The Study of the Production Quality of Small Size Enterprises Workers by Appling the Knowledge Management: Case Study in Garment Industry in Ubon Ratchathani

การศึกษาคุณภาพการผลิตของแรงงานวิสาหกิจขนาดย่อมหลังประยุกต์ใช้กระบวนการจัดการความรู้ กรณีศึกษาอุตสาหกรรมตัดเย็บในจังหวัดอุบลราชธานี

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Abstract

This research aims to study the quality of production of small enterprise workers after applying knowledge management processes. Case study of the sewing industry in Ubon Ratchathani province. The sample group consisted of 50 employees working in the production of V-neck T-shirts in a sewing factory in Ubon Ratchathani province. After that, the production process was studied. Define the sample group at Control the experimental environment Apply knowledge management process Comparative study of control charts before and after application of knowledge management process The research found that Value of waste from work after knowledge management Decreased from normal work environment 14.55% Value of waste from work after knowledge management Have less distribution than normal environment Production quality of the knowledge management process More stable than before knowledge management But when testing the hypothesis by using t-test In conclusion, the work quality of the employees before and after knowledge management has different production quality at the 0.05 level of significance.

Keywords: Production Quality, Small Size Enterprises, knowledge Management and Garment Industry

บทคัดย่อ

งานวิจัยฉบับนี้มีวัตถุประสงค์เพื่อศึกษาคุณภาพการผลิตของแรงงานวิสาหกิจขนาดย่อมหลังประยุกต์ใช้กระบวนการจัดการความรู้ กรณีศึกษาอุตสาหกรรมตัดเย็บในจังหวัดอุบลราชธานี กลุ่มตัวอย่างได้แก่พนักงานระดับปฏิบัติงานพนักงานผลิตเสื้อยืดคอวีในโรงงานอุตสาหกรรมตัดเย็บในจังหวัดอุบลราชธานี จำนวน 50 คน หลังจากนั้นทำการศึกษากระบวนการผลิต กำหนดกลุ่มตัวอย่างที่ ควบคุมสภาพแวดล้อมในการทดลอง ประยุกต์ใช้กระบวนการจัดการความรู้ ศึกษาเปรียบเทียบแผนภูมิควบคุมก่อนและหลังการประยุกต์ใช้กระบวนการจัดการความรู้ ผลการวิจัยพบว่า ค่าสัดส่วนของเสียจากการทำงานหลังการจัดการความรู้ ลดลงจากการทำงานในสภาวะแวดล้อมปกติ 14.55 % ค่าสัดส่วนของเสียจากการทำงานหลังการจัดการความรู้ มีการกระจายน้อยกว่าสภาวะแวดล้อมปกติ คุณภาพการผลิตของกระบวนการหลังการจัดการความรู้ มีความเสถียรมากกว่าก่อนการจัดการความรู้ แต่เมื่อทำการทดสอบสมมติฐานโดยใช้การทดสอบค่าที สรุปได้ว่าการทำงานของพนักงานก่อนและหลังการจัดการความรู้มีคุณภาพการผลิตไม่ต่างกันที่ระดับนัยสำคัญ 0.05

คำสำคัญ: คุณภาพการผลิต วิสาหกิจขนาดย่อม การจัดการความรู้ อุตสาหกรรมตัดเย็บ

1. Introduction

1.1 Statement of the problems

At present, the manufacturing industry in various countries with awareness to support regional competition and global society caused by many factors. Including, the quality of work of the workers which countries with good labor quality will result in product quality. The higher competitiveness products were produced. The populations have better living standards. Quality means the properties of the products that meet the needs of consumers, including product design to motivate users, the creation of products to meet the specifications. Ultimately, the product should be more popular than other products. Therefore, manufacturers need to control the quality of the production to meet the specified standards. However, in reality, the production process often has variations in product quality, which the manufacturer desires to control the least amount of variation [1]. One of the most important factors that affect the variation is personnel factors. When many variations occur; it means that the production process is unusual. Consequently, the results in the quality of the products are not as specified. The cause of personnel may come from differences in regard to attention, effort, precision, skill, and knowledge in work [2].

In Thailand, small and medium-sized enterprises (SMEs) are considered the main engine and core in driving the country's economy in 2018. There are several small and medium enterprises as 2.647 million nationwide, accounting for 99.8 percent of all enterprises in Thailand. The employment is up to 78 percent in the whole country [3]. Factors that entrepreneurs must consider are both external and internal factors of the organization. External factors that must be considered, such as politics, economy, competitors, customers, etc. The internal factors such as regulations, work systems, knowledge, etc. According to the National Economic and Social Development Plan No. 12, 2017-2021, adhered to "people as the center of development" by the strategy of human development and Thai society has

given high priority to the development of the quality of people [4]. Therefore, knowledge is the primary role in development. The researcher conducted this research. For the study of the production quality of small enterprise workers after applying the knowledge management process; the case study of the sewing industry in Ubon Ratchathani province. In order to develop the forms to build a useful knowledge management model.

1.2 Scope of study

1. This research focuses on the study of employees working in the production line industry.

2. This research uses a chart to control the proportion of defect in the study of quality data.

1.3 Research hypothesis

The work of employees before and after using the knowledge management process affects the quality of different products as the conceptual framework in Figure 1.

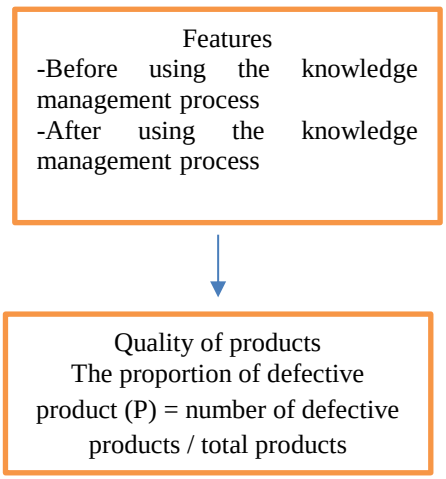

Figure 1 Conceptual framework in research

2. Objectives

This research aims to study the quality of production of small enterprise workers after applying knowledge management processes: a case study of the garment industry in Ubon Ratchathani province.

3. Research methodology

1. Study the general condition of the place and the experimental group.

According to studies, it has been found that the establishment of a case study in the business of various sewing types of garment products. Including, V-neck T-shirts is located at Kham Yai Subdistrict, Mueang District, Ubon Ratchathani province, which is consists of 2 production lines, each production line has 9 processes, each process has not the same number of working stations.

2. Determine the sample group used in the experiment

The sample group consisted of 50 employees in the V-neck production line by checking out the proportion of products that did not meet the requirements in each inspection period. The inspector is the quality control staff. The researcher studied the performance of employees before and after using the knowledge management process. It is divided into 2 periods with different periods.

3. Control the experimental environment

3.1 Determine the same product model in both situations, including V-neck T-shirt size M.

3.2 Determine the quality control staff to inspect the incoming raw materials used in the experiment again using visual inspection, including smudges or blemishes thoroughly to confirm the quality of the raw materials. After that, analyze the measurement system by the selected staff must have overall effectiveness (OE) of no less than 90%. The false alarm index (IFA) is not more than 5%, and the index of a miss (IMISS) is not over 2%.

3.3 Determine the standard for inspection of products by sight, such as defects, defects, thread

marks, thread fragments, straightness or contamination etc.

4. Apply knowledge management process

In this research, the knowledge management process is divided into 3 aspects, as follows:

4.1 Factors for importing include the formulation of plans, guidelines and supporting factors that consist of

- The positioning of employees with knowledge and the ability to match the main tasks of the job

- Encourage employees to think Decision making using statistical data and facts.

- Encourage employees to have a good attitude in knowledge management

- Create a knowledge management team that can clearly communicate the goals of knowledge management.

- Determine the action plan to be consistent with the vision

- Supporting the coordination between individuals, departmental departments per year

- Give prizes based on team performance and personal contribution in appropriate proportions

- Support the development of information technology for learning.

4.2 Process that consists of

- Organize training in various areas such as production techniques Production planning Production Management Lean PDCA 5S Management Quality Control Kaizen QCC TPM and TQM

- Determining to have a job teaching or mentor to guide the work and learning

- Create a knowledge base that is the best practices in various areas

- Create a clear knowledge storage system which can be searched quickly

- Arrange for the exchange of learning about production management 2 times per year

- Arrange the best practices contest for development 1 year per time

- Support for building facilities such as libraries, knowledge exchange corner Public relations boards etc.

- Arrange the work environment suitable for the job

4.3 The results include various goals that consist of

- The quality of production has increased internal processes that have been reduced the defect in production.

- Employees have higher knowledge and skills in the main mission able to perform tasks accurately, faster.

- Reduced production costs

- Increased customer proportion

5. Study the control chart before and after applying the knowledge management process.

In this research, the proportion of defect in the experiment was used. By determining the size, model used to study the proportion of 300 defect samples per model, since it is the minimum production amount that is produced in each trial period and determine 20 samples. According to the recommendations of Kitisak [5] using convenient random methods in every production model

Then collect data and create a chart to control the proportion of defect, if not in a controlled state, to find the cause of the disorder and eliminate the cause by determining the coordinates. Control chart P has the following formula:

$$CL_p = \bar{p} = \sum d / \sum n \quad (1)$$

$$UCL_p = \bar{p} + 3\left[\bar{p}\,(1-\bar{p})/n\right]^{0.5} \quad (2)$$

$$LCL_p = \bar{p} - 3[\bar{p}(1-\bar{p})/n]^{0.5} \quad (3)$$

When $\bar{p}$ is the average of p

$\sum d$ is the amount of defect before improving

$\sum n$ is the sum of the total number of samples

6. Comparison of defect proportion between before and after application of knowledge management process using comparison method as percentage value as equation (4).

$$\Delta \bar{p} = [\bar{p}_1 - \bar{p}_0] \times 100 / \bar{p}_0 \quad (4)$$

When $\bar{p}$ is the change in the proportion of defect

$\bar{p}_0$ is the proportion of defect before applying knowledge management process.

$\bar{p}_1$ is the defect proportion in defect after applying knowledge management process.

7. Comparison of range values from defect proportion data as equations (5)

$$R = P_{max} - P_{min} \quad (5)$$

When P_{max} is the largest proportion of defect,

P_{min} is the least proportion of defect.

8. Comparison of the width of the scope of the control proportion of the defect proportion as the equation (6)

$$Width = UCL - LCL \quad (6)$$

9. Test the hypothesis by using t-test statistic.

4. Result

1. The results of the quality of production of employees before using the knowledge management process as shown in Table 1

Table 1 Defect information before using the knowledge management process

Sample number	Number of samples (n)	Number of defects (d)	Proportion of Defects (P)	Sample number	Number of samples (n)	Number of defects (d)	Proportion of Defects (P)
1	300	6	0.02	11	300	3	0.01
2	300	3	0.01	12	300	0	0
3	300	0	0	13	300	5	0.017
4	300	12	0.04	14	300	16	0.053
5	300	2	0.007	15	300	7	0.023
6	300	8	0.027	16	300	5	0.017
7	300	4	0.013	17	300	1	0.003
8	300	6	0.020	18	300	2	0.007
9	300	3	0.010	19	300	4	0.013
10	300	5	0.017	20	300	4	0.013
				รวม	6000	96	0.016

From the table to find the upper and lower limits of the chart, control the proportion of defect as follows

$CL_p = 0.016$

$UCL_p = \bar{p} + 3[\bar{p}(1-\bar{p})/n]^{0.5}$

$= 0.016 + 3[0.016(1 - 0.016) / 300]^{0.5}$

$= 0.0377$

$LCL_p = \bar{p} - 3[\bar{p}(1-\bar{p})/n]^{0.5}$

$= 0.016 - 3[0.016(1 - 0.016) / 300]^{0.5}$

$= -0.0057$

Because the lower control limit calculated has a negative value So the lower control limit is 0 and the defect proportion chart can be created as shown in Figure 2.

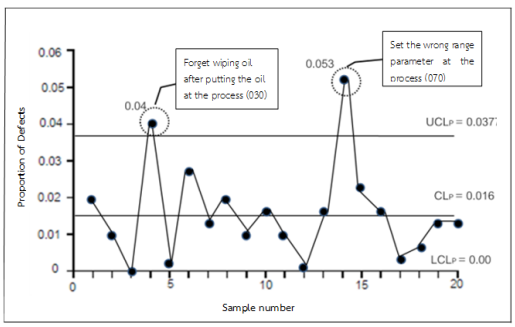

Figure 2 Proportion of defect before knowledge management

From Figure 2, since there are points out of control. Therefore, it needs to update the chart by

finding the cause that points to out of control then cut that point. Then calculate the proportion of the new defect as the formula.

$$CL_0 = [\sum d - \sum d_d] / [\sum n - \sum n_n] \quad (7)$$

When $\bar{p}_0$ is the average of p after the update

$\sum d$ is the total amount of defect before improvement

$\sum d_d$ is the sum of the amount of defect that has been cut.

$\sum n$ is the sum of all samples before updating

$\sum n_n$ is the sum of the number of cut off sample

After receiving the proportion of defect after improvement ($\bar{p}$ 0) from the equation (7) then take the value $\bar{p}$ 0 to find the new control limit as the equation (1) (2) and the equation (3) as follows

$$CL_0 = \bar{p}_0 = [\sum d - \sum d_d] / [\sum n - \sum n_n]$$

$$= (96 - 28)/ (6000-600)$$

$$= 0.0126$$

$$UCL_0 = \bar{p}_0 + 3[\bar{p}_0(1 - \bar{p}_0)/n]^{0.5}$$

$$= 0.0126+3[0.0126(1-0.0126)/300]^{0.5}$$

$$= 0.0319$$

$$LCL_0 = \bar{p} - 3[\bar{p}(1 - \bar{p})/n]^{0.5}$$

$$= 0.0126-3[0.0126(1- 0.0126)/300]^{0.5}$$

$$= - 0.0067$$

Because the lower control limit calculated has a negative value, so the lower control limit is 0.

Therefore, it can be concluded that the defect proportion (CL0) has a value of 0.0126, the upper control limit (UCL0) is 0.0319, the lower control limit (LCL0) has a value of 0. From the calculation, it is found that the standard deviation of the defect proportion (S1) has a value of 0.0129.

2. The results of the quality of production of employees after using knowledge management process as shown in Table 2

Table 2 defect data after using the knowledge management process

Sample number	Number of samples (n)	Number of defects (d)	Proportion of Defects (P)	Sample number	Number of samples (n)	Number of defects (d)	Proportion of Defects (P)
1	300	3	0.01	11	300	4	0.013
2	300	3	0.01	12	300	5	0.017
3	300	6	0.02	13	300	1	0.003
4	300	1	0.003	14	300	2	0.017
5	300	2	0.007	15	300	0	0
6	300	0	0	16	300	5	0.017
7	300	6	0.02	17	300	0	0
8	300	3	0.01	18	300	3	0.01
9	300	4	0.013	19	300	5	0.017
10	300	7	0.023	20	300	3	0.01
				รวม	6000	63	0.011

From the table to find the upper and lower limits of the chart, control the proportion of defect as follows.

$$CL_p = 63 / 6000 = 0.011$$

$$UCL_p = \bar{p} + 3[\bar{p}(1 - \bar{p})/n]^{0.5}$$

$$= 0.011 + 3[0.011(1 - 0.011) / 300]^{0.5}$$

$$= 0.0287$$

$$LCL_p = \bar{p} - 3[\bar{p}(1 - \bar{p})/n]^{0.5}$$

$$= 0.011 - 3[0.011(1 - 0.011) / 300]^{0.5}$$

$$= - 0.00654$$

Since the lower control limit calculated has a negative value Therefore the lower control limit is 0, and the defect proportion chart can be created as shown in Figure 3.

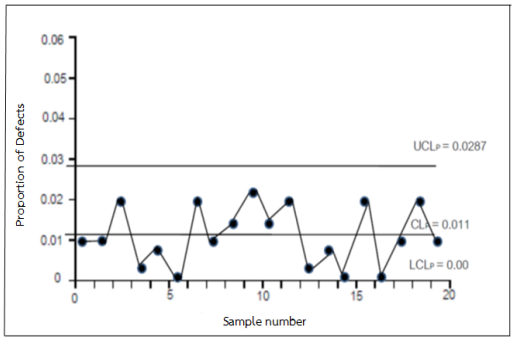

Figure 3 Proportion of defect after knowledge management

From Figure 3, there is no point outside the control, so the calculated values can be used.

Therefore, it can be concluded that, the proportion of the knowledge management (CL1) is 0.011, the upper control limit (UCL1) is 0.0287, the lower control limit (LCL1) has a value of 0 and from the calculation, it is found that the standard deviation of the defect proportion (S1) is 0.0071.

5. Summary and suggestions

5.1 Summary

The results of the production quality by using the proportion of defect from production as indicators can compare the results of each of the following issues.

1. Comparison of defect proportion before and after knowledge management

From $\Delta \bar{p} = [\bar{p}_1 - \bar{p}_0] \times 100 / \bar{p}_0$

$= [0.011 - 0.0126] \times 100 / 0.011$

$= -14.55$

Means that the proportion of defect from work after knowledge management Decreased from normal working environment 14.55%

2. Comparison of range values from defect proportion data

Determine the range from the proportion of defect data before knowledge management

From $R_0 = P_{max} - P_{min}$

$= 0.027 - 0$

$= 0.027$

Find the range of values from the proportion of defect data after knowledge management

From $R_1 = P_{max} - P_{min}$

$= 0.023 - 0$

$= 0.023$

Means that the proportion of defect from work after knowledge management Have less distribution than normal environment

3. Comparison of stability of defect proportion

Find the width of the boundary chart, control the proportion of defect before knowledge management

From the control chart width = UCL - LCL

$= 0.0319 - 0$

$= 0.0319$

Find the width of the boundary chart, control the proportion of defect after knowledge management

From the control chart width = UCL - LCL

$= 0.0287 - 0$

$= 0.0287$

Means the quality of production of the knowledge management process More stable than before knowledge management

4. Hypothesis testing

The hypothesis testing will use the Independent t-Test method at the significance level $\alpha = .05$

H_0: Work performance of employees before and after knowledge management has different production quality ($\bar{p}_0 = \bar{p}_1$)

H_1: Employee performance before and after knowledge management has different production quality ($\bar{p}_0 \neq \bar{p}_1$)

Determining the variance is not equal, therefore using the t-test Pooled variance by calculating according to the formula.

$$S_{P^2} = \frac{(18-1)0.0129^2+(20-1)0.0071^2}{18+20-2}$$

$$= 0.00011$$

$$t = \frac{0.0126-0.011}{\sqrt{0.00011\left(\frac{1}{18}+\frac{1}{20}\right)}}$$

$$= 0.48$$

Instead of the formula

Find the critical value of t when df = 18 + 20 - 2 = 36 at α = .05.

Find the critical value in the two-way table at the position α = .05, df = 36

It will receive the critical value of t = 2.03 (t_{table} = 2.03)

Since t = 0.48 <t_{table} = 2.03, therefore, accepting H_0 can be concluded that the performance of employees before and after knowledge management is not different in production quality at the significance level 0.05

5.2 Suggestions

1. From the research results, we found that the proportion of defect from work after knowledge management decreased from normal working environment 14.55%. although from statistical hypothesis testing, the results show that Production quality in both periods is no different. However, it shows that knowledge management tends to reduce defect from production.

2. From the research results, we found that the proportion of defect from work after knowledge management is distributed less than before the knowledge management shows that knowledge management results in predicting or solving quality problems easily.

3. Production quality of the post-knowledge management process More stable than before, knowledge management shows that knowledge management has a higher level of approving quality level.

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