Business strategy or useful tool: Analysis of the application of the 5S concept in Japan, the UK and the USA.

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Abstract

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A quantitative content analysis of the web-sites of 217 businesses is employed. Lexical analysis of the manifest content of World Wide Web business domains is used to determine the ways in which 5S has been adopted and implemented.

The research finds that Japan emphasises 5S as a strategy for improvement, requiring participation both at work and in the home. In the UK and USA, 5S is viewed as a system or tool for the workplace only. The findings suggest that a balanced understanding of both ‘5S as a philosophy or way’ and ‘5S as a technique or tool’ could define the ultimate goal of 5S as a strategy to achieve efficiencies in the workplaces and processes of organisations.
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Key words – Strategy, 5S, Japan, UK, USA Content analysis.

Introduction

The 5S concept (5S) has its origins in a Japanese acronym for seiri (organisation), seiton (neatness), seisō (cleaning), seiketsu (standardisation) and shitsuke (discipline), a philosophy that is embedded in Japanese everyday life. Literature suggests that since World War II, two major frameworks for understanding and applying 5S to business environments have arisen, one proposed by Osada (1989, 1991), the other by Hirano (1995, 1996).

This paper investigates and clarifies the ways in which 5S has been understood and implemented by Japanese and Western businesses. An outcome of this undertaking has been to address current deficiencies in the literature concerning the applicability of 5S when transferred from one country to another. This research also highlights the distinction between ‘5S as a philosophy or way’ and ‘5S as a technique or tool’ by comparing the major frameworks provided by Osada (1989, 1991) and Hirano (1995, 1996).

A quantitative content analysis approach is used to compare and contrast the use of 5S through 38 measured components from the World Wide Web (Web) pages of organisations in Japan, the UK and the USA. Six dependent variables are studied through the lens of country of origin as independent variable. Key words or components extracted from organisational Web pages are allocated to each of the dependent variables. Each country is considered in terms of the way in which it uses 5S, that is as a business strategy to guide organisational processes or as a tool to achieve specific, limited outcomes.
Background to the study

With just 0.3 percent of the world’s land mass and 2.3 percent of its population (Hitomi, 2004) Japan is a small country. Yet in 2001, Japanese GDP was 14 percent of total world product, second only to the USA which accounted for 30 percent. In comparison, the UK was in fifth place with 4.7 percent of total world product (Hitomi, 2004).

Japan is a world leader in manufacturing industries. In particular, Japanese car production plants lead in productivity, with Honda, Toyota and Mitsubishi occupying the top three positions worldwide (EIU, 1997). In addition to success at home, Japanese companies operating overseas have also achieved high levels of productivity and profitability (Hitomi, 2004). However, the success of Japanese companies in the UK and USA, compared with many locally owned and operated companies, has prompted the question “how well do native Japanese practices transfer to other countries?” (Halpern, 1999). The implications are that the benefits of Japanese business strategies have not been properly understood and implemented by locally owned businesses in the UK and USA. One such approach to manufacturing is lean production (Womack, Jones and Roos, 1990), a system based on the philosophy and work practices of the Toyota Motor Company. An integral part of lean production is the 5S concept, a Japanese approach to living and work. The purpose of this research is to investigate and clarify the ways in which the 5S concept has been understood and implemented by Japanese and Western businesses.

Origins of the 5S concept

Each of the terms comprising 5S is widely understood in Japan as a method of improving lifestyle (Osada, 1989). In Japan the practice of 5S is recognised as a group of organisational and cleaning activities that shape basic morality and ethics in the workplace, at school, and in the home (De Mente, 1994).

The philosophical concept of 5S has been embedded in Japanese society through the principles of Shintoism, Buddhism and Confucianism for several hundred years (De Mente, 1994). Japan has traditionally emphasised cooperation, advocating the values of trust, self-restraint, harmony and organisational loyalty. Shintoism, Buddhism and Confucianism have all contributed to the formation of these values in Japan (Watsuji, 1952).

Shintoism emphasises the importance of cleanliness of mind; using other people for one’s self-interest is considered ‘unclean’ (Watsuji, 1952). Confucianism emphasises orderliness, which was initially introduced from China and then re-developed in Japan. Orderliness is based on the Japanese understanding of Confucianism with an emphasis on community values (Watsuji, 1952). Both Buddhism and Confucianism share spiritual ideals often deriving spiritual fortitude from self-discipline. These combined ideals of Shintoism, Buddhism and Confucianism are often denoted by dō (the way: philosophy or methodology), such as bushidō (the way of the samurai), shintō (the way of the Gods: Shintoism), butsudō (the way of the Buddha: Buddhism), and other martial arts, including kendō, jūdō, and karatedō, which are intended to train the body and mind through discipline (Sugiura and Gillespie 2002).

For the Japanese 5S is a holistic application used to raise moral and ethical standards, and is grounded in the philosophical assumptions of Shintoism, Buddhism and Confucianism. The 5S is strongly associated with the constitution of Japanese culture and society.

The use of 5S as a business strategy has been evident in Japan since World War II (De Mente, 1994). Initially, various plant maintenance concepts (preventive, periodic, predictive and
corrective maintenance) were imported to Japan from the US (Nakajima, 1988). The concept of Quality was also introduced from the USA to Japan by Sarasohn, Deming and Juran, from the late 1940s to the early 1950s (Dean, 2005; Foley, 2000). An innovative concept of total productive maintenance (TPM) was developed in Japan during this period and 5S was actively utilised at Nippondenso (Nakajima, 1988) as a platform for TPM implementation. Later, the concept of 5S was integrated with KAIZEN (continuous improvement) philosophy (Imai, 1986), then implemented at Toyota Motor Corporation as part of their production system, namely Toyota Production System (TPS). The 5S has also been widely used in Total Quality Management (TQM) systems where it has been referred to as part of a series of quality initiatives (Shari Mohd and Aspinwall, 2001), a good housekeeping tool (Ahmed and Hassan, 2003; Chin and Pun, 2002), an effective cleanliness program (Tannock, Krasachol and Ruangpermpool, 2002) and a system for maintaining a good working environment (Krasachol and Tannock, 1999). Japanese professionals and academics (Aoki, 1989; Mishima, 1993; Sugiyama, 1989; Yamamoto, 1996) have studied and discussed the significance of 5S, as well as contributing to its development and evolution.

Osada’s view of 5S: As a philosophy for life and business

According to Osada (1989), 5S is a fundamental part of Japanese culture and society. For both individuals and organisations, 5S engages improvement activities in any environment, including homes, schools, communities and workplaces, regardless of size or type. The implementation of 5S can uncover hidden problems that may otherwise remain unnoticed. The benefits of implementing 5S are summarised as:

- **Cleanliness** – to maximise effectiveness, contribute to a healthier life and reduce crime (due to enhanced transparency);
- **Orderliness** – to maximise efficiency and effectiveness, reduce people’s workload, reduce human errors (due to simplifying processes); and
- **Discipline** – to increase the level of morality and ethics and to increase minimum standards through training and education.

In the workplace, 5S is used as a strategy “to organise the workplace, to keep it neat, to clean, to maintain standardised conditions, and to maintain the discipline that is needed to do a good job” (Osada, 1991, p.x). The use of 5S as a business strategy increases ‘transparency’ in an organisation ensuring a good first impression of the workplace by visitors, particularly potential new customers. The successful implementation of 5S increases not only efficiency, such as in productivity and the level of quality at a given cost, but also organisational effectiveness through “the synergetic (or cooperative) effect” (Osada, 1991, p.1), which is often seen in team sports. The 5S program always emphasises total participation, since the ‘synergetic effect’ creates strong workplace commitment for organisational improvement activities (Osada, 1991).

In linking the 5S philosophy to the workplace as a strategy to lead and guide action Osada (1991) provides the following definitions and descriptions for each of the activities. The order of the activities is not important but all are linked and implemented concurrently and cyclically (see Fig 1).
The first S seiri represents ‘organisation’, which means “to put things in order—to organise them—in accordance with specific rules or principles” (Osada, 1991, p.25). This begins with distinguishing between the necessary and the unnecessary in order to create a system that works effectively.

The second S seiton means ‘neatness’, and aims to have things in the right place or right layout so that people can obtain or use whatever they need quickly. To do this, one must prioritise the necessity and importance of goods/equipment to maximise ease of location. Functional layout is also important; not only to maximise efficiency but also to improve quality. The key questions who, what, why, where, when and how (Imai, 1986) should be asked of oneself in respect of each item.

The third S seisō means ‘cleaning’, which emphasises self-inspection, cleanliness and creating a faultless workplace. Inspection here has particular relevance to machines in a factory. When dealing with machines incorporating high-technology, merely appearing to be clean is not enough. There might be a particle of dust which is impossible to remove by only sweeping. Active self-inspection of machines by operators, and embedding quality into each work process, increases work life and performance, hence avoiding fatal breakdown or downtime in operations.

The fourth S seiketsu means ‘standardisation’, which is at least continuously maintaining the level of the first three ‘S’s: seiri, seiton and seisō. It emphasises both “personal cleanliness and the cleanliness of the environment” (Osada, 1991, p.31). Here, innovation and ‘visual management’ (making things clearly visible using colours, tags, logos or symbols) improves the effectiveness of kaizen (interpreted by Osada as making things better for everyone).

Finally the fifth S shitsuke means ‘discipline or training’. This is critical to understanding and implementing 5S. Pre-established behavioural patterns evolve naturally as a result of following a strategy, rather than just being dictated by upper management. This requires proactive changes in people’s behavioural patterns at all levels within an organisation to achieve goals effectively. Also, this concept is fundamental to Japanese’ thinking of ‘doing the right things in everyday life in the right way’ (Watsuji, 1952).
Hirano’s view of 5S: As a technique or tool

Hirano (1995, 1996) developed an alternative version of the 5S concept during the same period as Osada, but with a more practical focus. Hirano (1995, p.28) explains the significance of 5S as a tool for “corporate survival” that enables just-in-time (JIT) production rather than a strategy to guide action.

Hirano (1995, 1996) places emphasis on the first two components of 5S, seiri (organisation) and seiton (orderliness – using his interpretation) specifically. Seiri is sorting out needed items from unneeded ones and disposing of the latter, while seiton is prioritising needed items. The other three components of 5S are explained in a similar way to Osada (1989, 1991). Hirano (1995) suggests that 5S should be promoted by top management using the following steps:

1. Establish a 5S promotion organisation: this should be done by top management and be operated companywide;
2. Establish a 5S promotion plan: scheduling implementation activities;
3. Create 5S campaign materials: top managers should participate at this stage;
4. In-house education: answering the question of ‘What does 5S mean?’ and providing training;
5. 5S Implementation: using visual methods, such as red-tagging for seiri (organisation) and the signboard strategy for seiton (orderliness); and
6. 5S evaluation and follow-up: periodic evaluation to check, maintain and improve 5S conditions.

Figure 2. Hirano’s view of the 5S (Hirano, 1995, p. 34)
Comparison of the Osada and Hirano frameworks

When comparing the approaches of Hirano (1995, 1996) and Osada (1989, 1991), there is a similarity in terms of how the components of 5S relate to one another. Seiri (organisation) relates to seiton (orderliness) and seisō (cleaning) associates with seiketsu (cleanliness/standardisation). All four components are shaped by shitsuke (training/discipline). However, several important distinctions between them should also be noted. Firstly, Hirano (1995) places more emphasis on the first two S’s: seiri (organisation) and seiton (orderliness), whereas Osada (1991) stresses that shitsuke (training/discipline) is the most crucial. Secondly, Hirano (1995) argues the need for a “practical and comprehensive manual [to provide] know-how” (p.xiv) in 5S implementation. Therefore his series of publications includes the Manga (Japanese cartoon), a pocket guide, audio/visual aids and a manual for operators (Hirano, 1996). However, Osada claims that while some examples are beneficial they should only be regarded as examples from which an organisation can learn rather than a philosophy of learning. Thirdly, Hirano adopts a top-down approach whereas Osada stresses a bottom-up approach in the implementation of 5S. Finally, Osada acknowledges that 5S is applicable in any environment as a strategy to improve outcomes while Hirano limits the use of 5S to eight ways:

1. as a foundation for introducing just-in-time (JIT) production;
2. for Total Productive Maintenance (TPM), with particular emphasis on combining cleaning activities with maintenance activities;
3. to refresh a stale Total Quality Control (TQC) program;
4. as a first step toward the future implementation of JIT and/or TQC;
5. by emphasising the ‘red-tagging’ strategy as the solution to an inventory flood;
6. as an experiment other than in manufacturing;
7. to maximise efficiency in sales warehousing and other sales tasks; and
8. to audit the current operations and build a strong foundation for a computer-based system.

In summary, Osada views 5S as a strategy for organisational development, learning and change, whereas Hirano considers 5S as an industrial formula that differentiates a company from its competitors. Osada’s model is multidimensional and evolutionary. All components comprising 5S are interconnected with each other and shaped by shitsuke. This model works cyclically like Deming’s (1994, p.194) ‘PDSA (Plan-Do-Study-Act)’ model. Osada’s 5S model should be used strategically in the way of an upwards spiral for improvement at each level of 5S activities by the incorporation of Imai’s (1986) KAIZEN philosophy. By comparison, Hirano’s model is sequential and linear. The first two of Hirano’s components (seiri and seiton) and the latter two components (seisō and sheiketsu) should be performed simultaneously.

Methodology

The literature relating to the application of 5S suggests that the complexity of 5S as a holistic business strategy had not been fully appreciated at the time of adoption by organisations in the UK and the USA, where implementation involved a focus on special applications rather than a detailed understanding. An aim of this research was to study the 5S concept objectivity, therefore quantitative methods were considered to be appropriate. In order to achieve this it was decided to investigate non-reactive or pre-existing messages about 5S from various countries, rather than responses or reactions to them. In this context messages refer to the ‘content’ (Neuendorf, 2002;
Weber, 1985) of organisational communication, so content analysis was selected as an appropriate means of examining existing messages.

Content analysis was primarily developed by communications specialists (Berelson, 1952) seeking to understand a communication phenomenon (Stacks and Hocking, 1992). In social studies content analysis has also commonly been regarded as a useful method for analysing and understanding content, including words, symbols, ideas or themes, in written or audio/visual materials (Krippendorf, 1980; Levin and Fox, 2003; Neuman, 2003). Content analysis is a powerful means of analysing the content of Web pages, e-mail messages, and bulletin board postings on the Internet (Babbie, 2004; Bernard, 2000).

Quantitative content analysis is “a research technique for the objective, systematic and quantitative description of the manifest content of communication” (Berelson, 1952, p.18). Manifest content means visible words appearing in a text, while latent content means implicit meaning in a text (Neuman, 2003). Quantitative content analysis with manifest coding is “a scientific method (including attention to objectivity-intersubjectivity, a priori design, reliability, validity, generalisability, replicability, and hypothesis testing)” (Neuendorf, 2002, p.10).

The research context for this study was the organisational Web pages of businesses in Japan, the UK and the USA. The study examined existing messages concerning 5S within an organisational context. Also, the research required knowledge of the words commonly used by organisations. Words or messages in Web pages experience less intervention by translators, as opposed to other paper-based materials, which was ideal for the purposes of this study in terms of organisational intentions regarding 5S.

**Data collection**

*Units of analysis and data collection*

A unit of analysis is any identifiable message component resulting from the disaggregation of an item of communication into smaller parts (Carney, 1972). In this study, the unit of analysis selected was at the individual word level used to describe 5S on organisational Web pages. The unit of data collection was Web pages provided by each organisation, while the frame of data collection was the database of a popular search engine.

Initially, several popular search engines (Excite, Altavista, Google and Yahoo) were examined in terms of whether or not the nomination of regions and languages was possible. As a result of examination, only Yahoo satisfied this criterion. Three countries were then studied through Yahoo to overcome time constraints. The United States of America (USA) and the United Kingdom (UK) represented English-speaking countries and were used to compare messages about 5S to those of Japan. As the unit of data collection, only organisational Web pages were included. Irrelevant Web sites made by individuals (Web diaries or Web logs) and those that featured discussions (Web forums, discussion boards, or guest books) were excluded. Selected Web pages incorporated the word ‘5S’ on the title of the page, on the section heading or with special emphases (in bold, coloured, highlighted or in a different font size).

*Sampling process*

The data collection procedure adopted a stratified sampling technique utilising a sample drawn from a number of separate strata of the population (Babbie, 2004; Daniel, 1990) of available
Web sites. Two researchers participated in the data collection procedure. One of them was proficient in both English and Japanese. Three computers with common settings were simultaneously used at an Australian university. Data collection commenced with all researchers going to the Yahoo site [http://yahoo.com] then selecting ‘Advanced Search’. Researchers typed ‘5S’ then specified the criterion of ‘only in title’. Each researcher then specified both language and region. This process enabled the researchers to stratify all samples by region automatically. Researchers then worked on each regionally stratified setting (country block), examined a title and a summary of each Web page listed on the first 100 pages and nominated exclusive words. Those words were assigned to the ‘exclude these words’ section. Data collected from each country were transferred into a spreadsheet.

At the final stage data researchers exchanged country blocks to determine whether any irrelevant pages remained. All irrelevant Web pages, such as Web pages in English provided by Malaysian or Singaporean companies in the USA block were manually removed. Pages were checked according to their accessibility. Web pages under construction, with limited access, containing a discussion forum or board, or containing only graphics were removed from the list. At the end of the entire process, 86 pages from the USA, 47 pages from the UK and 84 pages from Japan were prepared for analysis, a total of 217 items. This number of items was considered to be manageable, and was therefore treated as a census for content analysis. Each Japanese Web page was then translated into English mainly through the use of a translation program called ‘King of Translation’.

Following translation, data mining software, ‘Leximancer’, was used to convert Web pages into text files automatically by counting every third sentence and reproducing a new text file without human intervention (Smith, 2004). Table 1 shows the number of text files converted by the Leximancer program. A total of 3666 text files formed the population to conduct a statistical analysis for this study.

<table>
<thead>
<tr>
<th>Country</th>
<th>Number of Web Pages</th>
<th>Number of Text Files</th>
<th>Valid Percent (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>86</td>
<td>1355</td>
<td>37.0</td>
</tr>
<tr>
<td>UK</td>
<td>47</td>
<td>1269</td>
<td>34.6</td>
</tr>
<tr>
<td>JP</td>
<td>84</td>
<td>1042</td>
<td>34.6</td>
</tr>
<tr>
<td>Total</td>
<td>217</td>
<td>3666</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Using lexical analysis to obtain data

The independent variable selected as the lens through which the dependent variables would be studied is country (COUNTRY). Dependent variables for this study are six areas of content (GENERAL, EXPLANAT, BENEFIT, TARGET, OBJECT and PROPOSE). The category (GENERAL) represents the 5S concept and contains each of the elements of 5S. The remaining five categories were determined by researchers from the output of Leximancer data mining software. Leximancer was then used to explore the data and assist in identifying variables for statistical analysis (Smith, 2004). The independent variable COUNTRY was manually assigned with three levels of nominal measurement to represent each of the countries being studied (1-UK, 2-JP and 3-USA). Measured components for each dependent variable had two levels of
nominal measurement (1-yes and 0-no) based on the presence (1-yes) and the absence (0-no) of each word in order to count its frequency.

Components measured for this study were assigned from the outcome of a pilot test conducted by the initial execution of the Leximancer program. This data-mining software tool can be used to conduct content analysis in either a quantitative or qualitative way. In quantitative content analysis, manifest coding (assigning each word as it is, regardless of its meaning) is usually employed. Leximancer’s learning capability generated and put similar words into groups automatically as synonyms, then represented them as a ‘concept’ (Smith, 2004). After the initial execution of the Leximancer program, the 38 words selected were put into six categories by agreement between three coders. The process of inter-coder reliability and validity checking is described later. Table 2 shows the nominated 38 words as components measured for a statistical test generated by the initial execution of Leximancer.

Table 2. Six categories as dependent variables and components measured

<table>
<thead>
<tr>
<th>GENERAL</th>
<th>EXPLANAT</th>
<th>BENEFIT</th>
<th>TARGET</th>
<th>OBJECT</th>
<th>PURPOSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>organisation</td>
<td>activity</td>
<td>costs</td>
<td>company</td>
<td>equipment</td>
<td>improvement</td>
</tr>
<tr>
<td>order</td>
<td>easy</td>
<td>effective</td>
<td>customer</td>
<td>information</td>
<td>lean</td>
</tr>
<tr>
<td>cleaning</td>
<td>continuous</td>
<td>efficient</td>
<td>people</td>
<td>items</td>
<td>maintenance</td>
</tr>
<tr>
<td>standard</td>
<td>important</td>
<td>productivity</td>
<td>participation</td>
<td>machine</td>
<td>management</td>
</tr>
<tr>
<td>training</td>
<td>method</td>
<td>time</td>
<td></td>
<td>workplace</td>
<td>manufacturing</td>
</tr>
<tr>
<td></td>
<td>necessary</td>
<td></td>
<td></td>
<td></td>
<td>production</td>
</tr>
<tr>
<td></td>
<td>process</td>
<td></td>
<td></td>
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<td>quality</td>
</tr>
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<td></td>
<td>should</td>
<td></td>
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<td></td>
<td>safety</td>
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<td></td>
<td>system</td>
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<td>tool</td>
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<td></td>
<td>work</td>
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</tbody>
</table>

Allocation of words to categories

GENERAL (general definition-related content). Five words were assigned in this category. The second S-seiton (orderliness) is assigned as ‘order’ to represent ‘[put in] order’, which is a common expression. The word ‘training’ was assigned to represent shituke (training/discipline), the fifth component in 5S. It also included ‘discipline’, ‘self-discipline’, ‘sustain’ or other theoretical definition-related words cited by organisations.

EXPLANAT (explanation-related content). Eleven words were assigned in this category. Those measured components were divided into two classifications: nouns and adjectives. The word ‘should’ was assigned in the adjectives classification to distinguish it from ‘necessary’.

BENEFIT (benefit-related content). Five words were assigned in this category. The words ‘cost’ and ‘time’ were assigned in this category. As other general benefits, both ‘efficiency’ and ‘effectiveness’ were also assigned in this category.

TARGET (target-related content). Four words were assigned in this category. The words ‘company’ and ‘customer’ were assigned to examine the difference in the focus of organisations. Also, ‘people’ and ‘participation’ were assigned here to examine organisations’ perceptions of total participation in 5S.

OBJECT (object-related content). Five words were assigned in this category. Those words assessed the scope of 5S in action, whether specific or broad.
**PURPOSE (purpose-related content).** Eight words were assigned to this category. Those words represented conjunct management approaches organisations adopted, as well as the general purpose of 5S.

The frequency of appearance in organisational Web pages of the 38 concept words was noted for each country. A summary of the 20 most frequently appearing concept words, in country order, is shown at Table 3 below.

| Table 3. Summary of 20 most frequently occurring concept words by country |
|---------------------|---------|--------|-------|---------|--------|-------|---------|
| USA Concept* | AC**  | RC*** | UK Concept | AC | RC | JP Concept | AC | RC |
| work | 211 | 15.5% | work | 118 | 9.2% | improvement | 163 | 15.6% |
| area | 155 | 11.4% | time | 111 | 8.7% | place | 161 | 15.4% |
| workplace | 142 | 10.4% | area | 107 | 8.4% | cleaning | 153 | 14.6% |
| process | 106 | 7.8% | workplace | 95 | 7.4% | management | 128 | 12.2% |
| organisation | 95 | 7.0% | manufacturing | 81 | 6.3% | time | 125 | 11.9% |
| place | 94 | 6.9% | improvement | 72 | 5.6% | activity | 120 | 11.5% |
| time | 92 | 6.7% | cleaning | 72 | 5.6% | method | 100 | 9.5% |
| cleaning | 84 | 6.1% | should | 68 | 5.3% | order | 96 | 9.2% |
| waste | 73 | 5.3% | environment | 68 | 5.3% | workplace | 86 | 8.2% |
| items | 73 | 5.3% | place | 65 | 5.1% | business | 79 | 7.5% |
| manufacturing | 64 | 4.7% | standard | 64 | 5.0% | actual | 76 | 7.2% |
| tools | 63 | 4.6% | process | 62 | 4.8% | company | 75 | 7.1% |
| training | 61 | 4.5% | production | 61 | 4.8% | people | 72 | 6.9% |
| lean | 59 | 4.3% | management | 61 | 4.8% | necessary | 71 | 6.8% |
| equipment | 59 | 4.3% | items | 57 | 4.4% | factory | 63 | 6.0% |
| people | 59 | 4.3% | quality | 57 | 4.4% | training | 60 | 5.7% |
| improvement | 59 | 4.3% | organisation | 56 | 4.4% | work | 55 | 5.2% |
| environment | 58 | 4.2% | equipment | 55 | 4.3% | production | 48 | 4.6% |
| system | 56 | 4.1% | business | 54 | 4.2% | case | 45 | 4.3% |
| should | 52 | 3.8% | people | 50 | 3.9% | quality | 42 | 4.0% |

Notes: *Concept = Employed word; **AC = Absolute count; ***RC = Relative count

Validity and reliability

Issues of validity and reliability were considered. As a computer-generated coding system was employed, an inter-coder reliability test was not deemed to be necessary. Instead, another type of reliability testing, ‘stability testing’ (Neuman, 2003), was considered. Stability testing is known as a ‘test-retest’ method, a repeated performance over a one-month interval, with minimum average scores of 85% as suggested by Kassarjian (1977). This testing method is effective in overcoming the issue of accessibility of items on the Internet. One month after the date of initial data collection an accessibility check was conducted and all Web pages used in this research were accessible.

The research also considered both face validity and content validity (Stacks and Hocking, 1992). In this regard the most critical issue in this study is the accuracy of translation. A dominant method to improve this validity is called ‘back translation technique’, which involves the use of an independent translator(s) (Brislin, 1980).

The research used an adaptation of Brislin’s (1980) method for checking the accuracy of the translation of 84 Japanese Web pages. This adapted method involved the combined use of an
electronic dictionary, machine-translation software program and a Web-based translating service. This technique seemed complicated but was both time and cost effective. ‘King of Translation’, a machine-translation program, was initially used to translate each Japanese Web page into English. When the program failed to find matched words, the program left those words as Japanese. Words identified in this way were translated individually into English by the use of an electronic dictionary. Then, all the Japanese Web pages were independently translated into English by the use of a Web translation service (provided by Google [http://www.google.com] and Altavista [http://babelfish.altavista.com]). A comparison between the use of ‘Internet King of Translation’ [IBM Japan] and the Web translation services was satisfactory, except for some industry-specific terminologies. An independent translator, who participated in this study voluntarily, confirmed those terminologies and the accuracy of the machine translation. In terms of manifest coding, the validity check was fully satisfied.

Inter-coder validity in grouping categories was also considered. To increase the quality of this validity, coders who are unaware of the study’s purpose can be voluntarily nominated and trained to grasp the operational definitions of all the variables (Kassarjian, 1977). Two researchers again put measured components into categories for this study. All coders, including the principal researcher, agreed to the use of 38 words. Then, each of three coders separately placed and assigned those words into six categories. As all coders agreed with the allocation of 38 words, this validity check was fully satisfied.

As outlined above Leximancer data mining software extracted the main concepts contained within data, counted the frequency of each concept (words) and displayed the result in tabular format (Smith, 2004). As thematic content analysis requires knowledge of the frequency distribution to analyse the major theme embedded within collected data, only descriptive statistics are needed. SPSS software was employed to provide a cross-tabulation analysis of the relationships between specified variables. Pearson’s chi-square statistic was used to determine the significance of the analysis. All variables used in this analysis are non-parametric (categorical) and the tests for these variables have only general assumptions: (1) random sampling; (2) similar shape and variability across distributions; and (3) independence (Francis, 2001). The use of Pearson’s chi-square statistic also has to meet the assumption that less than 20% of the cells have an expected count of less than five (Francis, 2001). However, any value, including zero, is acceptable for observed frequencies (Coakes and Steed, 2001).

**Data analysis**

*General definition-related content (GENERAL)* – for the 5S concept vary substantially across countries and country differences can be obscured. Table 4 shows the summary of the chi-square tests in the general definition-related content. In comparison to Japan, the UK and USA Web pages used ‘organisation’ more frequently. Also, Japanese Web pages employed ‘order’ and ‘cleaning’ more frequently than the UK and USA. The UK Web pages used ‘standard’ more than the USA and Japan. A significant difference in the use of ‘training’ did not appear among the three countries. The use of four out of the five conceptual words was significantly different.
Table 4. General definition-related content by country

<table>
<thead>
<tr>
<th>Measure</th>
<th>USA (Count (%))</th>
<th>UK (Count (%))</th>
<th>JP (Count (%))</th>
<th>Chi-square test (N = 3666)</th>
<th>$\chi^2$ (df=2)</th>
<th>$\rho$</th>
</tr>
</thead>
<tbody>
<tr>
<td>organisation</td>
<td>95 (7.0)</td>
<td>56 (4.4)</td>
<td>10 (1.0)</td>
<td>51.373</td>
<td>&lt;.001*</td>
<td></td>
</tr>
<tr>
<td>order</td>
<td>41 (3.0)</td>
<td>46 (3.6)</td>
<td>96 (9.2)</td>
<td>55.192</td>
<td>&lt;.001*</td>
<td></td>
</tr>
<tr>
<td>cleaning</td>
<td>84 (6.2)</td>
<td>72 (5.7)</td>
<td>153 (14.7)</td>
<td>74.017</td>
<td>&lt;.001*</td>
<td></td>
</tr>
<tr>
<td>standard</td>
<td>33 (2.4)</td>
<td>64 (5.0)</td>
<td>34 (3.3)</td>
<td>13.342</td>
<td>&lt;.001*</td>
<td></td>
</tr>
<tr>
<td>training</td>
<td>61 (4.5)</td>
<td>47 (3.7)</td>
<td>60 (5.8)</td>
<td>5.555</td>
<td>=.062</td>
<td></td>
</tr>
</tbody>
</table>

Notes: 0 cells (0%) have expected count less than 5; *Significant at the 0.05 level.

Explanation-related words (EXPLANAT) – nouns and adjectives that are used to describe 5S, were all significantly different by country. Table 5 details explanation-related content.

Japanese Web pages employed ‘activity’, ‘method’ and ‘necessary’ more than the UK and USA. None of the Web pages in Japan used ‘tool’. The USA Web pages used ‘process’, ‘system’, ‘tool’ and ‘work’ more than UK and Japan. The USA also employed ‘easy’, followed by Japan and the UK. However, both the USA and Japan used ‘important’ more than the UK. The UK Web pages used ‘method’ less frequently than Japan but more than the USA. The two categories of ‘should’ and ‘continuous’ were more frequently used in the UK and USA than Japan. The words used for explaining 5S were applied differently. For Japanese organisations, 5S was likely to be used as a strategy, whereas in the UK and USA, 5S was understood as a process, system or tool. In relation to the general definition of 5S, it seems that the Japanese see 5S as a platform for change and development with learning aspects. In UK and USA it is seen as an organisational process or tool to achieve change or development. Also, in Japan 5S is not strictly related to work, while the UK and USA regard 5S as being directly associated with work.

Japan tends to perceive 5S as both necessary and important. The USA appears likely to recognise it as important but not necessary. The UK tends to perceive that 5S does not require work commitment, emphasising the word ‘should’, indicating a directive rather than an enabler.

Table 5. Explanation-related content by country

<table>
<thead>
<tr>
<th>Measure</th>
<th>USA (Count (%))</th>
<th>UK (Count (%))</th>
<th>JP (Count (%))</th>
<th>Chi-square test (N = 3666)</th>
<th>$\chi^2$(df=2)</th>
<th>$\rho$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nouns</td>
<td>activity</td>
<td>19 (1.4)</td>
<td>29 (2.3)</td>
<td>120 (11.5)</td>
<td>161.227</td>
<td>&lt;.001*</td>
</tr>
<tr>
<td></td>
<td>method</td>
<td>20 (1.5)</td>
<td>8 (0.6)</td>
<td>100 (9.6)</td>
<td>162.433</td>
<td>&lt;.001*</td>
</tr>
<tr>
<td></td>
<td>process</td>
<td>106 (7.8)</td>
<td>62 (4.9)</td>
<td>20 (1.9)</td>
<td>42.429</td>
<td>&lt;.001*</td>
</tr>
<tr>
<td></td>
<td>system</td>
<td>56 (4.1)</td>
<td>28 (2.2)</td>
<td>32 (3.1)</td>
<td>7.978</td>
<td>=.019*</td>
</tr>
<tr>
<td></td>
<td>tool</td>
<td>63 (4.6)</td>
<td>43 (3.4)</td>
<td>0 (0.0)</td>
<td>47.057</td>
<td>&lt;.001*</td>
</tr>
<tr>
<td></td>
<td>work</td>
<td>211 (15.6)</td>
<td>118 (9.3)</td>
<td>55 (5.3)</td>
<td>69.419</td>
<td>&lt;.001*</td>
</tr>
<tr>
<td>Adjectives</td>
<td>easy</td>
<td>44 (3.2)</td>
<td>8 (0.6)</td>
<td>20 (0.9)</td>
<td>23.320</td>
<td>&lt;.001*</td>
</tr>
<tr>
<td></td>
<td>continuous</td>
<td>20 (1.5)</td>
<td>25 (2.0)</td>
<td>4 (0.4)</td>
<td>11.233</td>
<td>=.004*</td>
</tr>
<tr>
<td></td>
<td>important</td>
<td>35 (2.6)</td>
<td>7 (0.6)</td>
<td>35 (3.4)</td>
<td>24.365</td>
<td>&lt;.001*</td>
</tr>
<tr>
<td></td>
<td>necessary</td>
<td>25 (1.8)</td>
<td>11 (0.9)</td>
<td>71 (6.8)</td>
<td>80.161</td>
<td>&lt;.001*</td>
</tr>
<tr>
<td></td>
<td>should</td>
<td>52 (3.8)</td>
<td>68 (5.4)</td>
<td>9 (0.9)</td>
<td>34.693</td>
<td>&lt;.001*</td>
</tr>
</tbody>
</table>

Notes: 0 cells (0%) have expected count less than 5; *Significant at the 0.05 level.
Benefit-related content (BENEFIT) – more differences than similarities were found. Table 6 shows a summary of the chi-square tests in the benefit-related content.

Japan and the USA employed ‘cost’ and ‘effective’ more than the UK. On the other hand, Japan and the UK used ‘time’ more than the USA. All countries employed ‘efficient’ and ‘productivity’ similarly. The use of three out of five conceptual words was significantly different. There were more differences than similarities in the use of benefit-related words between Japan and the West. Data from all countries suggested that 5S increases productivity and efficiency. Organisations in the UK tend not to consider costs; however the USA and Japan do. In the UK, productivity and efficiency tend not to be directly related to costs. Some studies of 5S in the UK indicated that companies were not familiar with 5S (Ho and Fung, 1994; 1995); also awareness of the usefulness of 5S was limited (Ho and Cicmil, 1996; Ho, Cicmil and Fung, 1995).

Table 6. Benefit-related content by country

<table>
<thead>
<tr>
<th>Measure</th>
<th>USA</th>
<th>UK</th>
<th>JP</th>
<th>( \chi^2 ) (df=2)</th>
<th>( \rho )</th>
</tr>
</thead>
<tbody>
<tr>
<td>costs</td>
<td>33 (2.4)</td>
<td>14 (1.1)</td>
<td>25 (2.4)</td>
<td>7.472</td>
<td>.024*</td>
</tr>
<tr>
<td>effective</td>
<td>34 (2.5)</td>
<td>15 (1.2)</td>
<td>29 (2.8)</td>
<td>8.546</td>
<td>.014*</td>
</tr>
<tr>
<td>efficient</td>
<td>24 (1.8)</td>
<td>18 (1.4)</td>
<td>17 (1.6)</td>
<td>0.520</td>
<td>.771</td>
</tr>
<tr>
<td>productivity</td>
<td>32 (2.4)</td>
<td>30 (2.4)</td>
<td>21 (2.0)</td>
<td>0.407</td>
<td>.816</td>
</tr>
<tr>
<td>time</td>
<td>92 (6.8)</td>
<td>111 (8.7)</td>
<td>125 (12.0)</td>
<td>19.695</td>
<td>&lt;.001*</td>
</tr>
</tbody>
</table>

Notes: 0 cells (0%) have expected count less than 5; *Significant at the 0.05 level.

Target-related content (TARGET) – used on the Web pages was significantly different by country. Table 7 shows a summary of the chi-square tests in the target-related content. There was a significant difference in the use of target-related words between Japan and the UK and USA. Japanese organisations tend to consider that 5S is implemented not only for the benefit of organisations themselves but also for customers. Results showed that Japan used the words ‘company’, ‘customer’, ‘people’ and ‘participation’ more than the UK and USA. In contrast, the West is less likely to consider who benefits from implementing 5S. This also indicates that what people were being trained for is not consistent across the countries, considering the result of general definition-related content. Japan employed ‘company’, ‘customer’ and ‘people’ more than the UK and USA. Japan also used ‘participation’ more frequently than the UK and USA.

Table 7. Target-related content by country

<table>
<thead>
<tr>
<th>Measure</th>
<th>USA</th>
<th>UK</th>
<th>JP</th>
<th>( \chi^2 ) (df=2)</th>
<th>( \rho )</th>
</tr>
</thead>
<tbody>
<tr>
<td>company</td>
<td>40 (3.0)</td>
<td>39 (3.1)</td>
<td>75 (7.2)</td>
<td>32.515</td>
<td>&lt;.001*</td>
</tr>
<tr>
<td>customer</td>
<td>17 (1.3)</td>
<td>15 (1.2)</td>
<td>40 (3.8)</td>
<td>26.593</td>
<td>&lt;.001*</td>
</tr>
<tr>
<td>people</td>
<td>59 (4.4)</td>
<td>50 (3.9)</td>
<td>72 (6.9)</td>
<td>12.308</td>
<td>=.002*</td>
</tr>
<tr>
<td>participation</td>
<td>16 (1.2)</td>
<td>5 (0.4)</td>
<td>22 (2.1)</td>
<td>14.558</td>
<td>&lt;.001*</td>
</tr>
</tbody>
</table>

Notes: 0 (0%) cells have expected count less than 5; *Significant at the 0.05 level.
**Object-related content (OBJECT)** – was significantly different by country. Table 8 shows a summary of the chi-square tests in the object-related content.

Japan employed ‘machine’ more than the UK and USA, while the UK and USA used ‘items’ more frequently. There were some similarities between Japan and the USA; both countries employed ‘information’ and ‘workplace’ more than the UK. All countries used ‘equipment’ similarly. The use of four out of five conceptual words was significantly different.

There were some similarities and differences in the use of object-related words between Japan and the West. All the countries studied agreed that work equipment is more well-organised and clean as a result of 5S implementation. The USA and Japan tend to consider 5S as also dealing with information and the workplace. In Japan, machines are better organised and cleaned using 5S.

The results showed that the UK and USA used ‘item’ more than Japan. This indicates that these countries tend to consider seiri (organisation) to be a very important component in 5S. As seiri is the first component of 5S and involves an act of disposing of unneeded items as a result of organisation activities, the UK and USA are likely to consider that the first S seiri should be emphasised the most, rather than focussing on all items as a holistic strategy.

**Table 8. Object-related content by country**

<table>
<thead>
<tr>
<th>Measure</th>
<th>USA</th>
<th>UK</th>
<th>JP</th>
<th>Chi-square test (N = 3666)</th>
</tr>
</thead>
<tbody>
<tr>
<td>equipment</td>
<td>59 (4.4)</td>
<td>55 (4.3)</td>
<td>36 (3.5)</td>
<td>1.505                 = .471</td>
</tr>
<tr>
<td>information</td>
<td>43 (3.2)</td>
<td>20 (1.6)</td>
<td>35 (3.4)</td>
<td>9.058                 = .011*</td>
</tr>
<tr>
<td>items</td>
<td>73 (5.4)</td>
<td>57 (4.5)</td>
<td>5 (0.5)</td>
<td>43.581                &lt; .001*</td>
</tr>
<tr>
<td>machine</td>
<td>21 (1.5)</td>
<td>25 (2.0)</td>
<td>37 (3.6)</td>
<td>11.417               = .003*</td>
</tr>
<tr>
<td>workplace</td>
<td>142 (10.5)</td>
<td>95 (7.5)</td>
<td>86 (8.3)</td>
<td>7.872                = .020*</td>
</tr>
</tbody>
</table>

Notes: 0 (0%) cells have expected count less than 5; *Significant at the 0.05 level.

**Purpose-related content (PURPOSE)** – there were some similarities and differences between the three countries. Table 9 shows a summary of the chi-square tests in the purpose-related content.

Japanese Web pages employed ‘improvement’, ‘maintenance’, ‘management’ and ‘production’ more than the UK and USA. The term ‘lean’ was not used in Japan. There was no significant difference in the use of ‘quality’ and ‘safety’ between the USA, UK and Japan. In other words, the use of six out of eight conceptual words was significantly different. There were more differences than similarities in the purpose of implementing 5S between Japan and the West. Data from the countries studied agreed that 5S deals with quality and safety. However, Japanese organisations also tend to consider that the purpose of implementing 5S is for the improvement of management and production. In relation to the previous results, the maintenance of machines is likely to be emphasised in Japan. On the other hand, the UK and USA tend to consider the connection between 5S and lean manufacturing.
Table 9. Purpose-related content by country

<table>
<thead>
<tr>
<th>Measure</th>
<th>USA</th>
<th>Count (%)</th>
<th>UK</th>
<th>JP</th>
<th>Chi-square test (N = 3666)</th>
<th>$\chi^2$ (df=2)</th>
<th>$\rho$</th>
</tr>
</thead>
<tbody>
<tr>
<td>improvement</td>
<td>59 (4.4)</td>
<td>72 (5.7)</td>
<td>163 (15.6)</td>
<td>116.240</td>
<td>&lt;.001*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>lean</td>
<td>59 (4.4)</td>
<td>28 (2.2)</td>
<td>0 (0.0)</td>
<td>48.435</td>
<td>&lt;.001*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>maintenance</td>
<td>20 (1.5)</td>
<td>12 (0.9)</td>
<td>31 (3.0)</td>
<td>14.701</td>
<td>&lt;.001*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>management</td>
<td>33 (2.4)</td>
<td>61 (4.8)</td>
<td>128 (12.3)</td>
<td>105.749</td>
<td>&lt;.001*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>manufacturing</td>
<td>64 (4.7)</td>
<td>81 (6.4)</td>
<td>9 (0.9)</td>
<td>44.769</td>
<td>&lt;.001*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>production</td>
<td>32 (2.4)</td>
<td>61 (4.8)</td>
<td>48 (4.6)</td>
<td>12.871</td>
<td>=.002*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>quality</td>
<td>51 (3.8)</td>
<td>57 (4.5)</td>
<td>42 (4.0)</td>
<td>0.899</td>
<td>=.638</td>
<td></td>
<td></td>
</tr>
<tr>
<td>safety</td>
<td>40 (3.0)</td>
<td>28 (2.2)</td>
<td>21 (2.0)</td>
<td>2.583</td>
<td>=.275</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes: 0 (0%) cells have expected count less than 5; *Significant at the 0.05 level.

Discussion

The initial thematic analysis indicated a consensus in the improvement of the work environment utilising the 5S concept across all countries. However, the analysis of the main theme by country showed different outcomes. For example, Japanese Web pages emphasised ‘improvement’ the most. In the UK and USA, 5S was directly related to ‘work’. In other words, the perception of the 5S concept in the West was likely to be limited to a work-related concept, as opposed to the Japanese interpretation that 5S is an application of life wisdom to business situations, which is supported by the literature review. The overall outcome of analysis indicated that some aspects of 5S are significantly different across the countries studied.

Theoretical implications

There are three major theoretical implications suggested by the results of the study. Firstly, organisations in Japan, UK and USA are likely to consider that 5S is directly associated with work and management by improving their workplace through organisation and cleaning activities. More specifically, these organisations tend to look upon the following aspects of 5S in a similar way: (1) training is very important; (2) organising and cleaning equipment in the workplace are accomplished; (3) productivity and efficiency are achieved; and (4) the main purpose of implementing 5S is to achieve better quality and safety. Hence, if training were properly provided, the potential of 5S would also be fully obtained in the West.

Secondly, each component of 5S constituting the Japanese perspective is yet to be fully understood in the UK and USA where more emphasis is placed on seiri (organisation). This may be a result of the source from which Western organisations adopted the concept. Hirano (1995, 1996) suggests that his publications mainly target Western countries. Hirano’s intention in those publications is that seiri (organisation) and seiton (orderliness, in his interpretation) are the most important components of 5S implementation. Other researches (Bullington, 2003; Hamilton and Smith, 1993; Hubbard, 1999; Marcum, 1995) who have cited Hirano’s literature claimed similar outcomes. Ohno (1988) suggested that organisations must consider the actual meaning of seiri (organisation) in regard to 5S; it should not mean moving clutter from one place to another. Similarly, recent studies by Chapman (2005) and Parks (2003) suggested that focussing too
closely on organisation activities, without adequate understanding, may result in unsuccessful implementation. Osada (1991) claimed that as the relationship between the concept of innovation, visual management and _kaizen_ (improvement) is involved in the overall application of 5S, partial understanding or implementation would generate more problematic outcomes.

Thirdly, Japan tends to recognise 5S as a holistic business strategy, whereas the UK and USA are likely to consider 5S as a technique or tool. The results of the present study reflect expectations of 5S in the UK and USA. Regarding 5S as a technique or tool relates to Hirano’s framework that 5S contributes to achieving an organisational goal as well as increasing individual productivity. Organisations with this objective are more likely to expect an affordable investment at the beginning and quick visible results at the end. In fact, 5S does not require any financial outlays, it is easy to understand and the outcome of implementing 5S has immediate effects (Hamilton and Smith, 1993; Nystuen, 2002; Parks, 2003; Steenbergen, 2001).

**Managerial implications**

From a managerial perspective the findings provide a link between theory and the current practice of 5S. Although the results of this study indicate that 5S contributes to an increase in productivity and operational efficiency, 5S has a managerial difference based on country. Therefore, it is suggested that 5S practitioners or trainers should consider the benefits of 5S as a business strategy rather than just simplified applications. In particular, it seems that businesses in the UK and USA have not yet understood the importance of total participation in 5S. The development of an organisational culture aimed at achieving total participation would lead to the successful implementation of 5S.

This research further suggests that a more balanced understanding of both ‘5S as a philosophy or methodology’ and ‘5S as a technique or tool’ can achieve the ultimate goal of 5S, which is a strategic management approach to solving problems in the workplace and processes of organisations. Integrated thinking such as ‘body and mind’ or ‘_dō_ (way: philosophy or methodology) and _jyutsu_ (a technique or tool)’ improves the comprehension not only of the 5S concept but also of other management approaches.

**Conclusion**

Little research has been conducted into the different ways in which 5S has been interpreted and implemented in the UK and USA compared with its original meaning. Investigation of the Web pages of businesses in Japan, the UK and the USA suggests significant differences in the ways in which 5S has been applied. In Japan, 5S has been embraced and implemented as a holistic business strategy. In the UK and USA, 5S has been implemented as a technique or tool.

In Japan businesses emphasise total participation in 5S in the belief that synergies accompany this approach. A holistic approach is evident in the manifest use of 5S as a strategy in the words used by Japanese organisations. Regarding 5S as a strategy engenders notions of self-motivation, completeness and synergy, and is consistent with the approach suggested by Osada (1989, 1991).

Businesses in the UK and USA utilise 5S as a technique or tool. Using 5S in this way will provide some short-term impact but not assist in the development of the organisation. This research suggests that when 5S is used as a technique or tool, it may assist in employee motivation or empowerment. However, it neither influences organisational culture nor does it
achieve synergies. Regarding 5S as a technique or tool is consistent with the approach suggested by Hirano (1995, 1996).

This paper makes a contribution to the literature relating to 5S by clarifying the differences in the ways in which the 5S concept has been interpreted and implemented. Neither the UK nor the USA has embraced the 5S concept in its true sense. Consequently, the benefits of business improvement evident in Japanese business, particularly in the manufacturing sector, have not been realised.

It does appear that using 5S as a strategy, rather than just as a tool, provides a platform for business success. Also, that using 5S just as a tool is a form of organisational myopia that misses the benefits that result from using 5S as a business strategy.
References


