

FAILURE PREVENTION IN WORK STUDY PROJECTS WITH UTILIZING SIX SIGMA METHODOLOGY

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Abstract: *Despite the pervasiveness of Work Study program implementation, there is an increasing concern about implementation failures. One reason many Work Study programs fail is the lack of an effective implementation model to guide the implementation and encourage the workers and managers to be involved in this programs. As Six Sigma is one of the best qualified models and ways to solve the problems in operation and also helps the group members to find the problems and tries to engage all the employees in projects, so it seems so useful for attraction of the workers who are included in Work Study programs. The aim of this research is to introduce a new implementation model using Six Sigma methodology to show new ways for utilizing Work Study programs with considering employees in groups and encouraging them to be involved in measurement programs.*

Key words: *Productivity, Work Study, Six Sigma, Implementation.*

1. INTRODUCTION

Human beings play a crucial role in the beneficial process of a manufacturing organism. Management focus on effective performance of its personnel and justifiably so, in addition labor plays a very important role in achieving effective utilization of equipment. Thus, as its interest in benefits and cost, management adds considerable importance to the methods engineer's role in achieving higher productivity of man and machine^[1].

The term time and motion study have been given many interpretations since their

origin. Time study which is organized by Taylor was used mainly for time standards determinations, and motion study developed by the Gilberts, was aimed largely on methods improvement. At the 1930's, a general movement began to study work with objective of finding better and simpler methods of getting job done. Afterward, these two terms were combined and created a term called "Motion and time study", or "Work Study" or "Methods engineering" ^[1]. The extension of time and motion study is even much broader today. We now are concerned with the design of work systems and methods. Our objective is to find the ideal method or the method nearest the ideal that can be practically used to increase higher productivity of anything. The Work Study utilizes powerful tools; however there is a risk for the plan failure ^[2].

There are several reasons that cause failure in Work Study programs. The reasons for such a failure may varies in different countries with diverse culture and public ideas, the degree of education especially in workers, the religion and the technical level. But the most agreed-upon matters are the lack of goal clearness in Work Study in an organization, single-axial decision-making, non-cooperative situations, using unqualified tools in decision making during design phase and environmental conditions and etc.

Actually a combination of these factors can activate a term called individual resistance. That the reasons of this resistance among staff are ^[3]:

(1). Misunderstanding of time evaluation and its goals, (2). To habituate to current

conditions, (3). The necessity of spending much time on learning new skills, (4). To fear of the ambiguity of unknowns, (5). Economical factors, (6). Confusing relationships among staff, (7). The confusion of influence and power terms, (8). Current conditions which is a reflection of individual's opinions in a group, (9). Ineffective communications, (10). Misunderstanding,

Up to now, a number of wh-questions were used to solve this problem (after resistance's creation), which were not successful in solving this problem, just as there is no referential model [3].

Six Sigma which is a trademark of Motorola, was established more than 30 years ago just for reducing manufacturing defects[4].

The underlined concept of this method was established by WILLIAM SMITH, which is dealing with the high rate of failure that was experienced in the production systems. For most of companies trying to improve their productivity and to reduce their costs, Six Sigma is the best choice [4]. Six Sigma is at the top of the agenda for many companies that try to reduce cost and improve productivity [5].

Today, the efficiency of Six Sigma in industry are profound and deep, for example, in 1999 General Electric company spent nearly a half of billion in Six Sigma initiatives and got more than 2 billion in benefits for Fical year [6]. Successful implementation and growing organizational interest in Six Sigma method have been exploding in the last few years [7].

Six Sigma is such a well-structured methodology which could help a company to get expected goals through successive project improvement [7]. The comparison of qualification design by using Six Sigma are given in the table(1).

What caused the succession of Six Sigma is group work, full staff cooperation, creation of similar organizational goals, preventive management, cultural change, and the

Table. 1.

| Rating of process improvement techniques [8]. | |
|---|------------|
| Process improvement tool | Impact (%) |
| Six Sigma | 53.60 |
| Process mapping | 35.30 |
| Root cause analysis | 33.50 |
| Cause and effect analysis | 31.30 |
| ISO 9001 | 21.00 |
| Statistical process control | 20.10 |
| Total quality management | 10.30 |
| Malcolm Baldrige criteria | 9.80 |
| Knowledge management | 5.80 |

model type [9]. Six Sigma is known as the first successful qualification plan [8]. What caused the succession in Six Sigma plan is the attention to human sources such as innovation, cooperation, group work, communications and stimulation instead of blind sticking for technical and statistical matters[10]. Numerous books and articles provide the basic concepts and benefits of the Six Sigma method[4].

So, here, by focusing on successful results of Six Sigma and its acceptance, we would show a model that has a systematic viewpoint in relation to resistant matters and Work Study leads to a fully profitable approach.

2. LITRATURE REVIEW

2.1. Work Study

As a whole, the goals of Work Study programs can be summarized in three parts: (1). The most effective use of staff, (2). The most effective use of tools and primary materials, (3). The appropriate performance of equipments, human resources and primary materials [3].

The Work Study programs for every organization requires many things in terms of their needs. The Work Study is mainly divided into two parts: Methodologies and Measurements [1]. The Work Study set up in five phases. (1): selecting the work to be studied, (2): recording the relevant facts, (3): examining the facts critically, (4): developing the most practical, economical,

and effective method, (5): installing and monitoring the method.

The Work Study projects utilizes a number of tools. The most important Time Measurement tools are Stop watch, Basic most, Mini most, Maxi most and MTM systems. There are many articles and publications explaining the details of the method. The Work Study utilizes powerful tools; however, there is always a risk for the plan failure [11].

The reasons such as the absence of clearness in goals descriptions, using non-qualified tools during decision making phase and non-appropriate choice of the part to be studied, making decisions without staff cooperation, the absence of appropriate motivation system, the lack of expectations clearness about workers during studies and etc use many features in terms of individual characterizations that may cause resistances in the staff. That this resistance results in obstructions and immediate changes rejections in the workers. There are many articles and publications on the organizational resistances that are confirmed the individual characterizations create these kinds of resistances [3].

Up to now, the question-techniques, individual motions study, learning curve and etc were used in the critical analysis level. The questions started with wh are designed for critical considerations of current method and the creation of improved method. These questions are intended to consider the material efficiency and transportation, and to eliminate, modify, combine, rearrange and simplicity of our actions that lead to a more convenient and a more profitable method [3,11].

The wh-question system is used to criticize the current method, but it can not help us to create a systematic viewpoint and total analysis in relation to the resistance type to changes. Actually it can not create a trend that causes accompany and acceptance among staff.

2.2. Six Sigma

Six Sigma is a verified tool set for driving and achieving goals with in a company [12]. This is a business strategy which intended to improve customer requirements understanding, business systems, financial performance, and productivity [13]. To accomplish the Six Sigma objectives, one of the most practiced methodologies is the DMAIC approach (Define, Measure, Analyze, Improve, and Control) [12]. DMAIC is a closed-loop process which reduces unproductive steps, often focuses on new measurements, and applies technology for constant improvement [14]. Successful implementation and growing organizational attention in Six Sigma method have been blowing up in the last few years [14]. Numerous books and articles supply the basic concepts and benefits of the Six Sigma method methodology[4]. Six Sigma improvement projects often use explicit goals to stimulate performance [15].

A case study show that there is a constructive relationship between participating management style and productivity, quality, and employee's morale. Effective Six Sigma principle and practices will succeed by refining the organizational culture continuously [16]. In most cases, scholars have found that there is a considerable relationship between group goals and group performance [17]. All of these caused that the other methods could use the Six Sigma. For example, the Six Sigma is used for choosing project and its decision making process [16]. Six Sigma uses special tools to accompany staff and to prevent formation of organizational resistances that are known as soft tools [6]. Various resources are used for tools concepts and performance [9].

Therefore, the management principle of Six Sigma is similar to new management method with human resources orientation. Then, the benefits of Six Sigma that could be used to create new model for Work Study are the strategic and systematic view point, preventing management, group work, creativeness, motivation, creating

similar organizational goals in all levels, and soft tools that are useful for necessary atmosphere. Therefore, by using beneficial and systematic procedures of Six Sigma and by applying appropriate tools in the Work Study process, we demonstrate a model to eliminate the problems that cause failure in Work Study programs.

3. METHODOLOGY

3.1. The reason for using Six Sigma procedure in Work Study programs.

Classic viewpoint in relation to methods study show that the scientific approach and new management in Work Study still are not being used as effective as possible. One of the most effective parameters in the studies, the human resources as an inclination point, is being less appointed. As a result, the factors caused individual and organizational resistances in the Work Study, are often faced with classical procedures such as questioning techniques. This trend is given in the methods and Work Study cycle in various organizations in fig.1. (Work Study cycle)

One of the most important steps in this cycle is the analysis of the recorded procedure. Some tools used in this step are: critical consideration, question-technique, Micro motions study, economical principles of motions, and learning curve, that the absence of a systematic model for Work Study could be observed with attention to the independent results.

Therefore, one the most effective methodologies containing both of analysis aspect and effective cooperation in the improvement of Work Study procedure is Six Sigma's methodology. In relation to analysis procedure, it is concluded that there is no reference system procedure along with human resources especially in group work, job motivation, staff resistance and encouragements.

Six Sigma procedures can help us to consider these cases as a united and reference system. Our main model is given

based on Cascade part in figure.1. Based on the cascaded part in figure.1, it seen that the decisions are made without staff cooperation.

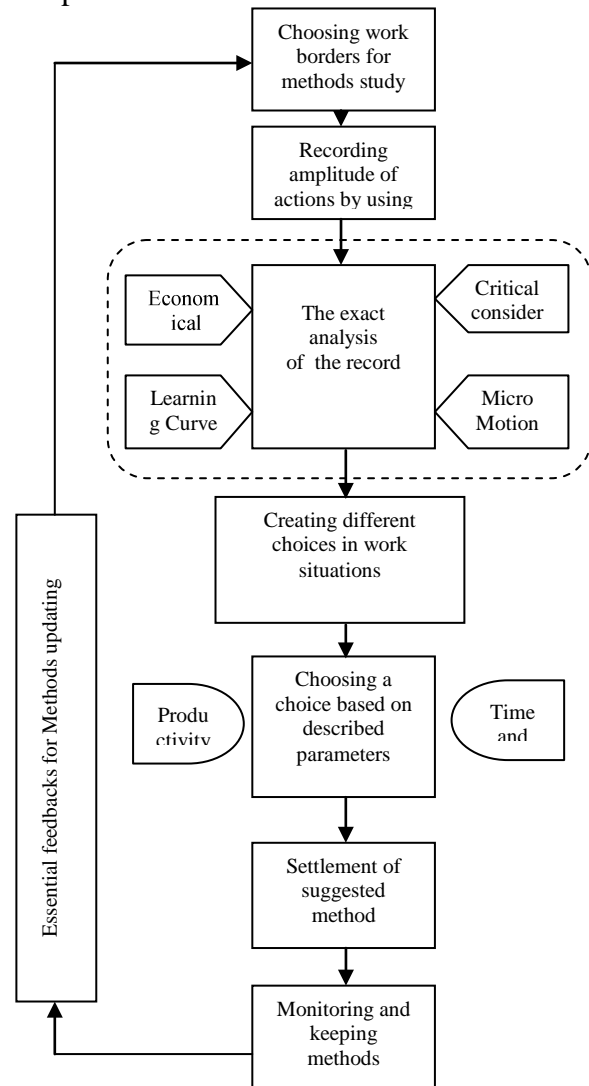


Fig. 1. The cycle of Work Study and setting up a method based on Work Study.

Actually, all of factors that cause failure in the Work Study programs, began from this point leading to resistances in the next Work Study steps, such as choosing better choice, establishing better method and monitoring method.

Therefore, if we use Six Sigma procedure in this step, we can prevent from future resistance. The adopted current resistance in the Work Study process with Six Sigma is given in Table.2, showing the way of prevention and Six Sigma's procedures that help us to block these resistances.

| The reasons of failure in Work Study programs | Six Sigma index | Classical viewpoint | Six Sigma Outlines to solve the problems | Preventable outlines of Six Sigma |
|---|---------------------------|---------------------------------------|--|---|
| -misunderstanding of time measurement and methods engineering -habituate to current conditions - The necessity of spending much time on learning new skills | Technical resistance | Feeling to be qualified person or not | Learning, informational cooperation, motivations | Staff are dealing with changes and making decisions |
| - To fear of the ambiguity of unknowns - Economical resistance reasons - The confusion of power terms - Confusing relationships - Ineffective communication | Political resistance | Loosing power and effects | Emphasizing on something that is gained in case of runing the solution | Staff will use the benefits of organization success |
| - Current conditions which is a reflection of individual's opinions in a group - Misunderstanding and resistance - confusing social and group relationships | organizational resistance | Controlling | Giving the control or finance to key element | Staff dealing with organization activities and decision making process |
| - confusing social and group relationships - Ineffective communication | Individual resistance | Lack of motivation | Less involvement in routine works during the program; More motivation | Giving not too much activities to an individual* ; encouragement, motivational factors in the organizational resistance |

Table 2. The reasons of failure in Work Study with predicted resistances by Six Sigma
*: Due to private issues.

4. CONCLUSIONS

Summing up the explained cases, it showed that the classic procedures had an unsystematic viewpoint to this problem, since it considers components individually, while the relationships between these components are very important for estimating the effects of a method in the

analysis of study work. Therefore, the Six Sigma procedures were used in the current study, and the results showed that the improvement of productivity, which is one the most appropriate results in every Work Study projects.

The details of methodology and observed results are given in the main article.

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