

**INVESTIGATING THE EFFECT OF 5S APPLICATIONS ON
BUSINESS EXCELLENCE: A SAMPLE IN TURKISH FOOD
INDUSTRY**

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ABSTRACT

The main motivation of this research is to examine effects of “5S applications” which is similar to Kaizen philosophy, on excellence perceptions of firms in food sector. In this context, a questionnaire was applied to the logistics department employees of randomly chosen firms that operate in Istanbul and Kocaeli districts. Data obtained from surveys were subjected to structural equation modeling test. According to the results, overall 5S applications showed positive and significant effects on excellence in business variable, excluding “cleaning”. Moreover, outstanding effect of “sustain” application is an intriguing finding of this research. With the importance that efficiency concept has today, it is evaluated that the results obtained in this study will be beneficial to organizations, especially during their process improvement activities by being the first research in food sector that seeks connection between the 5S and excellence.

Keywords: *5S Applications, Efficiency, Kaizen, Excellence in Business, Food Sector.*

ÖZ

Bu araştırmanın temel amacı Kaizen felsefesine benzeyen 5S uygulamalarının gıda sektöründe faaliyet gösteren firmaların mükemmeliyet algılamalarına etkilerini incelemektir. Bu kapsamda, İstanbul ve Kocaeli'nde faaliyet gösteren ve rastgele seçilen firmaların lojistik birimlerinde çalışan personele anket uygulanmış ve anketlerden elde edilen veriler yapısal eşitlik modellemesi ile teste tabi tutulmuştur. Elde edilen sonuçlara göre, "temizlik" hariç tüm 5S uygulamalarının iş mükemmelliği değişkeni üzerinde anlamlı ve belirgin etkileri bulunmaktadır. Ayrıca, araştırmanın önemli bir bulgusu da "sürdürülebilirlik" değişkeninin mükemmellik değişkeni üzerindeki göze çarpan etkisinin tespit edilmiş olmasıdır. Verimlilik kavramının günümüzde sahip olduğu önem nedeniyle, gıda sektöründe 5S ile mükemmellik arasında bağlantı kurmayı amaçlayan ilk araştırma olan bu çalışmada elde edilen sonuçların, işletmelere özellikle süreç iyileştirme faaliyetlerinde fayda sağlayacağı değerlendirilmektedir.

Anahtar Kelimeler: 5S Uygulamaları, Verimlilik, Kaizen, İş Mükemmelliği, Gıda Sektörü.

1. INTRODUCTION

Increasing competition and rapid changes both in businesses and markets have forced enterprises to adjust their working styles to improve their performance. To confront these competitions and changes, enterprises need appropriate management systems.

Excellence is a combination of values and activities which results in remarkable achievements. In other words, excellence can be defined as quality enhancement. Different business excellence models are applied in many countries to help enterprises to improve their performance [21]. In this context, it is inevitable for excellence to glamour in business. There are myriad of studies on excellent companies and these studies proved the concept of Kaizen (continuous improvement) as a precondition for business excellence [2].

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Kaizen is a Japanese word that indicates a process of continuous improvement of the standard way of work [3]. It is a compound word involving “Kai” (change, modify) and “Zen” (for the better). Thus the term of Kaizen means "Continuous Improvement". Continuous improvement is one of the core strategies for excellence and it is considered vital in today's competitive business area. It calls for eternal effort for improvement involving everyone in the enterprise [25]. The foundation of Kaizen philosophy is 5S. The five “S” comes from the first letter of the Japanese words (Seiri, Seiton, Seiso, Seiketsu and Shitsuke). The practice of 5S purposes to establish the values of sorting, neatness, cleaning, standardization, and sustain in business [15].

In today's increasingly competitive environment, the foreground of concepts of performance, innovation and excellence lead enterprises to 5S techniques which are applied in the course of Kaizen philosophy. There are some studies about the effects of 5S on performance, innovation and excellence in e-trade workplace [14]; in manufacturing, construction, service, health, education sectors [8] and in sectors which apply total quality management [27]. However, no studies are found in the literature about this area especially in Turkish food sector. In this respect, the basic motivation of the study is to determine the effects of organization, neatness, cleaning, standardization, and sustain elements of the 5S application on the business excellence. The effects of 5S on performance and innovation in Turkish food sector remain as the future works.

This paper has been organized into four sections, starting with the introduction. In literature review section, the concept of 5S is emphasized and detailed, previous studies are mentioned and the benefits of 5S activities are explained. In the third section, the survey data and analyses are presented. In the last section, conclusion, discussion and limitations are given.

2. LITERATURE REVIEW

Excellence is the state or quality of being excel. Particularly in the field of business, excellence is regarded as an important value, and a goal to be chased. Excellence can be defined as the ability of firms to make profits, while meeting the customers' requirements [9]. According to Contemporary

Turkish Dictionary, excellence is being perfect and completeness. Before 1980's, Total Quality Management that had the same or similar meaning with business excellence was a trend for organizations to improve themselves [11]. Recently, this trend has moved from "quality" towards "excellence," because of the widened focus of the assessment canon [13].

The use of 5S applications for achieving business excellence has been evident in Japan since the World War-II. At first, various plant maintenance concepts were imported to Japan from the US and then, 5S was integrated with Kaizen philosophy by Japanese [14]. The components, namely Seiri, Seiton, Seiso, Seiketsu and Shitsuke, bringing together the concept of 5S, are deeply embedded in Japanese life. For this reason, it is not a randomly formed philosophy, but a system of thought that is influenced by the great influence of Shintoism, Buddhism and Confucianism in Japanese culture. Each component of 5S are explained briefly below [5].

2.1. Seiri (Sorting)

Seiri is about sorting out between necessary and unnecessary materials in the workplace and discard of unnecessary things. The idea of Seiri is to keep only the necessary items in workplace in an appropriate area [12]. According to Kobayashi and friends [14], Seiri creates a system that works effectively and that system presents excellency for enterprises.

2.2. Seiton (Neatness)

Seiton can be defined as "organizing necessary items in excellent in order to pick them up easily for later use". Seiton focuses on where and how much material and equipment should be placed [12]. The essence of seiton is to arrange tools in a sequence of process that relates to the work. A decision must make about the usage rate of materials. Frequently used materials should be placed in easiest access points and rarely used materials should be placed further away. Heights of shelves should be considered, too. Frequently used items can be better at shoulder level, rarely used ones can be better at feet or ceiling level. The reasons behind this are finding equipments easily and much faster, saving time and providing a comfortable location [16].

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2.3. Seiso (Cleaning)

Seiso is applied for providing a clean and well-maintained working environment, keeping the equipment clean and protecting them. Purpose of the seiton is to prepare a beautiful work environment by purifying the workplace from the nuts and dust [20]. For this reason, cleanliness can also be expressed as a careful inspection. Seiso (cleaning) looks like the simplest stage of 5S in its name, but it has a complex content that encompasses many activities. Therefore, incomplete and inaccurate actions may create unnecessary costs to enterprises [5].

2.4. Seiketsu (Standardization)

Seiketsu (standardization) is the most important way of ensuring results achieved by sequential and continuous application of the first three principles of 5S. The goal of standardization is to ensure the continuity of a secure, well-organized and lean environment [12]. Seiketsu delineates the worked out and implemented standards in the form of procedures and instructions in workplaces. Standards ought to be communicative, clear and understandable. To provide a true seiketsu standard, it must involve all participants of processes in the given workplace, it means direct workers. With the aim of assuring easy access, compulsory standards should be found in specific and visible places [18].

2.5. Shitsuke (Sustain/Discipline)

Shitsuke is the last S of the 5S system which is interested in the regularity of maintaining the standard of the organization for a set of time [23]. Implementing the idea of the 5S will demand self-discipline connected with implementing and obeying the rules of regularity from employees. It provides an increase in personnel consciousness and a decrease on the number of undesired products and processes [18]. Shitsuke which is an important part of the Kaizen philosophy must be followed and applied continuously because it covers the control and renewal of applications in use [5]. Rains defines the discipline as complying with a set of well thought and defined processes and executing them correctly and he asserts that it's an essential ingredient to achieve excellence [22].

Some of the benefits of 5S to enterprises are listed below [18, 19].

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Seiri : Process improvements, decreases stocks, ease of use at the workplace, prevention of losing equipment.

Seiton : Process improvements, time efficiency, safety improvements.

Seiso : Machine efficiency, maintenance of devices, quick data about damages, improvement of the workplace, elimination of the accidents.

Seiketsu : Increases safety, decreases pollution, process improvements.

Shitsuke : Increasing awareness and morale, decreasing mistakes, decreasing inattention, proceedings according to decisions, improvements in communication.

Gapp et al argue that the 5S applications in business operations will have a positive impact on quality, speed of operation, costs, employee motivation and performance of the company [5]. The concepts like quality, performance, motivation etc. are the key factors of excellence [26]. In this context, it is proposed that 5S applications have positive effect on business excellence consistent with the literature [8, 14, 27].

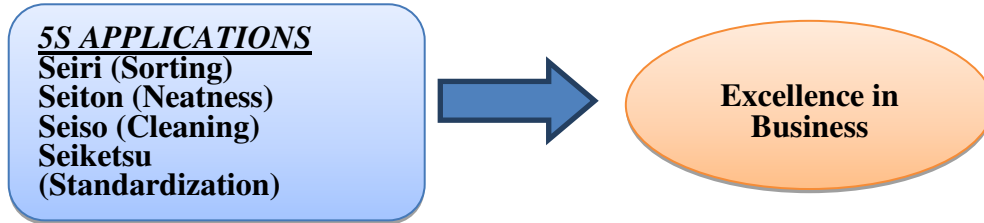


Figure 1. Conceptual Framework

3. METHODOLOGY

This research, which is relational in context according to its aim, consists of three stages. In the first stage, literature had been reviewed about the designated variables and the survey items were prepared. In the second stage research was conducted and data was gathered. In the final stage, data acquired was analyzed and results were expounded.

Target population is composed of logistics department employees of randomly chosen food production facilities operating in Istanbul and

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Kocaeli provinces. Due to topic of the research, designated target population were selected from food producing firms. Questionnaires were applied to total 73 employees from 58 firms via face-to-face survey method and data gathered was subjected to analysis. Barclay and his fellow friends assert that for each path directed to a latent variable, ten times observations are needed to reach a significant result [1]. On the other hand, Mertens and friends state that for Partial Least Squares (PLS) algorithm, sample size as small as 30 is adequate for making a coherent assumption [17]. Consequently, 73 observations were determined as sufficient.

In the analysis stage, WarpPls program which can manage small sample sizes was used [7]. Data were subjected to factor analysis, validity and reliability tests and finally structural equation modeling test.

Questionnaire form consists of two parts. First part covers the questions of the constructs presented in this study. In the second part, there are statements aimed to learn demographic and business profile of the respondents. Data was obtained using “5 point-Likert Scale” which is ranging from, “1-strongly disagree to 5-strongly agree”. Scales utilized in this study as dependent variable is adapted from Sharma et al. [24]. “5S applications” which is also the independent variable of this study was developed by researchers.

3.1. Characteristics of Sample

The characteristics of the sample are given in Table 1. 67% of the participants were male and 49% of them are aging between 26 and 46 years. As for the educational level of the respondents, majority are university graduates. Participants of this study are generally (86%) enrolled from firms that employ more than 50 personnel. Moreover, majority of the sample works in an experienced organization which has operated for more than six years.

Table 1. Characteristic of Sample

	<i>Frequency</i>	<i>Percentage</i>
Gender		
Male	49	67
Female	24	33
Education		
Bachelor's Degree	52	71
Master's Degree and Upper	21	29
Age		
18-25	12	17
26-35	36	49
36-45	20	27
46+	5	7
Number of employee in firm		
1-9	3	4
10-49	7	10
50-249	42	57
250+	21	29
Duration of the firm in market (in years)		
Less than 1	2	3
1-5	9	12
6-10	23	32
11-15	22	30
16+	17	23
Total	73	100

3.2. Reliability and Validity

Assessment of models involves determining the indicator reliabilities, (cronbach alpha, composite reliability), convergent validity (factor loadings, AVE values) and discriminant validity (The Fornell-Larcker Criterion) [7]. In order to evaluate the model, WarpPls package program was used and results are presented in Table 2.

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Table 2: Validity and Reliability Tests

Item	Cronbach <i>a</i>	Composite Reliability	AVE	Correlation and Square root of AVE's					
				Sort	Neatness	Cleaning	Standardize	Sustain	Excellence
Sort	1	1	1	1					
Neatness	1	1	1	0,708	1				
Cleaning	1	1	1	0,708	0,682	1			
Standardize	1	1	1	0,565	0,637	0,549	1		
Sustain	1	1	1	0,593	0,597	0,628	0,59	1	
Excellence	0,96	0,964	0,64	0,73	0,702	0,722	0,676	0,79	0,8

Note: Numbers shown in bold are Square Root of Average Variance Extracted of each item

Values more than 0,7 are generally acceptable for reliability considerations [6]. Cronbach alpha and composite reliability values are above the threshold, indicating sufficient reliability (Table 2).

Validity tests comprise divergent and convergent validities. For testing divergent validity, Fornell & Larcker [4] criterion was used. According to this criterion, square root of AVE value for each construct must be higher than all of its correlations with other constructs. As for convergent validity AVE values and factor loadings were examined. For a construct that is convergent valid, its AVE value and factor loadings need to be above 0,5 [6]. Examination of results demonstrated in Table 2 showed that constructs as a whole are valid and reliable.

4. TESTING CONCEPTUAL MODEL WITH STRUCTURAL EQUATION MODELING

After confirming the validity and reliability of the constructs general fit of the structure was evaluated with WarpPls program. Kalaycı explicate that Variance Inflation Factor (VIF) value of a construct is an issue that requires consideration for multi-collinearity concerns [10]. Hair et al. [6] assert that VIF values under “3” can be interpreted as multi-collinearity-free model. In this study, results show that average full collinearity VIF value is 2.882, showing that multi-collinearity will not be a problem.

In this research, authors are inclined to use PLS technique because of the small sample size and the exploration analysis that involves theory testing. In addition, because WarpPls program can handle single item scales, structural equation is solved using partial least squares (PLS-SEM)

technique. PLS regression with jackknifing method which provides better results for smaller sample sizes s chosen.

5S variables showed varying effects on excellence in business construct. According to the results, *sustain* has the highest effect on dependent variable with $\beta=0,399$ and 0.01 significance level, while *cleaning* affects insignificantly with $\beta=0,077$. *Sort*, *neatness* and *standardize* also affect *excellence* significantly.

Table 3: Structural Equation Modeling Test

<i>Independent Variables</i>	<i>Dependent Variables</i>	<i>Path Coefficients (β)</i>	<i>R² Value</i>
Sort		0,182**	
Neatness		0,155*	
Cleaning	Excellence	0,077	0.767
Standardize		0,169**	
Sustain		0,399***	

Note: “***” 0.01 significant, “**” 0.05 significant and “*”0.1 significant.

5. CONCLUSION

In this study, the effects of 5S applications on business excellence were measured. In order to measure this effect, a survey was applied to logistics department employees of randomly chosen food production facilities operating in Istanbul and Kocaeli provinces. Data acquired through survey method was subjected to analysis with WarpPLs statistical program and results were explicated.

By doing empirical research, bonds between the variables suggested in this study were quantitatively tested; strength and direction of the effects were presented. According to results derived from tests, 5S applications had positive and significant effects on excellence in business variable, excluding *cleaning*. In addition, *sustain* application showed relatively stronger effect on excellence in business. Sustaining is about general discipline that keeps the workflow constant and in order. Thus, it was expected to obtain significant connection between sustain and excellence. Because the error-free process which is the basic indicator of excellence can be achieved through discipline, it might have been perceived as the most important

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factor on excellence by the directors. Cleaning variable on the other hand, explains general hygiene of the workplace. The reason of the insignificance of cleaning might be stemming from that it is mainly perceived as an ordinary activity, rather than an obligation or a “must” according to the directors. Hence, respondents might not perceive the relevance between excellence and cleaning process. Nevertheless, it is surprising that cleaning doesn't have any significant effect on excellence in food sector where hygiene is very important, and it should be examined in detail in future studies. Although there is no relevant study in the extant literature, several authors assert the power of the 5S applications in management sciences. Hypotheses claimed and results found show that 5S activities have positive effect on excellence harmonious with the studies of Ho, Kobayashi et al. and Zink in different sectors [8, 14, 27].

Taking the results into consideration, utilizing if not embracing 5S applications in business processes would bring improvements and perfection. Thereby, it would be wise for practitioners in food sector to use these applications and urge their employers to do the same. However, this way of thinking can be extended to other sectors, because, philosophies like Kaizen may be implemented into any business procedure in order to bring an organization one step closer to impeccability.

This paper is unique in terms of being first which provides empirical evidence on 5S applications on excellence in business. Moreover, results of this research will be beneficial especially to organizations operating in food sector and to managers who favors philosophies like Kaizen or lean production. In future studies, 5S applications can be applied to other techniques like Kaizen, in order to better understand its role in the literature. Apart from that, utilizing different dependent variables such as satisfaction or loyalty and applying models to different sectors can improve our understanding.

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