community development finance institution, in a context that
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project was a part.

TQM: An Integration of
Systems Theory, System
Dynamics and
Organisational Learning
- Madhu Ranjan Kumar and
Shankar Sankaran

Abstract
This paper explains Total Quality Management (TQM) in
terms of systems theory. It identifies which subsystems of an
organisation need to be linked for TQM. It shows how TQM
leads to different types of organisational learning. It then
develops a model for TQM implementation based on the
systemic school of action learning. The model shows how
successful TQM implementation using action learning can
lead to different types of organisational learning. Therefore,
this paper calls for TQM implementation using the
experiential process of action learning instead of the current
trend of following a set of TQM tools.

Introduction
This paper aims to explain Total Quality Management
(TQM) through the integration of systems theory, system
dynamics and organisational learning. It then develops a
model for TQM implementation using action learning, which
is built on this integration. It aims to exploit the cyclical
similarity between action research and TQM (Kumar and
Sankaran 2005) by merging the different focuses of these two
traditionally different streams. The current focus of TQM is overall organisational excellence (Kumar 2006), which may or may not result in organisational learning. The focus of action research is bringing about change coupled with learning in a specific context. However, overall organisational excellence is not its forte. Further, there is an element of rigour in action research-oriented change which is generally not found in TQM implementation. However, this paper will show that if we appreciate the systemic base of these two streams, it is possible to develop an approach for TQM which coheres with action learning.

Total Quality Management – a systems perspective
A brief history of systems theory is required before TQM can be explained from a systems perspective.

Systems thinking developed in the 1950s as an alternative to traditional management thinking (McElveya 2003, p.59). The systems school grew out of the ‘general systems theory’ developed by the biologist Bertalanffy (McElveya 2003, Mirvis 1996) and the quantitative techniques – operations research and systems analysis – that were developed during the Second World War. Further, Simon’s contributions on ‘bounded rationality’ and ‘satisficing’ recognised the complex environment in which post-war managers made decisions (Ehrenberg and Stupak, 1994, p. 77). He pointed out that human beings are only partly rational and, therefore, make satisfactory decisions rather than considering all the alternatives available to make the best possible ones. He used the term ‘satisficing’ to explain this process. The systems thinking school is aware that traditional management thinking does not have the full picture of situations in organisations. The systems school views organisations as complex interrelationships among input, throughput (process), output, and feedback. From a systems point of view, an organisation is an open and complex system with varying degrees of process flexibility and many feedback loops which are used adaptively for the organisation’s survival. In the context of organisational change, Harrington, Carr and Reid (1999) have explained three interrelated concepts of system, emergent properties and complexity.

A system is a set of different elements, which together, perform a function that the constituent elements cannot do alone. Emergent properties are those functions, good or bad, which would not exist except for the operation of the system. Complexity is something that is composed of interconnected elements that function as a system to produce emergent properties. Deming (1993) used the analogy of the automobile to describe a system – a collection of wheels, engine and transmission does not make them a system. To become a system it must possess the complexity of having been designed in a particular way and interconnected in a particular way. They then become a system called the automobile, which provides the emergent property of ‘transportation’ which thereby makes it valuable. Thus, it is the complexity which gives rise to the emergent properties that define a system and make it valuable.

Complexity, however, is also a source of problems. Complexity is on the cusp between stability and chaos and a small amount of perturbation can push the system one way or the other. Systems with an order of complexity as small as three elements with two interconnections per element can produce chaotic behaviour. However, the lack of chaos is not always desirable, as seen by the fact that bankruptcy and death are examples of stable but undesirable states. Thus, the more the complexity, the greater is the chance that the system will degenerate into a chaotic state or a stable but undesirable state.
An interface is a point where two elements come together and exchange something. Interfaces are a key to designing an effective system. The interface should be clear and defined and should not be complex. A complex interface results in people developing the means to 'work around' the complexity. Thus, in an organisation, a complex interdepartmental interface results in people developing 'a personal relationship' to manage the poor interdepartmental interface. Interfaces that are ambiguous, grey and subject to interpretation will result in variations in behaviour. High inter-element complexity and ill-defined interfaces will result in disaster. An ideal organisation is one in which the elements have a high internal and low external order of complexity. Each element must be as independent as possible.

Most good systems have good feedback control mechanisms. Feedback is used to maintain and improve the system. But feedback is also a source of complexity and thus has advantages and risks. A good system is one that manages perturbation and change as a system. If feedback results in a perturbation which does not die out before the next perturbation, the system will result in chaos or a stable but undesirable state.

The systems view of organisation is shown in Figure 1. The figure shows an organisation in which the main sub-systems are marketing management, operations/production and finance. It is an example of an open system where the customer gives feedback to the marketing subsystem of the organisation about his/her product choice and its quality requirement. It also gives feedback to the operation/production subsystem about the quality of output. The more effective the feedback loops, the 'softer' the system (i.e. the more flexible and responsive to change). According to Cusins (1994) the quality management system (QMS) can be thought of as the servomechanism for the organisation. It runs in the reverse direction to the operational system. Information on outputs from operations form input to QMS and outputs from QMS form inputs to operations. TQM consists in making effective boundary judgments at every system interface within the organisation and between the organisational system and the user system.

Figure 1: Simplified example of an organisation as a system (Cusins 1994, p. 23).
Thus, from the point of view of system theorists, a quality judgment is made at the boundary between the supplier system and the user system about what passes across it. Further, whether an output is classified as a product or waste is a judgment about its quality. A satisfactory output is a product. An output, which cannot be used by the user system, is a waste. Waste can collect in the production system, or in the user system or both. Nature often becomes the user system of the waste. Cusins further defines ‘dynamic’ and ‘static’ quality factors. The dynamic quality factors are individual, unique and situation dependent. Their addition will create an image of high quality. The static quality factors are general and common to all customers. They are not situation dependent. Their absence will create an image of poor quality (Cusins 1994, p. 27).

The systems approach has made a lasting impact on TQM. According to McElvea (2003), the birth of most management models, such as TQM and HPO (High Performance Organisation), stems from a systems view of the organisation. Deming, the father of TQM (Shrader 1995), also developed what he called ‘the system of profound knowledge’ (Bauer, Reiner and Schamschule 2000, p. 412).

Systems thinking suggests that instead of reductionist approaches to management, a holistic view should be adopted (Taiwo 2001). Taiwo adds that while there is no single model that can capture an organisational situation fully, some of the methodologies which can be used to capture the inter-relationship and intra-relationship of an organisation are classified as ‘hard’, ‘soft’, ‘cybernetic’ or ‘emanicipatory’ depending on the effectiveness of their feedback loop. These methodologies, if used adequately, complement the customer focus, process improvement and employee involvement principles of TQM.

From the point of view of systems theory, TQM fits within the open and the rational systems perspective. Thus TQM is a system with interactive components. Committing to just one part of the system is unlikely to produce the desired effects. Therefore, from a systems theory point of view, TQM is more than leadership: it is more than culture, or training or teams. It is all of these factors together. Further, successful implementation means that effort and perseverance are required to find the right balance for each organisation. Thus it is desirable that each firm explores its own needs for leadership, education and training, the use of teams, and the culture development to fit its own particular brand of TQM (Reed, Lemak and Mero 2000).

Thus, implementing a complex system such as quality management, with all its serial interactions, is a difficult task and many of the ‘TQM failures’ can be attributed more to the failure to implement and manage them as a system, than to any inherent weakness or fundamental flaws in the system or its components (Reed, Lemak and Mero 2002).

Business excellence 1990
TQM 1980
Quality assurance 1970
System thinking 1960
System Dynamics 1950
Operations Research 1940
Human Relations 1924
Taylor 1913

Figure 2: Milestones of organisational roots (Bauer, Reiner and Schamschule 2000)
Bauer, Reiner and Schamschule (2000) parallel the systems thinking with the growth of quality systems as shown in Figures 2 and 3.

Figure 3: Milestones of quality development (Bauer, Reiner and Schamschule 2000).

A review of the literature (Kumar 2006) shows that what was earlier known as TQM has now morphed into business excellence. All the quality awards are today known as models of business excellence. It really makes the two conceptually the same. Both are dominated by a comprehensive systems approach which includes a systemic control of all resources including social and cultural ones.

TQM and System Dynamics
System dynamics is a tool that can capture the interactions among a range of system variables and predict the implication of each over a period of time (Khanna et al, 2003). Khanna et al (2002) have quoted a study by Forrester wherein he used system dynamics to investigate how strategy, decision making, structure and delay influence the growth and stability of organisations. Through the use of system dynamics software, Bauer, Reiner and Schamschule (2000) showed the interdependence of different organisational subsystems for quality (Figure 4).

Figure 4: Quality and business results (Bauer, Reiner and Schamschule 2000).

Khanna et al. (2002) have studied the dynamic interactions among TQM subsystems in the Indian automobile sector. Using the Malcolm Baldrige National Quality Award Model (MBNQA) of the United States, and modifying it to suit Indian socio-cultural conditions, they identified 12 variables that help in implementing the TQM philosophy. They developed causal relationships among the variables and clustered seven of them as enablers and five of them as results. The definitions of the full set of variables are given in Table 1 and Table 2. The tables also link the variables with the emphasis given by the founding fathers of TQM and with the ISO quality management system.
Table 1: Definition of variable for enablers (Khanna et al. 2002, p. 367).

<table>
<thead>
<tr>
<th>Variables</th>
<th>Definition</th>
<th>Reference</th>
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<tbody>
<tr>
<td>Leadership</td>
<td>Senior managers who provide clear vision and values that promote total quality. It is the most important enabler for driving a total quality management culture</td>
<td>Crosby, 1981; Deming, 1993</td>
</tr>
<tr>
<td>Strategic planning</td>
<td>Business strategies incorporate long-term and short-term goals based on customer and market expectations</td>
<td>Ishikawa, 1985</td>
</tr>
<tr>
<td>Information management</td>
<td>Effective information and communication systems for continuous improvement of all work</td>
<td>Ishikawa, 1985</td>
</tr>
<tr>
<td>Human resource focus</td>
<td>Maximitise opportunities for all employees to realise their full potential</td>
<td>Juran, 1995</td>
</tr>
<tr>
<td>Customer and market focus</td>
<td>Customer (internal and external customer) relationships must be managed to secure clear understanding of requirements</td>
<td>ISO 9000-2000</td>
</tr>
<tr>
<td>Supplier focus</td>
<td>Suppliers are treated as partners in the process of improvement</td>
<td>ISO 9000-2000</td>
</tr>
<tr>
<td>Process management</td>
<td>Systems approach to quality control of all operations including appropriate use of ‘quality tools’</td>
<td>ISO 9000-2000</td>
</tr>
</tbody>
</table>

Table 2: Definition of variables for results (Khanna et al. 2002, 368).

<table>
<thead>
<tr>
<th>Variables</th>
<th>Definition</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impact on society</td>
<td>Societal responsibilities/environmental management</td>
<td>ISO 14001/OHSAS 18001</td>
</tr>
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</table>
Organisational knowledge creating process

Nonaka (1994) argues that organisational knowledge is created by continuous dialogue between two types of knowledge – tacit and explicit. Explicit knowledge is formal knowledge which is can be codified and transmitted. It is captured in the records of the past such as libraries, databases and archives and is assessed on a sequential basis. Tacit knowledge has a personal quality which makes it hard to formalise and communicate. It involves both cognitive and technical elements. The cognitive element comes from the ‘mental models’ that include schemata, beliefs, and paradigms that help individuals to perceive and define the world. The technical element of tacit knowledge covers skills, concrete know-hows and crafts that apply to specific contexts. Sharing of tacit knowledge involves parallel processing of the complexities of current issues.

Organisational knowledge is created, enlarged and enriched by the individuals of an organisation. It is carried out by the interactive amplification of tacit and explicit knowledge held by individuals, organisations and societies in a spiral fashion. The organisation is the forum where the spiral of knowledge creation takes place through socialisation, externalisation, combination and internalisation (SECI). The SECI model is shown in Figure 5.

![Diagram of SECI model](image)

Figure 5: Modes of knowledge creation in an organization (Nonaka 1994).

For parallel processing of knowledge, Nonaka emphasises middle-up-down management where all members work together both horizontally and vertically. He de-emphasises the charismatic role of top management or the entrepreneurial role of lower management. He looks upon the middle managers as the knowledge engineers who synthesise the tacit knowledge of top managers and frontline employees into new knowledge and new learning.

Further, in the context of learning, Reason (2001, p.185) has identified four levels of knowledge:

- **Experiential knowing** is through direct face-to-face encounter with person, place or thing; it is knowing through empathy and resonance, and is almost impossible to put in words.
- **Presentational knowing** emerges from experiential knowing, and provides its first expression through forms of imagery such as poetry, drawing, sculpture, movement, dance and so on.
- **Practical knowing** is knowing ‘how to’ do something and is expressed in a skill, knack or competence.
- **Propositional knowing** is knowledge ‘about’ something and is expressed through ideas and theories. It is expressed in abstract language or mathematics.

Bawden (1991, p.17) has considered these four dimensions of learning as opposites yet integrated to each other as shown in Figure 6.
TQM as integration of systems theory, systems dynamics and action learning

How it is possible to integrate different types of learning for TQM implementation through action learning? Action learning postulates that people learn most effectively when working on real-time problems occurring in their own setting (Raelin 1997, p.21). Argyris and Schön have described organisational learning as a theory of action (Elkhaer 1999, p.79). Zimmer (2001) says that using a systemic action-learning cycle at the level of second-order cybernetics, it is possible to reduce conflict in the organisation and maintain autonomy. According to Zimmer, first-order cybernetics is about the first-order feedback system, where ‘I plan and do, I sense and I check’. Second-order cybernetics is about the second-order feedback system, where ‘I share my reflection and feedback with those from another person – you’. Zimmer further says that respect for autonomy is a powerful tool to manage complexity. It lets mutually supportive order emerge.

Figure 6: The four types of learning as polar opposites (Bawden 1991).

Figure 7: Development of different types of learning from TQM via action learning.

However, the systemic action learning approach suggested above does not show how TQM can lead to different types of learning. Herein comes the need to integrate the systems...
theory and organisational learning for an organisation. Thus this paper builds a model to merge TQM learning with the action learning school of systems theory leading to different types of organisational learning as shown in Figure 7.

Figure 7 blends the different types of learning shown in Figure 6 with the PDCA (plan-do-check-act) cycle in the context of TQM. It shows that each cycle of PDCA brings about an improvement (or change) which can then become the basis for planning the next cycle of improvement (or change). This thus gives rise to practical learning. From the PDCA cycle the improvement emerges. In the context of learning, at the individual or group level, the experience of undergoing the PDCA cycle makes the individual/group reflect on their experience. They draw on theories and constructs to make sense of their experience. That is, the theories and constructs known to them until then are used to interpret and find answers to the questions posed in the reflection. These answers are the new learning for the individual/group. This gives rise to experiential learning. As a result, the individual/group learn(s) to act differently in the organisation. Thus in the next cycle (cycle 2), this new learning is part of their theories and constructs which, in turn, moderates their experience, reflection and interpretation. However, the experiential learning arrived at cannot be elevated to the status of knowledge unless it can be generalised and then verified to be correct.

This is done in the action research cycle. Here, the learning which emerges during reflection and its interpretation need to be generalised and tested. This then gives rise to propositional learning. The interplay of these three types of learning finally gives rise to intuitive learning which is akin to developing a different gut reaction. Development of different kinds of gut reaction changes the culture of the organisation and makes it more quality oriented. This way,

by building the elements of action learning into TQM implementation, it is possible to use the SECI model shown in Figure 5 and make different kinds of learning a necessary outcome of the TQM initiative.

So far, this paper has shown that cyclic learning is the common theme between TQM and action research, systemic approach is their common assumption and systemic dynamics is the common tool which can link the interactions between different systemic variables of TQM and action learning. Figure 7 shows that intuitive learning is the final outcome of these learning processes. This intuitive knowledge is conceptually akin to what Scharmer calls ‘not-yet-embodied knowledge’ or ‘self-transcending knowledge’ (2001). According to Scharmer (2001, p. 145), this knowledge comes from the formation of ‘common will’ which, in turn, develops from: interaction between shared action and shared reflection.

In the context of TQM implementation, this paper now argues that continuous improvement can become the shared will – the community of intention – which can emerge from the interaction between shared action (say, ISO 9000/ISO 14000 certification) – the community of practice – and shared reflection – the communities of reflection. However, this requires moving away from conventional ‘reflection-in-action’ or ‘reflective dialogue’ to a conversational quality ‘which taps into the sources of emerging reality’ (Scharmer 2001, p.147) and can help us intuit what our next action should be.

TQM via action learning: an Indian context
Let us look at the organisational culture necessary for effective TQM implementation using action research in an Indian context.
The first aspect is the importance of symbolism which goes beyond the importance of dialogue. Developing the right kind of dialogue for action research has been considered important by different schools of action research (see, for example, Scharmer 2001; Zimmer 2001). However, in social systems where nonverbal communications dominate, it is difficult to make language the vehicle of change. Thus in an Indian organisation, it is difficult for the participants to enter into a dialogical exercise which could give rise to even type II learning, let alone the type III learning Scharmer (2001) and Zimmer (2001) describe. However, the symbolism of ‘action in tune with the “espoused” dialogue’ (Kumar & Sankaran 2005) was found to be a better precursor to the development of ‘shared will’.

The second aspect is the importance of introspection after an understanding of symbolism. Indians have a strong introspective personality (Ronald 1988). Thus, it is possible that change gets propelled by shared introspection instead of shared reflection. In the literature on organisational learning, action and judgment have been considered as elements of wisdom and experience, while spirituality and passion have been considered as the path to wisdom (Bierly III, Kessler & Christensen 2000). But while the learning literature has recognised the importance of action and experience, spirituality has generally been ignored. Only a few TQM implementations have been attempted by invoking the spiritual aspect (see, for example, Schmidt-Wilk 2003). However, a common spiritual journey is necessary for development of shared introspection. For example, in the Indian context, the nuances of action science was explained to a group of more than 200 illiterate employees not by getting them to understand the subtle differences between first-order and second-order learning but by relating these to them through the Indian epic, the Mahabharat (Kumar & Sankaran 2006).

Thirdly, although the action research literature generally emphasises playing down the hierarchical barriers, at least in the Indian context, there need not be a deliberate attempt to bring down the hierarchy for effective action learning. In fact, a deliberate attempt for egalitarianism can often be construed as a sign of weakness by the co-action researchers in the Indian context.

Conclusion

In TQM, there are five interdependent organisational subsystems as per system dynamics – process, business results, leadership, people management and customer satisfaction (see Figure 4). The model in Figure 7 links the improvement in the processes of an organisation (cycle 1) to customer satisfaction which, in turn, leads to better business result. The aspect of leadership and people management becomes operational in the experiential learning cycle. Thus, beginning from TQM, this model links system dynamics with action research leading to different types of organisational learning which, as indicated in section 4, should be an outcome of TQM. This provides the theoretical underpinning for using an action research-based approach in TQM implementation. In this scheme of things, continuous improvement can emerge as the natural shared will of an organisation through the interaction between the shared experience of, say ISO certification, and shared reflection thereon. Therefore, it is not surprising that Roth and Senge (1996, p. 98) consider Deming’s approach of continuous improvement to be in line with the action research traditions of Lewin and Kolb. However, notwithstanding this theoretical underpinning, TQM implementations via action research are few and far between. This is largely because TQM implementation has been looked upon as an improvement-oriented management system consisting of values, methodologies and tools (Eriksson 2004) and not as an experiential process.
References


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Using an Indigenous worldview for action learning and action research to create equity in education
- Frances Wyld

Abstract
Education is broadly acknowledged as among the keys to providing equitable social and economic outcomes for Indigenous People. Good teaching however is built on students’ prior knowledge, and effective learners use their worldview to cognitively adopt new knowledge through highly individualised neurodevelopment systems. But whose knowledge has currency in contemporary education? How does the learner make critical choices about what they need to know, when their prior knowledge and core epistemology remain unrecognised? Indigenous cultural knowledge is undervalued in Australia and this contributes to the ongoing marginalisation of Indigenous worldviews within the education system. Yet Indigenous worldviews are ethical, reciprocal and sustainable: all values central to Western educational ideals and practices. This paper uses pedagogical examples drawn from a range of educational experiences, in an attempt to demystify the learning process in Indigenous contexts, and support action learning and action research as means to extend understandings of how an Indigenous worldview can be use to enhance equity in education for Indigenous Australians.