

The Impact of Employee-involved Physical Workplace on Self-disciplinary Behavior in the China context

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Abstract

This study investigates 5S, a well-known physical workplace improvement framework developed in Japan, aiming at regulating the physical workplace by the support of employees' self-disciplinary behavior. Through the lens of planned organizational change, we suggest that in the China context, employees' self-disciplinary behavior cannot be presumed upon the 5S implementation as is assumed in Japan. Instead, we argue that the behavior is fostered by the intervention activities when employees are involved in improving the physical workplace. Furthermore, drawing upon a psychological contract perspective, we argue that the extent of behavioral change also depends on the extent to which the improved workplace matches employees' expectation. When expectation is met, employees will perceive the workplace as efficient and comfortable, and they will increase loyalty to the organization and enhance self-disciplinary behavior at work. Based on a sample of 418 front-line employees in a large-sized manufacturing firm in China, we find strong support to our model.

Keywords: planned organizational change, 5S, physical workplace, psychological contract, organizational loyalty

Introduction

Altering the physical workplace is a potent lever for inducing change in organizational members' behavior. Numerous studies in the area of management and organizational behavior have shown that physical workplace does not only influence employees' psychological state (e.g., [1][2][3][4]) but also their working behavior (e.g., [5][6][7][8]).

Even though the physical workplace has long been considered playing an important role in employees' behavior, we can hardly find any large scale empirical studies of operations management (OM) grounding in solid theoretical foundation. In view of the existing literature about planned organizational change programs such as TQM, ISO9000, and Six Sigma, though their impact on employees' behavior is implicit, the major pivot of behavioral change has nevertheless been hinged upon the optimization of organizational systems and technologies, and the role of physical workplace has often been overlooked. Furthermore, the literature is particularly meager in providing theoretical explanations to the behavioral change in which employees are involved in altering the physical workplace. Without seizing the details of changing physical workplace, organizations may run the risk of choosing a set of cost ineffective changing intervention activities that the effects of improving employees' behavior are in doubt.

In this study, therefore, we aim at addressing the aforementioned missing link. We scrutinize the Japanese way of intervention, 5S, to improve the physical workplace with reference to the planned organizational change framework of [9], which highlights that the physical work setting (one of the work setting elements) mediates the effect of intervention activity on individual behavior. In addition, we develop and validate a theoretical model describing how the intervention activities in 5S program determine the

employees' behavior via the mechanism developed from the lens of psychological contract.

The remaining part of this paper is arranged as follows. First, we will establish a hypothesized structural model based on the perspective of planned organizational change and psychological contract. We next proceed to the development and validation of measurement scale, and the test of our theoretical model. Finally, we discuss and conclude our findings and the implications to academics and practitioners.

Theoretical Background and Hypothesis Establishment

The Physical Workplace

Our theoretical model is built upon the premise that physical workplace affects employees' behavior. According to [10, pp.181-182] “[p]hysical environment entails all the material objects and stimuli (e.g., buildings, furnishings, equipment, and ambient conditions such as lighting and air quality) as well as the arrangement of those objects and stimuli (e.g., open space office plans and flexible team work spaces) that people encounter and interact with in organizational life.”

The notion that the physical workplace affects the people who live in the workplace is rooted in the social cognitive models of behavior [11][12], which perceive an individual's environment as an important source of information about appropriate behaviors [9]. As [5] note, it is an essential means to “support, constrain, symbolize, and confer meaning upon various aspects of social relationships” [13, pp.491]. Previous empirical research has shown that physical environment is closely related to the employees' performance and morale (e.g.,[1][14][15][16][3][17][4][18]). It is not only

influential to employees but is also critical in affecting the perception of users and customers (e.g., [19]). It is also associated with the improvement of organizational outcomes (e.g., [8][20]). If it is not designed properly, employees will react negatively [21]. In previous studies, the effect is explained mainly from the lens of social interference and overstimulation proposed by [21] that individuals react negatively to dense work area which will induce the unwanted, unpredictable and uncontrollable interactions in the work place, thus trigger the psychological state of stimulus overload and subsequent negative behavioral and affective responses [3][4].

Planned Organizational Change

While the effect of a physical workplace on employees' behavior has drawn much attention from the management academics, little attention is drawn to the importance of the intervention activities in establishing the physical workplace and their effect on employees' behavior. The importance of investigating these activities lies in the fact that *“change interventions can be perceived as the activity through which changes in elements of an organizational work setting are implemented.”* and *“behavior change must be the primary focus of intervention activity since it is necessary in order for organizational outcomes to improve.”* [9, pp.620] According to their framework [9], the physical workplace plays a role of mediator in transmitting the effect of intervention activities to the employees' behavior. Therefore, inferior intervention may undermine the sustainability of the behavioral change that the physical workplace has contributed to. This perspective is echoed by the literature of participative management which contends that employees' involvement, as a kind of intervention activity, in making suggestions

and executing improvement, is closely associated with committed employees and organizational success (e.g.,[22][23][24][25]).

Psychological Contract

Different from the traditional thought that explains the relationship of the physical workplace and employees' behavior based on a social inference perspective, the theory of psychological contract contends that it is the fulfillment of employees' expectation about the physical workplace that determines the behavior. The theory of psychological contract states that *"employees hold beliefs regarding the terms of the informal exchange agreement between themselves and their organizations"* [26, pp.897] and that the contract is *"an implicit agreement, negotiated between the employee and the employing firm (usually at the employee's time of entry), and it is a recognition of mutual obligations to be fulfilled by both parties in the course of their association"* [27, pp.109]. When contract exists, expectation exists [28]. For instance, *"management is expected to treat employees justly, provide acceptable working conditions, clearly communicate what is a fair day's work, and give feedback on how well the employee is doing"* [29, pp.228].

The notion of psychological contract has been used to explain many organizational phenomena. For instance, increasing studies have revealed that the violation of psychological contract is negatively associated with employee loyalty and commitment [30][31][26], and is positively related to counterproductive work behaviors [32][33][34]. On the contrary, the fulfillment of psychological contract is positively linked to organizational commitment and behaviors at work [35], and contributes to employees' organization citizen behavior [36][37].

5S - the Japanese Physical Workplace Improvement practices

Traditional view usually positions 5S as a set of practices for good housekeeping (e.g., [38]). According to the view, organizations without 5S will suffer from inefficiency and results in the accumulation of *muda*, the waste. Even worse, they will run the risk of low morale, poor quality, high costs and incapable of meeting the delivery requirements [38][39]. Critical to the success of 5S lies in the support of their behavior because “*if a company does not have the discipline to operate a clean, orderly, and tidy facility, it is not capable of enduring the rigor of continuous improvement – something that requires much discipline.*” [40, pp.97). However, people in organizations tend to engage with non-value-added activities, which are *muda* virtually [38]. This may be explained from the perspective of organizational behavior that people are creatures of habit and rely on programmed responses to deal with their complex life. To this end, when confronted with change, people tend to respond in their accustomed ways which then become the sources of resistance [29]. Cognitive theory also supports that employees tend to uphold their beliefs about the organization’s identity which constrain their understanding and create cognitive opposition to the change [41].

5S stands for five Japanese words: *Seiri* entails classifying items in the workplace into two categories: necessary and unnecessary [38] and then organizing the workplace by distinguishing and removing the unnecessary *muda* through stratification management [39]. *Seiton* means neatness. It is a way of eliminating searches after the unwanted *mudas* have been removed via *Seiri*. In *Seiton*, employees assign a unique place to store the necessities such that the stored things should be easily accessed [38] and thus search time

is reduced; *Seiso* means cleaning. It emphasizes on cleaning as inspection, on cleanliness, and on creating an impeccable workplace [39]. In other words, this set of activities is to maintain the physical workplace environment at a tiptop condition through persistent cleaning and inspection. Because ‘*Seiso*’ must involve frontline employees, it also provides a great deal of learning opportunity to them [39]. To ensure that the improved physical workplace via the three S’s is sustainable overtime and to make abnormalities obvious, *Seiketsu* aims at standardizing the physical workplace via setting up inspection devices based on visual management principles [42][39]. Finally, *Shitsuke* means self-discipline. To this end, the five S’s can be further divided into two categories. The first four S’s are the employee-involved workplace intervention activities for workplace improvement aiming at improving a well-received physical workplace while the last S is the employees’ self-disciplinary behavior which may be the antecedent or the outcome of the four S’s but is definitely not the intervention itself.

Hypothesis Development

The original concept of 5S has both socio-historical and philosophical roots [43][44]. 5S reflects the living pattern of Japanese, it is the way of life [43]. Therefore, Japanese take 5S for granted and it is the habitual behavior manifested in their daily life. In fact, many Japanese have been educated and trained in 5S practices since teenage. These practices have been internalized and have become the natural behavior of Japanese. These practices are further institutionalized in the organizations when the Japanese grow up and commence their careers in various businesses. To maintain the condition of 4S’s, employees must follow all the rules and regulations that are laid upon by the

organizations related to the physical workplace [42]. In other words, the continuity of the 4S's is hinged upon the prior existence of the last S, the employees' *Shitsuke*.

However, it may be a different scenario to the Chinese companies when implementing 5S. These companies who adopt the implementation strategy mainly to maintain the Japanese practices but not to modify the features of their workplace environment including the employees' work attitudes and behaviors [45]. One of the authors of this paper has come across a global electrical appliance manufacturer in Zhuhai (China) who had spent a huge amount of resources to drive the implementation of 5S. This organization adopted a top-down approach to execute 5S, but the front-line employees could hardly be involved in designing their workplace and planning the execution of 5S. Upon the launching of 5S, the senior management expected a quick fix of existing housekeeping problem and assumed that the frontline people had *Shitsuke* already but without noticing that *Shitsuke* had not been their people's habit yet. As a result, the significant improvement of the workplace after a three month's effort went down drain because of the negligence.

The example suggests that the way to implement 5S in the Chinese companies may be different from that of their Japanese counterparts. The main difference may lie in the relationship of the five S's. While in Japan, *Shitsuke* is the cornerstone of other four S's, it is, on the contrary, the outcome of the other four S's in China. In China, when employees practice the previous 4S's continuously, they will acquire the habit of making these activities as part of their daily life (cf., [38]). Such phenomenon is in congruent with the perspective of participative management (e.g., [46][47][25][23]) that employee-involved improvement not only contributes to the improvement of

organizational performance, but also leads to the employee's behavioral change. Therefore, we come up with following hypotheses by first proposing a construct, Workplace Improvement with the first four S's as dimensions:

H₁: the intervention, Workplace Improvement, is magnified via the dimensions of *Seiri, Seiton, Seiso* and *Seiketsu*

H₂: the implementation of Workplace Improvement directly and positively influences *Shitsuke*

While Workplace Improvement is deemed to directly affect *Shitsuke* in accordance with [38], the framework of the dynamics of planned organizational change [9] informs us that intervention will also indirectly affect employees' behavior via the physical workplace. Furthermore, from the perspective of psychological contract (e.g., [30][31][26]), it is very likely that employees are expecting a physical workplace that is livable and assuming it is the organization's responsibility to provide such a physical workplace. Thinking along this line, we suggest that the intervention Workplace Improvement will cultivate a comfortable physical workplace that employees perceive as satisfactory. Only when the workplace fulfills both the employees' physical and psychological expectation can any of their significant behavioral change be observed. This satisfaction makes behavioral change likely. We thus introduce the construct of Perceived Comfort Workplace to reflect the performance of employees' perceived workplace, and propose the following

H₃: a Perceived Comfort Workplace mediates the effect of Workplace Improvement on *Shitsuke*

If the workplace conditions eventually satisfy or exceed their expectation after the

Workplace Improvement activities, the employees will perceive that the organization is treating them well and thus will increase their loyalty towards the organization. Eventually, employees will not only increase their loyalty towards the organization, but will also be more willing to change their behavior to adapt to and sustain the workplace conditions at a tiptop level (cf., [28]). Therefore, we have the following hypothesis:

H₄: organizational loyalty mediates the effect of perceived comfort workplace on *Shitsuke*

Measurement Scale Development and Validation

Items generation and data collection

We have developed the measurement scales for 5S based on Osada (1991). There are four items identified for *Seiri*(Sort), four items for *Seiton* (Set-in-order), four items for *Seiso* (Scrub), five items for *Seiketsu* (Standardize) and three items for *Shitsuke* (Self-discipline). Furthermore, *Seiri*, *Seiton*, *Seiso* and *Seiketsu* are the dimensions of Workplace Improvement, hence we define it as a 2nd order construct (cf., [48]).

We have newly developed three items for Perceived Comfort Workplace based on [38] and [39] that a well-established physical workplace should have an effective visual management device in place such that defects can be detected easily. In addition, since the implementation of Workplace Improvement will minimize the potential hazards, the workplace will be safer and more comfort to the employees than before. Finally, the extent of employee satisfaction towards the workplace will be high because it is their involvement to improve the workplace.

We have also adopted the four measurement items of [49]. Finally, we have created 27 measurement items in English. To ensure translation equivalence [50, pp.575], we

have followed [51] to have the English version of the 27 perceptual statements translated into Chinese and translated backward to English. After refining the wordings, we then compile a questionnaire in Chinese and administer it to the 418 front-line workers of a Chinese electrical appliance manufacturer who have started their 5S implementation for three months.

Unidimensionality and Reliability

We have randomly split the 418 responses into 100 calibration and 318 validation samples. The calibration sample goes for Exploratory Factor Analysis (EFA). The result as shown in Appendix I, reveals that all the constructs are unidimensional with statistically significant factor loadings. However, one item has been removed from *Seiri*, *Seiton* and *Seiso* respectively due to its factor loading is less than 0.55 [52]. We also have eliminated two items from *Seiketsu* for the same reason. Furthermore, all the items for *Shitsuke* and Perceived Comfort Workplace have been retained. We have also dropped one more item from the measurement scale of Organization Loyalty [49] because of the low factor loading. We then proceed to the reliability assessment based on Cronbach's α . Appendix I shows that all the subscales possess α exceeding the suggested value of 0.60 [53]. We therefore, confidently conclude that the measurement scales are free from reliability problem. Eventually, we have come up with a 21-item measurement instrument for scale validation.

Convergent and Discriminant Validity

We have validated the measurement scale by applying Confirmatory Factor Analysis (CFA) to the validation sample of 318 responses. According to [54], a measurement scale possesses convergent validity when all the measurement items load onto the

corresponding factor with a statistically-significant manner and when the corresponding factor loading of each measurement item is greater than twice its standard error. Because all factor loadings are statistically significant at $p < 0.001$ and are, at the same time, greater than twice their respective standard errors (results not shown here), we can, therefore, confidently conclude that the measurement scale adopted in this study possess convergent validity.

We have followed [54] procedure to assess discriminate validity by setting the correlation between any two constructs to 1.0 and then performing a χ^2 -difference test between the constrained and unconstrained model. A significant positive χ^2 value indicates that the constrained model has a significantly poorer fitness than the unconstrained model, thereby providing evidence for the distinctiveness of the two constructs. This exercise has been repeated for all possible pairs of constructs. Our result (not shown here) shows that all χ^2 differences between the constrained and unconstrained models are significantly positive at $p < .001$. Therefore, the discriminant validity is statistically confirmed.

Result

We apply CFA to fit the data of 418 responses. The result (not shown here) shows that the second order factor Workplace Improvement fits the data quite well: $\chi^2=91.83$ $df=50$, $\chi^2/df=1.8$, TLI=0.95, CFI=0.96, GFI=0.97, RMSEA=0.045 (0.030, 0.059). Our result further reveals that the path coefficients of the four S's to Workplace Improvement range from 0.70 to 0.97 indicating that Workplace Improvement strongly leads to the four S's. To evaluate how well 'Workplace Improvement' as the second order factor explains a

significant portion of 4S's variation, we follow the procedure of [52] to estimate the extent of variance extracted which is accountable for Workplace improvement. According to [52]), the recommended level of variance extraction should be larger than 50%. Our result shows that the percentage of variance extracted from the four S's account for Workplace Improvement is 95%. Therefore, H₁ is supported.

Figure 1 indicates that our proposed model fits the 418 responses: $\chi^2=357.9$ df=180, $\chi^2/\text{df}=2.0$, TLI=0.90, CFI=0.91, GFI=0.92, RMSEA=0.049 (0.04, 0.056). The result reveals that Workplace Improvement significantly and positively influences *Shitsuke*. Hence, H₂ is supported based on the strong path coefficient: $\gamma=0.686$, $p<0.001$.

---Insert Figure 1 here---

H₃ is rejected because the path coefficient from Perceived Comfort Workplace to *Shitsuke* is insignificant. On the contrary, H₄ is supported. The result as shown in Figure 1 further confirms that both Perceived Comfort workplace and Organizational Commitment significantly mediate the effect of Workplace Improvement on *Shitsuke* though this indirect effect is relatively weak (0.025) in comparing with the direct effect from Workplace Improvement on *Shitsuke* (0.686). It reflects that Workplace improvement directly and indirectly influences *Shitsuke*.

Discussion

This study has made theoretical contributions in several aspects. First, it is the first attempt to empirically clarify the relationship of the five S's with rigor of theory and methodology. We have proposed and validated a theoretical model that is different from the typical Japanese perspective and is missing in the existing literature. Our model is in

congruent with the perspective of [45] that certain adjustment of Japanese manufacturing practices are necessary when they are applied overseas. We suggest therefore that the Chinese organizations should not assume the pre-existence of *Shitsuke* when improving their physical workplaces. On the contrary, they should expect that *Shitsuke* is the outcome of other four S's, the intervention activities under Workplace Improvement. Alternatively put, the intervention activities provide the means for organizations to shape the employees' behavior.

Second, building upon the stream of study which perceives physical workplace as a major driver of behavioral change, this study has extended the research domain by considering the way to change the workplace is a more fundamental driver worthy for attention. Interestingly, our result, as predicted, reveals that for the change of employees' behavior, the intervention does matter, and it even imposes a much stronger impact on the behavior than the physical workplace *per se*. Therefore, researchers and managers should not underestimate the effect of getting employees involved in improving and sustaining physical workplace, even if creating a the physical workplace after the employees' own heart is difficult, if not impossible.

Third, drawing upon the perspective of psychological contract, we have proposed an alternate theory which is different from that of social interference [21] used to explain how physical workplace is influencing employee behavior. The theory has also bridged the missing link that [9]'s framework has not addressed yet. That is, the Perceived Comfort Workplace does not directly lead to *Shitsuke* but via the increased employee loyalty towards the organization.

Fourth, our model has implications to management that they have two major pivots

to alter the employees' behavior. They can either adopt a top-down approach that presetting an effective physical workplace to motivate employees to change their behavior or employ a bottom-up approach by involving employees to change the workplace that they will treasure. For the latter approach, the employees will have greater intention to uphold the workplace conditions due to the manful efforts they have made.

Conclusion

In this study, we have increased the empirically based knowledge of factors that determine the employees' behavior from the view of improving the physical workplace. Building upon the perspective of planned organizational change and psychological contract, we have established a theoretical model to explain the significant role of the intervention activities and the subsequent mechanism that leads to self-disciplinary behavior at work.

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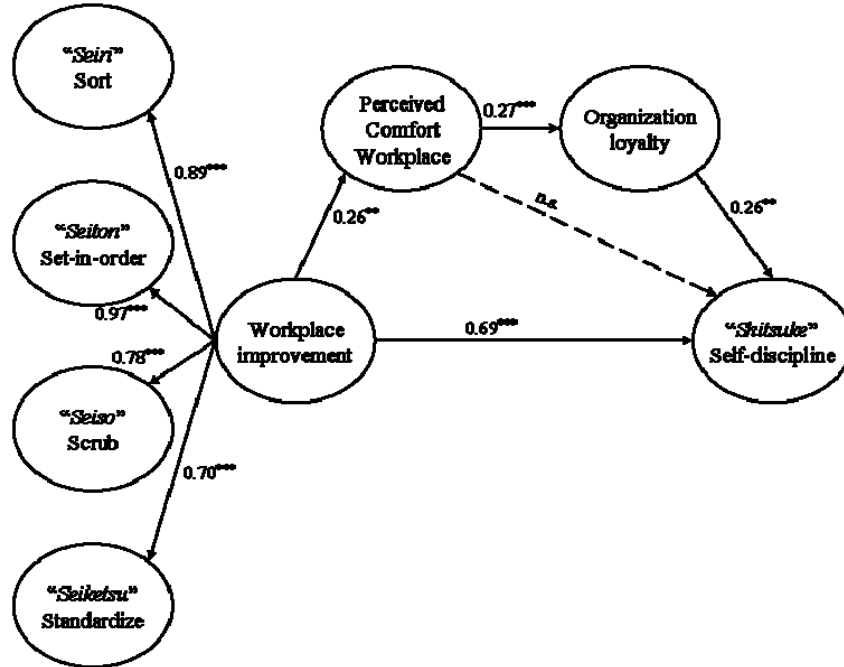
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Figure 1 – Dynamics of Workplace Improvement



*** denotes path coefficient is significant at $p < 0.01$ and $p < 0.001$ respectively

Model fitness: $\chi^2=357.9$ $df=180$, $\chi^2/df=2.0$, TLI=0.90, CFI=0.91, GFI=0.92, RMSEA=0.049 (0.04, 0.056)

Appendix I – Result after EFA, Dimensionality and Reliability

Construct	Measurement items	Factor loading	% of variance	Eigen value	α
<i>Seiri</i> (Sort)	We always categorize and settle the things in the workplace	0.6	61.9	1.9	0.69
	We always eliminate the dirt and blemish in the workplace	0.9			
	We identify the leakage of cover and pipe	0.9			
<i>Seiton</i> (Set-in-order)	We always assign a unique location for storing each thing	0.8	58.5	1.8	0.64
	We design workplace in an organized manner	0.7			
	We always store things in accordance with their nature of use	0.8			
<i>Seiso</i> (Scrub)	We always clean up the hidden areas	0.9	69.4	2.1	0.78
	We always maintain a glabrous floor	0.8			
	We always keep clean of the ducting and air louver	0.8			
<i>Seiketsu</i> (Standardize)	We always put label on the cabinet to identify the stored items	0.9	71.4	2.1	0.80
	We always classify by painting the ducting with different colors	0.9			
	We share the responsibility for managing different workplace areas	0.8			
Shitsuke (self-discipline)	We always take initiative to organize our work-bench	0.7	66.8	1.7	0.62
	We always wear uniform properly	0.8			
	We always take initiative to reduce waste	0.8			
Perceived Comfort workplace	It is much easier to detect problems in our production environment	0.7	66.8	2.0	0.75
	Our working environment is more comfort and safe	0.8			
	I am satisfied with the existing production environment	0.8			
Organization loyalty	If I had to choose all over again, I would take a job with this company	0.6	57.6	1.7	0.63
	I would recommend this company to a friend as a good place to work	0.8			
	I feel a sense of pride working for this company	0.8			