

Techniques

Towards TQM – integrating Japanese 5-S principles with ISO 9001:2000 requirements

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Abstract

5-S is the acronym for five Japanese words: *seiri*, *seiton*, *seiso*, *seiketsu* and *shitsuke* which, when translated, mean organisation, neatness, cleanliness, standardization and discipline respectively. They have been referred to as the five keys to a total quality environment. There are many similarities between the ISO 9001:2000 requirements for quality management and 5-S principles, which should be integrated. This paper shows that this integration can be achieved by extending the ISO 9001:2000 template to incorporate relevant 5-S principles. By piggy-backing on ISO 9001:2000 quality management systems, 5-S principles can be introduced more readily into organizations without the need for additional resources. This paper presents the ISO 9001:2000 requirements as well as 5-S principles and discusses how these two sets of requirements/principles could be integrated to move towards total quality management.

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Introduction

Takashi Osada developed the original concept of 5-S in the early 1980s. He coined the concept as the five principles to a total quality environment. The Japanese consider that the practice of the 5-S principles is not only useful for the workplace but also helps them personally by improving their thinking process. The logic behind the 5-S principles at the workplace is that these principles are the basic requirements for high efficiency in producing better quality products and services with little or no waste. The effectiveness of 5-S is shown by its popularity in Japan where the concept has been introduced, albeit mainly in the manufacturing and service industries. The major car manufacturer, Toyota, is one of the pioneering firms to adopt the 5-S principles.

Seiri, *seiton*, *seiso*, *seiketsu* and *shitsuke* are the five Japanese words which are collectively called the 5-S principles. 5-S proponents refer to it as a step-by-step approach towards achieving a total quality environment. Ho (1997) provides a translation and explanation of the meaning of the 5-S as follows:

- (1) *Seiri* means organisation, which is about separating the things that are necessary from those that are not, and keeping the number of unnecessary ones as low as possible and at a convenient location.
- (2) *Seiton* means neatness, which is a study of efficiency. It is a question of how quickly one can get the things needed and how quickly one can put these things away.
- (3) *Seiso* means cleanliness, which should be the concern of everyone in the organisation.
- (4) *Seiketsu* means standardisation, which means continually and repeatedly maintaining one's organisation, its neatness and cleanliness.
- (5) *Shitsuke* means discipline, which means instilling the ability to do things the way they are supposed to be done. The emphasis here is on creating a workplace with good habits.

However, because organisation, neatness, cleanliness, standardisation and discipline (OONCSD) is not an easy acronym, this has prompted some authors to use the words

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structurise, systematise, sanitise, standardise and self-discipline as the English equivalent of the 5-S (Ho, 1997).

The Toyota production system is by far the more well-known example of how the 5-S principles were applied in practice (Shingo, 1982; Floyd, 1997). Companies in Europe and North America have also adopted the 5-S principles. These include Siemens Corporation, Sauer Sundstrand, Hewlett-Packard, and Harley-Davidson New York, Inc. A study by Ho *et al.* (1995) suggests that many European firms are already practising principles which are similar to those of the 5-S but were not formalised into a programme adopted by the organisation. The importance of formalising 5-S principles in the organisation is that these can be introduced as a company plan to be implemented and properly practised throughout the organisation.

Achieving high productivity and quality standards is a challenge for many organizations. In so far as quality is concerned, many organizations have already established quality management systems to meet ISO 9001:2000 requirements or its predecessor's. As noted above, organizations may also adopt 5-S principles to achieve higher productivity and quality standards as a move towards TQM. This paper suggests that there are many similarities between ISO 9001:2000 requirements and 5-S principles and that these should be integrated for implementing the latter successfully. This integration can be achieved by extending existing ISO 9001:2001 quality management systems to incorporate 5-S principles. In this connection, Low (1999) and Low and Chong (1999, 2000a, b) have shown that it is possible to integrate just-in-time principles into existing ISO 9001:1994 quality management systems without the need for additional resources. Although not stated explicitly, the generic requirements of ISO 9001:2000 can be interpreted to embrace quality-pulled productivity improvements. This paper discusses and identifies the similarities between ISO 9001:2000 requirements and 5-S principles. The objective of this paper is therefore to identify the areas in which the ISO 9001:2000 standards can be used to operationalise 5-S principles for mutual benefits.

The 5-S principles

The 5-S principles are first explained below.

First S – *seiri* (organisation)

A key concept in organisation is stratification management. Translated simply, it means classifying all items and data so that they can be properly treated. Being able to classify an item would enable decisions to be made about the importance of the item, to decide what to discard and what to save, and to keep the number of things and quantity of each item that are necessary as low as possible so as to reduce the non-essential inventory. The necessary data should then be entered into the database; the necessary items stored at a convenient location, permitting easy access when required later. Stratification management thus separates things that are necessary for the job from those that are not, and ensures that essential things are close at hand for easy retrieval, resulting in maximum efficiency. The application of stratification management is shown in Table I (Ho, 1998).

To support stratification management, it is important to be able to identify each item, giving it a name that is easily recognisable by all. A proper name should be assigned to everything to prevent confusion as some items may have a real name but people often refer to them using a common name.

Another concept under organisation is the principle of “one is best” – practices of one-day processing, one-hour meetings, one-page reports, one-location storage, one-method processes. This simplicity reduces confusion and increases efficiency in work processes.

Second S – *seiton* (neatness)

Neatness focuses on the layout and structure of the office and workplace. It involves where and how the necessary items are placed. Obstructions to work flow will be easily identified and removed by having a clearly defined layout. Decisions must be made whether the storage locations should be centralised or decentralised. Such decisions would be based on the usage frequency and function of the items. In general, items and tools stored must be placed where they are needed, easily noticed, accessible, in the order required for utilisation, and not in obstruction of work processes.

Safe storage should also be practised, like storing heavy items at the bottom. For ease

Table I Stratification management

Usage	Degree of need (Frequency of use)	Storage method (Stratification)
Low	Things not used in the past year	Throw them out
	Things used only once in the past 6-12 months	Store at a distance
Average	Things used only once in the past 2-6 months	Store in central place
	Things used more than once a month	
High	Things used once a week	Store near worksite or carried by person
	Things used everyday	
	Things used every hour	

and safety, there must be provision of proper ladders or chairs for retrieval of items stored at higher levels. Other than storage, attention must also be paid to the other aspects of workplace layout. The position and height of the tools and equipment should enable the worker to maintain good posture for his comfort while making process movements.

For proper storage, decisions regarding the necessary items as identified under organisation have to be made as to where each necessary item should go, and how it is to be stored and retrieved. If possible, the item's name should also be labelled at the storage location to ensure proper storage. Markers and labels can be used for this purpose.

There is a need for a proper system of identification, labelling, and work process flows that everyone can understand, follow and maintain. Special attention must be paid to the tidiness of notices and signs, as these are common means of communication and also project an image of how a company is. Proper places should be designated for the placement of the signs. These should be placed neatly at a convenient height so that they can be seen and yet not be an obstruction. There should also be an indication of how long the notices should be up and they should be taken down when they are no longer required. This will keep them up to date and people will be constantly aware of new notices. The notices should also be of a proper size, and neatly typed with a clear heading.

Third S – seiso (cleanliness)

Cleanliness of the area is visible to everyone. To maintain a good image of cleanliness, everyone should be individually responsible for cleaning. Areas should be charted out; responsibility for cleaning assigned to personnel, leaving no areas undefined or

unaccounted for. Throwing out things that are unnecessary will uncover areas for inspections. Discarding unwanted items will make the area clear and uncluttered. Obsolete data must be removed so that they will not create confusion. Visibility is effective in tackling problems as it may uncover the cause of problems and thus enable one to deal with the root of the problems. This makes it possible to pre-empt problems and thus prevent their reoccurrence. Daily inspection, lubrication and cleaning of equipment are part of preventive maintenance that will increase efficiency of the machinery. Cleaning must thus be done daily and inspections can be incorporated to ensure that this is done religiously. Cleaning should be extended even to areas not usually obvious, such as the washroom.

Fourth S – seiketsu (standardisation)

“Seeing is believing”; thus emphasis must be placed on visual management. Standardised conditions on site must be achieved so that work can be done quickly. Standardisation should be implemented even for the numbering of technical documents and other papers. For example, reference numbers make it easy to trace the originator of the document and also make for easy filing and retrieval if necessary.

Standardisation also creates transparency, where everyone is clear of procedures, knows exactly where things are and how things are done; thus there are no hidden areas. A better understanding of what one's colleague is doing enables one to work better. It also allows the work processes to continue in the event of an employee being absent for the day. Employees are also better able to point out ways to improve operations if they can understand the company's operations as a whole. In addition, following standardised

procedures makes it easy to see which inventories are out of stock and which are missing. This helps in the organisation of the office.

Colour management can be used to create a more visually pleasing working environment. Standardised visual aids like indicators, labels and markers are easily recognisable and make communication simple and understandable, so that everyone can act quickly.

Fifth S – *shitsuke* (discipline)

Discipline means instilling the ability to do things the way they are supposed to be done. This involves training and inculcating good habits and having everyone practise them, thus encouraging the continuity of good habits. As the final S in the 5-S, it propagates the 5-S practice by ensuring that the former 4-Ss are carried out conscientiously. Making the 5-S a daily routine helps to maintain orderliness at the workplace. Setting up the 5-S is useless if it is not followed through, as things will return to being bad if they are not well maintained. Taking a further step, discipline also includes reviewing current practices and revising them to keep them relevant. It also means striving for *kaizen*, which is the Japanese equivalent for continuous improvement.

Checklist for integration

Investigation of the clauses in the ISO 9001:2000 standards showed that each clause corresponds to one or more of the 5-S classifications of *seiri* (organisation), *seiton* (neatness), *seiso* (cleanliness), *seiketsu* (standardisation), and *shitsuke* (discipline). The rationale for integrating the clauses/principles is to provide a different perspective towards satisfying the ISO 9001:2000 requirements. By practising the 5-S principles, the requirements of the ISO 9001:2000 standards can be achieved more readily. Thus, incorporating the practice of 5-S in the organisation should not be seen as a hassle, but as a novel, uncomplicated and natural way to satisfying the ISO 9001:2000 requirements. The proposed checklist for integrating ISO 9001:2000 requirements and 5-S principles is shown in Table II. A “×” mark on the template in Table II suggests that it is possible to integrate the relevant 5-S principles with the appropriate

ISO 9001:2000 clauses. This integration is discussed below.

First S – *seiri* (organisation)

First, the ISO 9001:2000 clauses that correspond to *seiri* serve to identify and define items so that decisions can be made as to how items could be handled, hence demonstrating stratification management. Other corresponding ISO 9001:2000 clauses under *seiri* set out the plans, schedules, procedures and criteria required for quality management. These clauses serve as guidelines as to how the organisation should operate.

Second S – *seiton* (neatness)

The ISO 9001:2000 clauses that correspond to *seiton* guide the organisation on what processes, procedures and other matters are to be systematised and documented. The clauses emphasize the control of documents to ensure traceability. In addition, it guides the organisation on what is to be reported and communicated to ensure the performance of follow-up actions, where necessary.

Third S – *seiso* (cleaning)

The ISO 9001:2000 clauses that correspond to *seiso* remind the organisation to remove non-conformities to ensure that there are no contributing factors that will result in defective final products. At each stage of the product realisation process, any defects or non-conformance should be rectified and assurance made that there would not be a recurrence. The integrity of each product and equipment placed in the charge of an organisation should be protected and maintained. Other clauses under *seiso* require the organisation to appoint competent personnel and assign responsibilities to them to ensure accountability.

Fourth S – *seiketsu* (standardisation)

Significantly fewer ISO 9001:2000 clauses correspond to *seiketsu*, as compared to the other 5-S principles. This is in no way indicative that standardisation is unimportant in achieving ISO 9001:2000 certification. In fact, it shows that ISO 9001:2000 certification does not lead to uniformity that does not set the organisation apart from other similar organisations. Instead, it should encourage organizations to try to achieve ISO 9001:2000 certification. The classifications promote consistency in operational guidelines

Table II Checklist for integrating 5-S principles and ISO 9001:2000 requirements

ISO 9001:2000						
clauses	Requirements	Seiri ^a	Seiton ^a	Seiso ^a	Seiketsu ^a	Shitsuke ^a
Scope						
1.1	General				X	X
Quality management systems						
4.1	General requirements	X	X	X		X
4.2	General documentation requirements	X	X	X		X
Management responsibility						
5.1	Management commitment	X	X			X
5.2	Customer focus					X
5.3	Quality policy	X	X	X	X	X
5.4.1	Planning – quality objectives	X			X	X
5.4.2	Planning – quality planning	X	X	X	X	X
5.5.2	Administration – responsibility and authority	X	X	X		
5.5.3	Administration – management representative	X	X	X		X
5.5.4	Administration – internal communication		X			X
5.5.5	Administration – quality manual	X	X	X	X	
5.5.6	Administration – control of documents	X	X	X	X	X
5.5.7	Administration – control of quality records	X	X	X	X	X
5.6.1	Management review – general					X
5.6.2	Management review – review input	X	X	X	X	X
5.6.3	Management review – review output		X			X
Resource management						
6.1	Provision of resources	X				X
6.2.1	Human resources – assignment of personnel	X		X		X
6.2.2	Human resources – training, awareness and competency		X	X		X
6.3	Facilities	X	X	X	X	X
6.4	Work environment	X		X	X	X
Product realization						
7.1	Planning of realization processes	X	X		X	X
7.2.1	Customer-related processes – identification of customer requirements	X				
7.2.2	Customer-related processes – review of product requirements	X	X	X		X
7.2.3	Customer-related processes – customer communication	X		X		X
7.3.1	Design and/or development – design and/or development planning	X	X	X		X
7.3.2	Design and/or development – design and/or development inputs	X		X		X
7.3.3	Design and/or development – design and/or development outputs	X	X			X
7.3.4	Design and/or development – design and/or development review	X	X	X		X
7.3.5	Design and/or development – design and/or development verification		X			X
7.3.6	Design and/or development – design and/or development validation		X			X

(continued)

Table II

ISO 9001:2000 clauses	Requirements	Seiri ^a	Seiton ^a	Seiso ^a	Seiketsu ^a	Shitsuke ^a
7.3.7	Design and/or development – control of design and/or development changes	X	X	X		X
7.4.1	Purchasing – purchasing control	X		X	X	X
7.4.2	Purchasing – purchasing information	X	X	X		X
7.4.3	Purchasing – verification of purchased product	X				X
7.5.1	Product and service operations – operations control	X		X		X
7.5.2	Product and service operations – identification and traceability	X	X	X		
7.5.3	Product and service operations – customer property	X	X	X		X
7.5.4	Product and service operations – preservation of property	X		X	X	
7.5.5	Product and service operations – validation of processes	X				X
7.6	Control of measuring and monitoring devices	X	X	X	X	X
Measurement, analysis and improvement						
8.1	Planning	X		X		X
8.2.1	Measurement and monitoring – customer satisfaction	X				X
8.2.2	Measurement and monitoring – internal audit	X	X	X	X	X
8.2.3	Measurement and monitoring – measurement and monitoring of processes	X				X
8.2.4	Measurement and monitoring – measurement and monitoring of products	X	X	X		X
8.3	Control of nonconformity	X	X	X	X	
8.4	Analysis of data		X			X
8.5.1	Improvement – planning for continual improvement	X	X	X		X
8.5.2	Improvement – corrective action	X	X	X	X	X
8.5.3	Improvement – preventive action	X	X	X	X	X

Note: ^aseiri (organization); seiton (neatness); seiso (cleaning); seiketsu (standardization); shitsuke (discipline)

of an organization and the operations themselves, and consequently promote standardisation and transparency.

Fifth S – shitsuke (discipline)

A majority of the ISO 9001:2000 clauses correspond to the 5th 5-S principle, *shitsuke*. The importance of discipline is evident to ensure that ISO 9001:2000 certification can be achieved and maintained. Guidelines can be defined under *seiri* and personnel appointed under *seiso*, but without discipline, quality management cannot be implemented and assured. The clauses under *seiso* ensure

that the organisation carries out the activities to ensure that the required level of quality will be achieved and sustained. Such activities include the collection of relevant data, monitoring and measuring processes, and verification and validation to ensure conformance. Another important issue expounded by the clauses under *shitsuke* is the importance of review and evaluations of defined guidelines to further improve the quality management system. Just as imperative is the involvement and commitment of top management in implementing the quality management

program and the participation of all employees in undergoing training to be competent in their tasks.

Conclusion

Organisations would ask why they would need to embrace the 5-S concept and implement it since it provides no recognised certification and thus provides no publicity for the organization. The general benefits of practising the 5-S principles have already been expounded above. In addition to those benefits, the 5-S principles provide a framework within which the ISO 9001:2000 requirements can be built on. It has been shown, in the proposed integrated ISO 9001:2000 and 5-S checklist, that the requirements of the ISO 9001:2000 standards can be met if the 5-S principles are practised.

There is another way in which the practice of the 5-S principles can assist in the achievement of the ISO 9001:2000 certification. In the certification process, external auditors would come to the organisation for an initial visit, when the auditor does a preliminary site walk through before the actual audits are conducted. As first impressions often make the most lasting impressions, it is important to be able to present, at the initial visit, a neat and clean work area, thus giving a good impression of a well-organised work area. In fact, dubious areas may often present a risk in the actual audits conducted later. Such good housekeeping may be achieved by practising the 5-S principles religiously. Thus, if an organization has already been practising the 5-S principles, there would not be any cause for worry when the external auditors arrive.

The 5-S principles also propose the regular maintenance as well as constant review and evaluation of implemented quality management systems. This is again a critical requirement for ISO 9001:2000 certification. An organisation is not encouraged to slacken

and then to buck up just before an external or ISO 9001:2000 half-yearly audit takes place. Discipline, as proposed in the 5-S principles, ensures that the organisation carries out its own regular internal audits to ensure consistent conformity to the ISO 9001:2000 requirements. In the long run, the integration of ISO 9001:2000 requirements with 5-S principles would lead towards TQM.

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Commentary

Useful clarification on the nature of the 5-S principles and how they can help with ISO 9001:2000.