harper Business (1993)**

***Systems Thinking: Managing Chaos and Complexity: A Platform for Designing Business Architecture* by J Gharajedaghi, Elsevier (2006)**

***The Fifth Discipline: The Art and Practice of the Learning Organisation* by P Senge, Random House (1990)**

***The New Economics for Industry, Government and Education* by W Edwards Deming, MIT Press (1994)**

"Towards a System of Systems Concepts" by R L Ackoff, *International Journal of Management Science* Vol. 17, No. 11 (July 1971)

***What is Total Quality Control? The Japanese Way* by K Ishikawa, Prentice Hall (1985)**