

EMPIRICAL STUDY ON TRANSFERABILITY OF KAIZEN PRACTICES

Phan Chi Anh, Vietnam National University, Hanoi, Vietnam anhpc@vnu.edu.vn
Zeng Jing, Yokohama National University, Japan, zengjing_china@yahoo.com,
Yoshiki Matsui, Yokohama National University, Japan, ymatsui@ynu.ac.jp

ABSTRACT

Kaizen is Japanese business strategy that calls for never ending effort for improvement involving everyone in the organization, from managers to workers. This study examines the influence of the national and organizational culture on the transferability of Kaizen. Statistical techniques are applied to database collected through the questionnaire survey of 238 manufacturing plants in 8 countries. The findings indicate that Kaizen practices are significantly related to low power distance, low uncertainty avoidance, female, and collectivism. In addition, the Kaizen implementation would be more successful in manufacturing plants having low centralization of authority and high cross-functional cooperation.

Keywords: Kaizen Practices, Transferability, National Culture, Organizational Culture, Manufacturing Plants

INTRODUCTION

Kaizen has been regarded as a key element in Japanese management and has been presented as one of the sources of the competitiveness of Japanese manufacturers. Since late of the 1980s, a larger number of studies, which have focused on different Kaizen systems, approaches and practices such as Japanese manufacturing techniques [2] [15], the Toyota production system [9] [12], and lean production [16], have illustrated the effectiveness of Kaizen. Furthermore, studies of kaizen activities in the countries outside Japan, such as US, China, Australia, Sweden and the UK suggest that the concept, approaches, and practices of Kaizen have become routinely accepted throughout the world. However, literature indicates that, as Kaizen is introduced to overseas operations following the Japanese corporate expansion activities, the performance of Kaizen implementation is contextual dependent. Some scholars indicated that Kaizen practices were embedded in the Japanese culture and difficult to transfer abroad while others suggested that only the rational aspects of those practices were transferable overseas. Recent studies show that Kaizen approaches were not easily adopted in abroad due to such environmental factors as the differences in national culture and working ethics. Along with national culture aspects, scholar argued that the adoption of Kaizen highly depends on some specific organizational culture

such as centralization of authority and cross-functional cooperation [13].

This study focuses on the transferability of Kaizen approach abroad by analyzing the relationship between the implementation of Kaizen practices, national culture, and organizational culture to answer the following research questions:

- Is the level of the implementation of Kaizen practices related to the national culture?
- Is the level of the implementation of Kaizen practices related to the organizational culture?

We apply the statistical techniques such as ANOVA, correlation analysis, and regression to database collected through the questionnaire survey of 238 plants in 8 countries after 2003. The findings indicate that the Kaizen implementation is significantly related to low power distance, low uncertainty avoidance, female, and collectivism. In addition, Kaizen practices could be more easily implemented in manufacturing plants having low centralization of authority and high cooperation between managers, workers, customers, and suppliers. We conclude that transferability of Kaizen practices strongly depends on cultural perspectives in both national and organizational level. This paper is presented as follows. The next section summarizes the literature review and framework of this study. The third and fourth sections present the collection of data, analytical process, and the conclusion of this study.

LITERATURE REVIEW AND ANALYTICAL FRAMEWORK

Kaizen is a hot topic in Japanese management studies over the past few decades. Although there are a number of studies on transferability of the Japanese management practices, the concept of Kaizen has been presented in different way. This study adopts the concept of Kaizen from Masaaki Imai who presents Kaizen as pervasive global program, which subsumes to TQM, just-in-time (JIT), and total productive maintenance (TPM) [7] [8]. One of example of Kaizen practices is the employee suggestion that aims at generating many small improvement and morale boosting benefits of positive employee participation. Literature indicates that, a total of 60 to 70 suggestions per employee per year are written down, shared, and implemented in Toyota Motor Company [9].

As recognized as a core of Kaizen, QC Circle activities has been initiated by Union of Japanese Scientists & Engineers (JUSE) in 1962 with the

objective is to develop members' capabilities and achieve self-actualization, make the workplace more pleasant, vital and satisfying, improve the customer satisfaction, and contribute to the society. Recently, QC Circle is expanded to more than 70 countries and regions and gives significantly contribution to the improvement of quality performance over the world [9] [12]. Autonomous maintenance refers to the practice designed to involve operators in maintaining their own equipment. Autonomous maintenance is regarded as a key component of TPM, which has initiated by the Japan Institute of Plant Maintenance (JIPM) in 1971 based on maintenance concepts developed in the United States in the 1950s. TPM Excellent Awards have been awarded to some 2,000 plants since its establishment in 1964. Recently, autonomous maintenance and other TPM techniques are widely expanded to other countries and region such as India, Thailand, and Taiwan.

The studies on transferability of kaizen practices suggest that the implementation of Japanese continuous improvement practices in the oversea plants is situated in cultural and social context [1] [6] [14]. While national culture is defined as collective programming of mind that distinguishes members of one group from another, organizational culture is regarded as the specific collection of values and norms that are shared by people and groups in an organization and that control the way they interact with each other and with stakeholders outside the organization. When Kaizen practices are adopted in an organization, those factors would moderate the teamwork, decision-making process for problem solving, and autonomous activities. To study the transferability of Kaizen, Hofstede's approach is selected in this study because it sharply differentiates between national and organizational cultural components. We would like to examine how such Hofstede's national cultural dimensions as *Power distance*, *Uncertainty avoidance*, *Individualism/collectivism*, *Masculinity/femininity*.

Power distance is the extent to which people believe that the power and status are distributed and unequal distribution is accepted as a proper way for social systems to be organized. Power distance influences the amount of formal hierarchy, the degree of centralization and the amount of participation in decision making in organizations. The plants that are located in high power distance countries tend to be more centralized and employees participate less in decision making. Implementation of such Kaizen practices as group problem solving or autonomous activities requires empowerment and participative decision making, which mirrors low power distance.

Uncertainty avoidance is the degree to which people within a culture are made uncomfortable by situations they perceive to be unstructured, unclear or unpredictable [5] [6]. In organizations, clarity of plans, policies, procedures and systems helps to avoid uncertainty. Kaizen practices emphasizes on the improvement of processes through scientist improvement methods and statistical process control. This relates to the cultures with high uncertainty avoidance, which greater emphasizes on procedure and routines.

Individualism/collectivism describes the degree to which people are oriented towards acting as individuals versus acting as part of a group [5] [6]. Literature on Kaizen studies indicated that the implementation of Kaizen requires cooperation, teamwork, and joint decision-making.

Masculinity/femininity describes the extent to which aggressiveness and success are valued, versus concern for relationships [5] [6].

As indicated in the literature, the Japanese culture made possible a commitment to quality throughout the ranks as had existed in no other country before [5]. According to Hofstede, Japanese culture is characterized by long-term orientation (LTO=80), high uncertainty avoidance (UAI=92), moderate power distance (PD= 54), moderate individualism (IDV=46), and strong masculinity (MAS=95). These characteristics allow the Japanese to learn and widely implement the Western quality management techniques in manufacturing companies and achieve high performance.

We would like to examine that whether Kaizen practices can be adopted in other environment rather than Japan.

Three typical Kaizen practices are used in this study as follows

- Small Group Problem Solving: plants use the small group/team to solve the quality problems
- Employee's Suggestion: plants implement the employee suggestion and give feedback to the employees
- Autonomous Maintenance: the operators rather than the maintenance staff to daily inspect and monitor the equipment performance

Along with national culture, we focused on three different aspects organizational culture as follows.

- Centralization of Authority: degree of freedom for an individual in the organization
- Cooperation: cooperation between managers, workers, customers, and suppliers
- Process Emphasis: plants focus on process improvement.

Table 1: Hofstede five national culture dimensions

Country	Power Distance (PDI)	Individualism (IDV)	Masculinity (MAS)	Uncertainty Avoidance(UAI)	Long-term Orientation (LTO)
South Korea	60	18	39	85	75
Japan	54	46	95	92	80
Italy	50	76	70	75	
United States	40	91	62	46	29
Germany	35	67	66	65	31
Austria	11	55	79	70	
Finland	33	63	26	59	
Sweden	31	71	5	29	33

Based on literatures, we establish two hypotheses on the relationship between Kaizen practices and Hofstede's national culture and organizational culture perspectives. The first hypothesis on relationship of national culture and Kaizen practices is presented as follows.

Hypothesis 1: Scores on the Kaizen constructs will be:

- Lower in countries with high power distance cultures.
- Low in countries with higher levels of uncertainty avoidance.
- Lower in countries with higher levels of individualism.
- Lower in countries with more masculine cultures

We assume that three aspects of organizational cultures are strongly related with the transformation of Kaizen practices. The implementation of Kaizen practices requires low centralization of authority and cooperation between managers, workers, customers, and suppliers to improve products and processes. In addition, Kaizen practices would be easily adopted in the plants that more emphasize on processes rather than products. The second hypothesis on the relationship of organizational culture and Kaizen practices is presented as follows.

Hypothesis 2: Scores on the Kaizen constructs will be:

- Lower in plants with high centralization of authority.
- Higher in plants with higher levels of cooperation.
- Higher in plants with more process emphasis.

The next section will present the process of hypotheses testing

DATA COLLECTION

This study acquires data collected from 238 manufacturing plants in 8 countries: Austria (21), Finland (30), Germany (41), Italy (27), Japan (35), Korea (31), Sweden (24), and the United States (29) from questionnaire survey after 2003. Those plants belong to three industries: electronic (79), machinery (78), transportation (81). Questionnaire on Kaizen practices and organizational culture are evaluated by eight positions from Direct Labor to Plant Manager on a seven-point Likert scale (1 = strongly disagree, 4 = neither agree nor disagree, 7 = strongly agree).

- Small Group Problem Solving is evaluated by Direct Labor, Quality Manager, and Supervisor
- Employee Suggestion is evaluated by Direct Labor, Process Engineer, and Supervisor
- Autonomous Maintenance is evaluated by Process Engineer, Supervisor, and Plant Superintendent
- Centralization of Authorities is evaluated by Direct Labor, Human Resource, and Supervisor
- Cooperation is evaluated by Inventory Manager, Plant Manager and Supervisor
- Process Emphasis is evaluated by Process Engineer, Supervisor, and Plant Superintendent

The first step of analytical process is the analysis of reliability and validity which are performed to evaluate the measurement properties of the individual scales. Reliability is an estimate of measurement consistency. In this study, Cronbach's alpha coefficient is calculated for each scale to

evaluate the reliability. Table 2 shows the alpha values for all scales exceeded the minimum acceptable alpha value of 0.60 (Nunnally, 1967). Most of the scales have alpha value above 0.70 indicating that the scales are internally consistent. Next, the validity of measurement scales was tested against content and construct.

Content validity: An extensive review about empirical literature on quality management and organization performance was conducted to ensure content validity. This study continues the works of Schroeder and Flynn (2001); that developed and tested a set of measurement scales of management practices in the framework of HPM Project.

Construct validity: Construct validity is tested to ensure that in a scale, all question items measure the same construct. Within scale factor analysis was conducted with the three criteria as follows: (a) unidimensionality, (b) a minimum eigenvalue of 1, (c) item factor loadings should be greater than 0.40. The results show that all scales had good construct validity. Table 2 shows that the eigenvalue of the first factor is all more than 1.90 for each scale. The factor loading for each item (shown in appendix) is more than 0.40, mostly ranged between 0.70 and 0.90 indicating the high validity of the measurement scales.

Table2. Measurement Test

Measurement construct	Cronbach Alpha	Eigenvalue (% variance)	Min.	Max.	Mean	Std.
Small Group Problem Solving	0.82	3.21 (53)	3.39	6.83	5.05	0.64
Employee Suggestion	0.83	3.03 (61)	3.47	6.80	5.18	0.64
Autonomous Maintenance	0.70	2.13 (53)	3.05	6.58	5.09	0.62
Centralization of Authority	0.76	2.02 (67)	1.33	5.48	3.49	0.86
Cooperation	0.75	2.67 (45)	4.42	6.87	5.74	0.42
Process Emphasis	0.60	1.70 (57)	3.33	6.33	4.50	0.56

HYPOTHESIS TESTING

Analytical process starts with the analysis of country-effect on Kaizen practices and organizational culture as shown in Table 3. Tukey pair-wise comparison tests of mean differences are conducted to identify how of Kaizen practices and organizational culture aspects differed between each pair of countries.

We find the slight differences between the countries Small Group Problem Solving (Finish plants versus US and Italian plants) , Employee’s Suggestion (Finish plants versus Italian plants), and Autonomous Maintenance (Finish plants versus US and Japanese plants, US plants versus Korean and Austrian plants, and Japanese plants versus Korean and Austrian plants).

We observe the large difference on organizational culture aspects between the countries, especially on Centralization of Authority. Swedish and Finish plants attribute higher degree of authority decentralization than other countries. An interest finding is Japanese plants give less focus on process than other countries.

Next, correlation analysis is conducted to find out the correlation between Kaizen practices, national culture dimensions, and organizational cultures aspects as shown in Table 4. The link between

Kaizen practices and organization culture aspects appear tight.

We find that every Kaizen practices are negatively related with Centralization of Authority and positively related with Cooperation. Autonomous Maintenance is positively related to Process Emphasis.

The link between Kaizen practices and Hofstede’s national culture dimension appear weak.

- Small Group Problem Solving is negatively related to scores on Power Distance and Uncertainty
- Employee Suggestion is negatively related to score on Masculinity.
- Process Emphasis is negatively related to scores on Power Distance, Individualism, and Masculinity.

To test the hypotheses formally, stepwise regression is conducted to find out the impact of the national culture dimensions and organizational cultures aspects on Kaizen practices as shown in Table 5 which presents the best models with highest explanation power for three Kaizen practices.

Table 3: Degrees of Kaizen Practices and Organizational Cultures Aspects Classified by Country

	AUT	FIN	GER	ITA	JPN	KOR	SWE	US	F test	Sig.	Tukey pair-wise test
Small Group Problem Solving	5.35	4.88	4.96	4.87	4.92	5.02	5.22	5.33	3.06	0.00	FIN vs. (US and AUT)
Employee's Suggestion	5.27	5.48	5.13	4.78	5.18	5.22	5.27	5.10	2.34	0.03	FIN vs. ITA
Autonomous Maintenance	5.37	5.44	5.08	4.95	4.81	5.32	5.01	4.86	4.49	0.00	FIN vs. (US and JPN), US vs. (KOR and AUT), JPN vs. (KOR and AUT)
Centralization of Authority	3.18	2.43	3.23	4.31	4.04	4.23	2.85	3.47	32.30	0.00	FIN vs. (US, JPN, GER, KOR, ITA, and AUT), US vs. (JPN, SWE, KOR, and ITA), JPN vs. (GER, SWE, and KOR), GER vs. (SWE, KOR, and ITA), SWE vs. (KOR and ITA), KOR vs. AUT, and ITA vs. AUT
Cooperation	6.00	5.77	5.91	5.68	5.60	5.64	5.67	5.71	3.22	0.00	JPN vs. (GER and AUT), KOR vs. AUT
Process Emphasis	4.59	4.92	4.63	4.44	3.96	4.51	4.52	4.50	10.56	0.00	FIN vs. (US, JPN, GER, SWE, KOR, and ITA), US vs. JPN, JPN vs. (GER, SWE, KOR, ITA, and AUT)

Table 4: Correlation Analysis

	Small Group Problem Solving	Employee Suggestion	Autonomous Maintenance	Power Distance	Individualism	Masculinity	Uncertainty Avoidance	Centralization of Authority	Cooperation
Employee Suggestion	0.628 (0.000)	1.000							
Autonomous Maintenance	0.320 (0.000)	0.412 (0.000)	1.000						
Power Distance	-0.145 (0.026)	-0.102 (0.116)	-0.129 (0.047)	1.000					
Individualism	0.079 (0.224)	-0.087 (0.180)	-0.149 (0.022)	-0.448 (0.000)	1.000				
Masculinity	-0.029 (0.656)	-0.133 (0.040)	-0.172 (0.008)	0.155 (0.017)	-0.010 (0.881)	1.000			
Uncertainty Avoidance	-0.149 (0.021)	-0.057 (0.384)	0.001 (0.990)	0.564 (0.000)	-0.680 (0.000)	0.653 (0.000)	1.000		
Centralization of Authority	-0.232 (0.000)	-0.368 (0.000)	-0.226 (0.000)	0.560 (0.000)	-0.283 (0.000)	0.392 (0.000)	0.504 (0.000)	1.000	
Cooperation	0.519 (0.000)	0.382 (0.000)	0.454 (0.000)	-0.242 (0.000)	0.075 (0.250)	0.037 (0.566)	-0.058 (0.376)	-0.302 (0.000)	1.000
Process Emphasis	0.093 (0.152)	0.075 (0.251)	0.224 (0.000)	-0.252 (0.000)	0.109 (0.093)	-0.299 (0.000)	-0.244 (0.000)	-0.226 (0.000)	0.125 (0.055)

We find that

- Cooperation and Uncertainty Avoidance significantly explain 28% of variability of Small Group Problem Solving
- Cooperation and Centralization of Authority significantly explain 25% of variability of Employee Suggestion
- Cooperation, Masculinity, Individualism, and Process Emphasis significantly explain 29% of variability of Autonomous Maintenance

The results of our analysis can be summarized as follows.

- Small Group Problem Solving significantly associates with Power Distance (-), Uncertainty Avoidance (-), Centralization of Authority, and Cooperation.
- Employee Suggestion significantly associates with Masculinity (-), Centralization of Authority, and Cooperation.
- Autonomous Maintenance significantly associates with Individualism (-), Masculinity (-), Centralization of Authority, Cooperation, and Process Emphasis

Table 5: Regression on Kaizen Practices

Dependent Variables	R ²	Adjusted R ²	F	Sig.	Independent Variables	Beta	T value	Sig.
Small Group Problem Solving	0.284	0.278	46.517	.000 ^b	(Constant)	0.795	1.551	0.122
					Cooperation	0.512	9.258	0.000
					Uncertainty Avoidance	-0.120	-2.168	0.031
Employee Suggestion	0.255	0.245	26.553	.000 ^c	(Constant)	3.789	6.232	0.000
					Cooperation	0.297	5.031	0.000
					Centralization of Authority	-0.337	5.497	0.000
Autonomous Maintenance	0.295	0.283	27.70	.000	(Constant)	1.010	1.882	0.061
					Cooperation	0.457	8.200	0.000
					Masculinity	-0.148	-2.557	0.011
					Individualism	-0.200	-3.614	0.000
					Process Emphasis	0.145	2.480	0.014

CONCLUSIONS

National culture and organizational culture provide fruitful area for research on quality management. The first finding of this study is the influence of national culture on transformation of Kaizen practices. We find that the implementation of Kaizen practices associates with low power distance, female, and collectivism aspects. This finding is in line with previous quality management studies [1] [3] [9] [12]. Beside of this, our analysis proved that implementation of Kaizen practices associates with culture in low uncertainty avoidance. This can be explained that the cultures in low degree of uncertainty avoidance are open for new things and changes. Low uncertainty avoidance countries are more likely to stimulate innovations and emphasize new ideas. They are more flexible and more acting than reacting on changes occurring inside and outside of business.

This finding suggests that Kaizen practices can be transferable to non-Japanese cultural environment. In addition to the national culture, our study indicates that the organization culture significantly influences the adoption of Kaizen practices. The biggest barrier to Kaizen success is the centralization of authority and lack of cross-functional cooperation. In order to increase the chances for successful Kaizen adoption, two aspects of organizational culture are required: power delegation and empowerment, and high cooperation between managers, workers, customers, and suppliers. The great influence of the national culture and organizational culture on Kaizen practices indicates that there is not a universal model for successful Kaizen transformation. Kaizen practices should be adapted to the local culture; in order have the highest probability of success.

REFERENCES

- [1] Aoki, K. (2008) 'Transferring Japanese kaizen activities to overseas plant in China', *International Journal of Operations & Production Management*, Vol. 28, No.6, pp. 518-539.
- [2] Brunet, A. P., & New, S. (2003) 'Kaizen in Japan: an empirical study', *International Journal of Operations & Production Management*, Vol.23, No.11, pp. 1426-1446.
- [3] Flynn, B. B. & Saladin, B. (2006) 'Relevance of Baldrige constructs in an international context: A study of national culture', *Journal of Operations Management*, Vol. 24, No.2, pp. 583-603.
- [4] Hofstede, G. (1984) *Culture's Consequences: International Differences in Work-Related Values*, Sage Publications, London, UK.
- [5] Hofstede, G. (2001) *Culture's Consequences: Comparing Values, Behaviors, Institutions and Organizations Across Countries*, Sage Publications, Thousand Oaks, CA, US.
- [6] Hong, J.F.L., Easterby-Smith, M. and Snell, R.S. (2006) 'Transferring organizational learning systems to Japanese subsidiaries in China', *Journal of Management Studies*, Vol.43, No.5, 1027-58.
- [7] Imai, M. (1990) *Kaizen: The Key to Japan's Competitive Success*, McGraw-Hill, New York, NY, US.
- [8] Imai, M. (1997) *Gemba Kaizen: A Commonsense, Low-cost Approach to Management*, McGraw-Hill, New York, NY, US.
- [9] Liker, J. K. (2004) *The Toyota Way: 14 Management Principles from the World's Greatest Manufacturer*, McGraw-Hill, New York, NY, US.
- [10] Lillrank, P. (1995) 'The Transfer of Management Innovations from Japan', *Organization Studies*, Vol. 16, No.6, pp.971-989.
- [11] Naor, M., Linderman, K. and Schroeder, R. (2010) 'The globalization of operations in eastern and western countries: unpacking the relationship between national and organizational culture and its impact on manufacturing performance', *Journal of Operations Management*, Vol. 28, No.3, pp. 194-205.
- [12] Ohno, T. (1988) *Toyota Production System: Beyond Large-Scale Production*, Productivity Press, New York, NY, US.
- [13] Recht, R. & Wilderom, C. (1998) 'Kaizen and culture: on the transferability of Japanese suggestion systems', *International Business Review*, Vol.7, No.1, pp. 7-22.
- [14] Saka, A (2004) 'The Cross-National Diffusion of Work Systems: Translation of Japanese Operations in the UK', *Organization Studies*, Vol. 25, No.2, pp. 209-228.
- [15] Schonberger, R.J. (1986) *World Class Manufacturing: The Lessons of Simplicity Applied*, Free Press, New York, NY, US
- [16] Womack, J.P., Jones, D.T. and Roos, D. (1990) *The Machine that Changed the World*, Rawson

Associates, New York, NY, US.

APPENDIX

Centralization of Authority

1. Even small matters have to be referred to someone higher up for a final answer.
2. This plant is a good place for a person who likes to make his own decisions.
3. Any decision I make has to have my boss's approval.
4. There can be little action taken here until a supervisor approves a decision.

Cooperation

1. We work as a partner with our suppliers, rather than having an adversarial relationship.
2. We encourage employees to work together to achieve common goals, rather than encourage competition among individuals.
3. We work as a partner with our customers.
4. We believe that cooperative relationships will lead to better performance than adversarial relationships.
5. We believe that the need for cooperative relationships extends to both employees and external partners.
6. We believe than an organization should work as a partner with its surrounding community.
7. Sometimes we encourage competition among employees, in order to improve their performance.

Process Emphasis

1. We believe that the process, rather than the people performing the process, is the source of most errors.
2. In our view, most problems result from the production system, rather than from individual employees.
3. In our view, the process is the entity that should be managed.
4. We believe that process improvements will result in greater quality improvement than human resource initiatives.
5. We think that most of our quality problems result from a lack of motivation.
6. Many of our quality problems result from employees who just don't try very hard.

Small Group Problem Solving

1. During problem solving sessions, we make an effort to get all team members' opinions and ideas before making a decision.
2. Our plant forms teams to solve problems.
3. In the past three years, many problems have been solved through small group

sessions.

4. Problem solving teams have helped improve manufacturing processes at this plant.
5. Employee teams are encouraged to try to solve their own problems, as much as possible.
6. We don't use problem solving teams much, in this plant.

Employee Suggestions

1. Management takes all product and process improvement suggestions seriously.
2. We are encouraged to make suggestions for improving performance at this plant.
3. Management tells us why our suggestions are implemented or not used.
4. Many useful suggestions are implemented at this plant.
5. My suggestions are never taken seriously

around here.

Autonomous Maintenance

1. Cleaning of equipment by operators is critical to its performance.
2. Operators understand the cause and effect of equipment deterioration.
3. Basic cleaning and lubrication of equipment is done by operators.
4. Production leaders, rather than operators, inspect and monitor equipment performance.
5. Operators inspect and monitor the performance of their own equipment.
6. Operators are able to detect and treat abnormal operating conditions of their equipment.