

TOTAL QUALITY MANAGEMENT AND AN APPLICATION IN THE  
TURKISH INFANTRY BATTALION

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by

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BILKENT UNIVERSITY  
Abstract

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This study presents a brief summary of total quality management, its history and its tools; offers an overview of a process improvement procedure by U.S. Department of Defense; and a sample process improvement application in nutrition system of a Turkish Infantry battalion.

The main purpose of the study is to show the advantages of using Total Quality Management tools in military processes. For this purpose, a quality improvement team established in a Turkish Infantry Battalion, consisting of 9 enlisted soldiers and a lieutenant, improved the nutrition system by using seven tools of the Total Quality Management. Project related with contracting nutrition system to a civilian catering firm -which is also in trial period in some of Turkish Army Units - is benchmarked cooperatively.

Key Words: Total quality, quality training, nutrition process, quality improvement

ÖZET  
TOPLAM KALİTE YÖNETİMİ VE  
BİR PİYADE TABURUNDA UYGULAMASI  
GÖKHAN KASIMLIOĞLU  
BİLKENT ÜNİVERSİTESİ  
YÜKSEK LİSANS TEZİ, İŞLETME FAKÜLTESİ  
TEZ DANIŞMANI: ASSOC.PROF. ERDAL EREL  
AGUSTOS 2001

Bu çalışma ile toplam kalite yönetiminin tanımları, kısa geçmişi, araçları ve Amerika Birleşik Devletleri Savunma Bakanlığında uygulanmakta olan süreç iyileştirme yöntemi incelenmiş ve bir Türk piyade taburu beslenme sistemine süreç iyileştirmesinin uygulaması gerçekleştirilmiştir.

Tezin amacı toplam kalite yönetimi araçlarının askeri birliklerin yaşadığı süreçlere uyarılmanın faydalarını göstermektir. Bu maksatla 1 üsteğmen ve 9 askerden oluşan bir iyileştirme takımı piyade taburunda tesis edilmiştir. İyileştirme takımının amacı toplam kalitenin yönetiminin 7 aracını kullanılarak beslenme sisteminde iyileştirme sağlamaktır. Türk ordusunda deneme aşamasında olan beslenme sisteminin sivil firmalara ihale edilmesi yöntemi de işbirlikçi kıyaslama(cooperative benchmarking) tekniği ile incelenmiştir.

Anahtar kelimeler: Toplam Kalite yönetimi, kalite eğitimi, süreç iyileştirme.

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## ***1 . INTRODUCTION***

“Each passing day proves that global competitive market environment will no longer accept organizations and companies that are not knitted with quality. One or two decades ago they were competing with their internal market rivals only, but nowadays the market is all around the world.” (Scherkenbach, 1998).

The previous sentence from William Scherkenbach describes today’s market phenomenon very well. In conformity with this phenomenon, a Turkish customer would demand a Chinese bicycle instead of a Turkish one; would purchase French cheese from the nearest store, and would award a contract for his/her company’s advertisement to a Swedish company.

If a company is not efficient and successful on serving to a high range of customers demanding high quality products, it is destined to die. U.S. Federal quality Institute published a survey result on how unqualified products and services affect U.S. companies. Survey results can be summarized as below:

“Since 1960, the United States has lost 40 percent of its market share to foreign competitors. During the same period, Japan has increased the size of its foreign market by 500 percent. The nine largest banks in the world are now Japanese. The United States used to make 90 percent of the color TVs in the world, now U.S.

makes only 5 percent. There were no American-made VCRs, compact disc players, or single-lens reflex cameras in 1990s in the U.S.”

While in the market place U.S. companies were losing blood on the military side, there were also some changes. Altunes (1994) describes that the Army transformed from a threat-based, forward-positioned force to a capabilities-based, strategically positioned, power-projection and mission-adaptive force. The numerous post closings, force structure and infrastructure reductions had major impacts on the lives and careers of every Army soldier and civilian. While there were increases in operational deployments, there were also huge reductions in limited resources that require greater emphasis on effectiveness and efficiency. U.S. Army has embarked upon a bold journey to transform and reshape itself into a force fully prepared for the next century.

Turkish Army is also very well aware of the today's challenging, multidimensional environment. In the near future, it is inevitable to face environment of reduced budgets and personnel. Army must find creative and innovative ways of doing its tasks. To this end, Turkish Army is introducing quality and quality improvement terms into military processes.

Quality is an approach that seeks for meeting customer needs and expectations that involves all managers and employees in using quantitative methods to improve continuously the organization's processes, products, and services. Quality improvement distinguishes duplication of effort, and initiates actions that eliminate waste. Quality improvement asks for analysis of the processes within each task that would highlight the implementation of value added and non-value-added work.

Turkish Army introduced ISO 9000 Systems and NATO Quality Assurance Systems (AQAP), as a starting point and from 1996 to present, Total Quality Management (TQM) philosophy to its units and institutions.

ISO 9000 Series Quality Assurance Systems introduced yearly costs for military units in order to preserve a quality assurance certificate. TQM philosophy does not need any certificate and does not seek any fee to be paid in order to have the certificate. This phenomenon drove most of the Turkish Army units to drop their ISO 9000 certificates. Every military unit established continuous quality improvement departments to welcome TQM philosophy.

“TQM consist of continuous improvement activities involving everyone in the organization-managers and workers-in a totally integrated effort toward improving performance at every level. This improved performance is directed toward satisfying such cross-functional goals as quality cost, schedule, mission need, and suitability. TQM integrates fundamental management techniques, existing improvement efforts, and technical tools under a disciplined approach focused on continued process improvement. This activities are ultimately focused on increased customer/user satisfaction.” (U.S. Department of the Army, 1990).

TQM philosophy was born and became popular after World War II (WW II). After WWII, the only economy capable of producing goods was the American one. Asian and European economies had been destructed by the war. Without competition, United States quickly became the leading producer of goods.

The emphasis in mass production system was to produce more and more to meet the demand. Quality was not the issue that needed a remedy. The focus was on high-volume output that would meet minimal standards. Producing and selling the

products immediately with the highest profit was the way of conducting business operation. Today global competition does not allow organizations to survive without adopting quality needs.

### **1.1. SCOPE**

The objective of this thesis is studying TQM tools in a Turkish Infantry Battalion. The scope of the study is to present possible advantages of introducing TQM tools into Turkish Infantry Battalion's Processes. For this purpose, we established a quality improvement team in an infantry battalion, showed improvement in the nutrition system after the application of Total Quality Management's seven tools.

### **1.2. THESIS OUTLINE**

This study is comprised of five chapters:

In the first chapter, we will discuss TQM philosophy along with the definitions of some related concepts. In the following chapter, we will examine the key elements of TQM. In the third chapter, Quality Improvement Process and TQM tools are summarized. In the fourth chapter, we will describe an application of process improvement in a Turkish Army Battalion. In the last part of this study, an analysis of the results and a brief summary of the findings and conclusions are provided.

## ***2. Total Quality Management***

### **2.1. KEY ELEMENTS OF TQM**

There is no consensus on key elements of the TQM philosophy, but people seek and adopt key areas to work in order to establish TQM philosophy in their organizations. One such approach in Davis and Goetsch's book (1997) "Introduction to Total Quality" gives a concise description of the key elements of the Total Quality as listed below:

- Strategically based,
- Customer focus (Internal and external),
- Obsession with quality,
- Scientific approach to decision making and problem solving,
- Long-term commitment,
- Teamwork,
- Continual process improvement,
- Education and training,
- Freedom through control,
- Unity of purpose,
- Employee involvement and empowerment,

In the following pages, we explain TQM's eleven critical elements step by step in order to demonstrate each of the applications' benefits.

#### **2.1.1. Strategically Based**

TQM organizations have a comprehensive strategic plan that contains at least the following elements: vision, mission, broad objectives, and objectives that must be completed in order to accomplish the broad objectives. The strategic plan of a Total Quality Organization (TQO) is designed to give it a sustainable competitive advantage between the same level organizations. The competitive advantages of a TQO are geared toward achieving world leading quality and improving on it continually forever.

For an Infantry Battalion mission and vision is clearly identified strategically. The vision of a Turkish Infantry Battalion is envisaged as “to be the best among the same types of battalions” and the mission of the infantry battalion is accepted as "improving effectiveness and productivity of the unit in the battlefield"

#### **2.1.2. Customer Focus**

In TQM philosophy, the customer is the driving factor. This applies to both internal and external customers. External customer defines the quality of product or service delivered. Internal customer helps to define the quality of people, processes, and environments associated with the products or services. For an Infantry Battalion, the brigade (the senior level of command), the officers of the battalion, the non-commissioned officers (NCOs), and the soldiers of the battalion are internal customers. The Turkish citizens are the external customers of the Battalion.

### **2.1.3. Obsession with Quality**

In TQM internal and external customers define quality. After defining and achieving priorities in quality organization should go on to meet and exceed this definition. This means all personnel at all levels should be obsessed with quality. When an organization is obsessed with quality, good enough is never good enough.

In a Turkish Infantry Battalion the structure and command/control procedures are defined strictly. All tasks are defined very well. Nevertheless it would not be possible to carry out a successful operation without the contributions of the motivated soldiers and mission would not be completed if the higher command would not approve it. Customers have to be satisfied with the outcome. For this reason, *Obsession with quality* is a critical topic in the Army.

TQM's tools would arouse subordinates' desires toward a more satisfactory work environment. In this TQM environment, subordinates would look for ways in order to increase their performance.

### **2.1.4. Scientific Approach**

“TQM is a two-part equation. While first part consist of people skills, involvement, and empowerment another important part of the equation is the use of scientific approach in structuring work and in decision-making and problem solving that relates to the work. This means that hard data are used in establishing benchmarks, monitoring performance, and making improvements.”(Davis and Goetsch, 1997).



In Turkish Army commanders in every level allow their subordinates to take part in decision-making process but most of the time scientific tools and techniques are neglected. In Chapter 4 seven tools of TQM are introduced.

#### **2.1.5. Long-Term Commitment**

“TQM is not just another management innovation; it is a new way of doing business that requires a whole new corporate culture. For that reason too few organizations begin to implementation of TQM with the long-term commitment to change that is necessary for success. Organizations obviously do not understand the approach; hire an expert and throw some money at a particular department and wait for achievement immediately. Their evaluation about the TQM is obviously nonsense.”(Davis and Goetsch, 1997).

Company and battalion commanders' belief on the TQM philosophy could create great effectiveness in the units. In the long run, commanders without futile ideas such as "*TQM is a new way of apple-polish*", or "*temporary management myth*" would generate great energy for the establishment of TQM. U.S. Navy got better outputs from the qualified processes after having implemented TQM philosophy for 15 years.

#### **2.1.6. Teamwork**

"In traditionally managed organizations, the best competitive efforts are often between departments within the organization. Internal competition should be focused on improving quality, and, in turn, external competitiveness. “Where once there may have been barriers, rivalries, and distrust, the quality company fosters teamwork and partnership with the workforce and representatives. This partnership is not a

pretense, a new look to an old battle. It is a common struggle for the customer, not separate struggles for power. The nature of a common struggle for quality also applies to relationship with suppliers, regulating agencies, and local communities.”(Scholtes, 1996).

In companies and battalions of the Army, commanders are familiar with teamwork but without methodology. Infantry units always have to cooperate with support units such as artillery and quartermaster units. Effective teamwork skills would produce better results. At the same time company and battalion commanders have to always work together with their subordinates.

#### **2.1.7. Continual Improvement of Systems**

"Products are developed and services delivered by people using processes with environment (systems). In order to improve the quality of products or services continuously which is fundamental goal in a total-quality management, it is necessary to continually improve systems." (Davis and Goetsch, 1997).

Turkish people start every work with a great enthusiasm. This enthusiasm goes on until initial success generates. In the next phase, without getting the big pie, they feel satisfied with what they achieved and they stop. Greater successes would be realized if the organizations choose to improve process consistently.

### **2.1.8. Education and Training**

“Education and training are fundamental to TQM, because they represent the best way to improve people on a continual basis. According to Scholtes, “In a quality organization everyone is constantly learning. Management encourages employees to constantly elevate their level of technical skill and professional expertise. People gain an ever-greater mastery of their jobs and learn to broaden their capabilities.”(Davis and Goetsch, 1997).

People will learn how to work smart through education and training. If there is no education and training for scientific procedures of TQM then it will not be possible to create a TQM philosophy.

### **2.1.9. Freedom through Control**

“Involving and empowering employees is fundamental to TQM as a way to simultaneously bring more minds to bear on the decision-making process and increase the ownership employees feel in decisions that are made. Employee involvement is not a loss of management control; in fact control is fundamental to TQM. The freedoms enjoyed in a TQM setting are actually the result of well planned and carried out controls.”(Davis and Goetsch , 1997).

In Turkish war history there are good and bad examples about the issue “control on people.” Enver Pasha’s (Full general in Turkish Army in WW I) bad decision, which caused approximately a hundred of thousand people’s sacrifice in Sarikamış, was generated after an extensive inspection. Enver Pasha made an

inspection on troops in order to check the combat readiness but his subordinate commanders and headquarter misled him and made him to believe everything is as desired. The cost of this bad decision due to a misguided inspection was the lives of 140,000 people.

On the other hand Turkish history has many examples that show even an individual could affect the results of a combat or even a war, without taking even an order from the headquarter. These examples show that control on people does not always prove success.

#### **2.1.10. Unity of Purpose**

“Historically, management and labor have had an adversarial relationship. From the perspective of TQM, who or what is to blame for adversarial management-labor relations is irrelevant. What is most important is this; in order to apply the TQM approach, organizations must have unity of purpose. This means that internal politics has no place in a TQM organization. Rather, collaboration should be the norm.”(Davis and Goetsch ,1997).

Commanders should explain their coworkers that TQM is not a temporary managerial tool tested. A shared vision would make everything easier. Officer, NCOs, and soldiers should believe that TQM is philosophy that works for them and for the Army’s goodness.

#### **2.1.11. Employee Involvement and Empowerment**

“The basis for involving employees is twofold. First, it increases the likelihood of a good decision, a better plan, or a more effective improvement by

bringing more minds to bear on the situation-not just any minds, the minds of the people who are closest to the work in question. Second, it promotes ownership of decisions by involving the people who will have to implement them.”(Davis and Goetsch 1997).

Quality circles, brainstorming and cause-effect diagrams are just a few tools of TQM that targets the employee involvement and empowerment. In a hierarchical organization, such as army, maybe it is not possible to empower subordinates in every decision making process, but commanders should find ways to allow more brains to generate creative ideas in decision-making process.

### ***3. Quality Improvement Process***

TQM provide many constructive tools for organizations, which face great challenges in the years ahead. The challenges are complex and require contribution of everyone involved in the organization. Deming presage that equipping a community to address change in an efficient and productive manner can be accomplished using the knowledge and tools of TQM.

Quality improvement represents a key principle of TQM, and quality improvement can be achieved by improvement of work processes. Spain (1996) defines process and work process as "Conversion of measurable inputs into measurable outputs through an organized sequence of steps or transformations. A work process can be defined as the sequential integration of inputs or objects (people, ideas, materials, methods, and machines) so as to produce value-added outputs for some other process or for delivery to internal or external customers." (Spain & Wishoff 1996).

Every work process is part of a larger process and, may be made up of smaller ones, everyone engages in a work process. Even though most work processes have been developed in long periods of time and have been modified by people with varying degrees of management status, work processes are rarely understood.

Anyone of us may have said at some point "Sure, my policy is always try to do things the right way. So show me what can actually be done differently to

improve the quality of my work.” Quality Improvement Process (QIP), is described in following pages would help us to find those different ways of doing things.

TQM philosophy desires continuous improvement in all processes accomplished by the organizations. While Deming was teaching Japanese how to improve and how to introduce this continual philosophy into the people’s mind, people in the U.S. were in comfort. After Japanese entrance into the world market U.S. was any more at ease.

Today companies have to live as G.A. Pavlov described, “ Live everyday like your hair’s on fire.” That is why TQM gained great emphasis on today’s global world.

### **3.1. PROCESS IMPROVEMENT**

Process improvement constitutes the nucleus part of the TQM philosophy. For this reason we will explain steps in improvement process. In explaining the issue M. Brassard’s “guide for continuous improvement in U.S. Navy, 1991” and Department of Navy’s “system approach to process improvement lecture notes, 1993” were the main sources.

**3.1.1.Step 1:** "Select the process to be improved and establish a well-defined process improvement objective.”(Brassard, 1991).

“A standardized process improvement model allows organizations to look at how it performs work. When all of the major players are involved in process improvement, they can collectively focus on eliminating waste of money, people, materials, time, and opportunities. The ideal outcome is that jobs can be done cheaper, quicker, easier, and safer.”(Brassard, 1991).

Quality improvement process begins once it has been identified and documented. Documentation of the process means defining the area where the quality improvement is most needed.

In addition to the quality improvement researchers, we observed in the questionnaire we applied in a Turkish battalion, selected process, team's vision, mission and strategic objectives have to be supported by the upper management level in the beginning of the process improvement. Shop floor workers or the subordinates must also agree that the chosen process needs to be improved in the first phase.

**3.1.2.Step 2:** "Organize a team to improve the process." (Brassard, 1991).

"This involves selecting the "right" people to serve on the team; identifying the resources available for the improvement effort, such as people, time, money, and materials; setting reporting requirements; and determining the team's level of authority." ([www.dod.gov/qualityimprovement.html](http://www.dod.gov/qualityimprovement.html)).

In designing the team also the unit commanders have to take into consideration the following issues:

- The team must consist of right people.
- The team must consist of 5 to 7 members not more.
- The environment must generate trust for the team members.
- They must be encouraged that they would do something in favor of the organization.

These elements may be formalized in a written charter. In Appendix D we added a formalized a sample written charter. A written charter would help commanders who intended to institute a TQM philosophy in their units.



**3.1.3.Step 3:** “Define the current process using a flowchart.”  
([www.dod.gov/fundamental.html](http://www.dod.gov/fundamental.html)).

This tool is used to generate a step-by-step map of the activities, actions, and decisions, which occurs between the starting and stopping points of the process. Before a team can improve a process, the members must understand how it works. The most useful tools for studying the current process are: flowchart, run/control chart, Pareto chart and check sheet. Most of the quality gurus recommend starting with flowcharts in order to see the whole picture of the process. To develop an accurate flowchart the team assigns one or two members to observe the flow of work through the process. It may be necessary for the observers to follow the flow of activity through the process several times before they can see and chart what actually occurs.

As an example, “launching a helicopter” is a cross-functional process involving contributing processes performed by bridge personnel, controllers, firefighting teams, the fueling team, engineers, the cargo handling team, flight deck personnel, and others. Each of these contributing processes has to be accurately flowcharted and clearly understood before the larger process can be improved.

**3.1.4.Step 4:** “Simplify the process by removing redundant or unnecessary activities.”(Brassard, 1991).

People may have seen the process on paper entirely for the first time in Step 3. This can be a real eye-opener, which prepares them to take these first steps in improving the process. Team member would identify similar steps, which do not affect the output and which can be eliminated. They would compare activity needs with its performer’s abilities and if the step adds value to the product or service produced by the process. If they decide that activity would be eliminated in the

process, the team should create a flowchart of the simplified process and search for if the simplified process produces products or services acceptable to customers and in compliance with applicable existing directives.

If the answer is *yes*, and the team has the authority to make changes, they should present the new simplified flowchart.

**3.1.5.Step 5:** "Develop a plan for collecting data and collect baseline data." (Brassard, 1991).

"Data collected according to a plan established by the team will be used as the yardstick for comparison later in the model. This begins the evaluation of the process against the process improvement objective established in Step1. When the team develops a data collection plan, they must first identify the characteristic of the product or service that has to be hanged in order to meet the objective." ([www.dod.gov/fundamental.html](http://www.dod.gov/fundamental.html)).

Collecting data would enable commanders' studies to shift to a more scientific implementation. Data can help them to define and focus more on the real problems. As an example, if a company commander senses that his subordinates' motivation is not at the desired level he has to take measures to increase it. Data collection by using questionnaires, interviews or observations can allow the company commander to figure out the real problems.

**3.1.6.Step 6:** "Assess whether the process is stable."(Brassard, 1991).

"Control chart or run chart are the main tools in assessing whether the process is stable and help the team to gain better understanding of what is happening in the process."([www.dod.gov/fundamental.html](http://www.dod.gov/fundamental.html)).

The collected data provide opportunity to set up control and run charts. Both of these tools organize the data and allow the team to make a sense of a mass of

confusing information. Both of these two tools are important because they help the team to identify special cause variation in the process. Whenever an individual or a team repeats a sequence of actions, there will be some variation in the process. Depending on the nature of the variation -special cause-, the team may choose to act in two directions.

**3.1.7. Step 7:** “Assess whether the process is capable.” (Brassard, 1991).

In this step team goes on to identify the root causes of the process inefficiency. The team plots a histogram to compare the data collected against the process improvement objective established in Step 1. Usually the process simplification actions in Step 4 are not enough to make the process capable of meeting the objective and the team will have to continue on search of root causes.

Once the process has been stabilized, the data collected in Step 5 is used again. This time the team plots the individual data points to produce a bar graph called a histogram. To prepare the histogram, the team superimposes the target value for the process on the bar graph. The target value was established in Step 1 as the process improvement objective. If there are upper and/or lower specification limits for the process, the team should plot them too.

After examining the shape created by plotting the data on the histogram, the team has to decide whether the shape is satisfactory and whether the data points are close enough to the target value. These are subjective decisions. If the team is satisfied with both the shape and the clustering of data points, they can choose to standardize the simplified process or to continue through the steps of the Basic Process Improvement Model.

**3.1.8.Step 8:** “Identify the root causes which prevent the process from meeting the objective.” (Brassard, 1991).

In this step the team begins the PDCA Cycle by identifying the root causes of a lack of process capability. Deming developed the PDCA cycle and it consists of steps as mentioned below:

P: Plan

D: Do

C: Check

A: Act

The data the team has looked for so far measure the output of the process. To improve the process, the team must find what causes the product or the service to be unsatisfactory. The team uses a cause-and-effect diagram to recognize root causes.

“Once the team recognize possible root causes, it is important to collect data to determine how much these causes actually affect the results. The team can use a Pareto chart to show the relative importance of the causes they have identified. At the end of the chapter information in designing a Pareto charts in a step by step approach are added.” ([www.dod.gov/fundamental.html](http://www.dod.gov/fundamental.html)).

**3.1.9.Step 9:** “Develop a plan for implementing a change based on the possible reasons for the process’s inability to meet the objective set for it.”(Brassard, 1991).

In Step 9, planning phase of the model starts. The team picks one of the root causes to work, which is the most voted cause or the highest item in the Pareto analysis. They then develop a plan to implement a change in the process to reduce or eliminate the root cause. The major features of the plan include changing the

simplified flowchart created in Step 4 and making all of the preparations required implementing the change.

**3.1.10.Step 10:** “Test the changed process and collect data.” (Brassard, 1991).

It is mostly recommended that, if it is feasible, the change should be implemented on a limited basis before it is applied to the entire organization. The changed process could be instituted in a single office or work center while the rest of the command continues to use the old process.

Whatever method the team applies, the goals are to prove the effectiveness of the change, avoid widespread failure, and maintain command-wide support. In some situations, a small-scale test is not feasible. If that is the case, the team will have to inform everyone involved of the nature and expected effects of the change and conduct training adequate to support a full-scale test.

**3.1.11.Step 11:** “Assess whether the changed process is stable.” (Brassard, 1991).

Steps 11 and 12 together comprise the Check phase of the PDCA cycle. The team uses a control chart or run chart in order to determine new process’ stability. If the process is stable, the team can move on to Step 12; if not, the team must return the process to its former state and plan another change.

**3.1.12.Step 12:** “Assess whether the change improved the process.” (Brassard, 1991).

Using the data collected in Step 11 and a histogram, the team determines whether the process is closer to meeting the process improvement objective established in Step 1. If the objective is met, the team can progress to Step 13; if not, the team must decide whether to keep or discard the change.

**3.1.13.Step 13:** “Determine whether additional process improvements are feasible.” (Brassard, 1991).

The team is faced with this decision following process improvement has the choice of embarking on continuous process improvement by re-entering the model or simply monitoring the performance of the process until further improvement is feasible.

1. Identifying possibilities for making further process changes by reviewing the process improvement model.
2. Standardizing the changed process without making further efforts to improve it.

If the second decision is made, the team is still involved in documenting the changes, monitoring process performance, and institutionalizing the process improvement.

Quality improvement tools are needed in most of the process improvement phases. We summarized the following TQM tools:

- Run and Control Charts.
- Pareto Charts.
- Fishbone Diagrams.
- Check Sheet.
- Histograms.
- Scatter Diagrams.
- Stratification.

### **3.2. OVERVIEW OF TQM TOOLS**

In the following section a brief summary of the TQM tools is submitted.

#### **3.2.1.Run Charts:**

A run chart is the most basic tool used to display how a process performs over time. It is a line graph of data points plotted in chronological order—that is, the sequence in which process events occurred. These data points represent measurements, counts, or percentages of process output. Run Charts are used to assess and achieve process stability by highlighting signals of special causes of variation. In order to prepare a run chart:

#### **3.2.2.Control Charts:**

Control chart is a graphical display of a quality characteristic that has been measured or computed from a sample versus the sample number or time. The chart contains a centerline that represents the average value of the quality characteristic corresponding to the in-control state. Two other horizontal lines, called the upper control limit (UCL) and the lower control limit (LCL) are also drawn. These control limits are chosen so that if the process is in control, nearly all of the sample points will fall between them. As long as the points plot within the control limits, the process is assumed to be in control, and no action is necessary. A problem with the run charts, and in fact, many of the other tools, is that it does not help us understand whether the variation is the result of special causes—things like changes in the material used, machine problems, lack of employee training—or common causes that are purely random. Dr. Walter Stewart develops the control chart to separate the “special causes” from “common causes.”

A point that plots outside of the control limits is interpreted as evidence that the process is out of control, and investigation and corrective action is required to find and eliminate the assignable causes responsible for this behavior. The control points are connected with straight-line segments for easy visualization. Even if all the points plot inside the control limits, if they behave in a systematic or nonrandom manner, then this is an indication that the process is out of control.

### **3.2.3. Pareto Charts**

A Pareto chart is a very useful tool whoever needs to separate the important from the trivial. It is used to establish priorities. It is particularly effective in helping sort out what problems or causes of problems to pursue first. By cascading Pareto charts user determine the most significant category in the first chart, then making a second chart related only that category, and repeating this as far as possible, to three, four times. If the cascading were done properly, root causes of problems would be determined rather easily.

### **3.2.4. Fishbone Diagram**

It is used to identify and isolate causes of a problem. It is not based on statistics. This chart is simply a means of visualizing how the varies factors associated with a process affect the process' output. It provides a graphical view of the entire process under investigation.

### **3.2.5. Check Sheet**

The check sheet is a useful tool for variety of application. Many organizations are literally drowning in their own data, while at the same time not knowing what is actually going on; they are data rich and information poor. Having access to data is



essential. However, problems arise when data cannot be winnowed from the important and when there is so much of it that it cannot be easily translated into useful information. Check sheets help deal with this problem. Its utility is restricted only by the imagination of the person seeking information. Check sheet can take any form. The only rules are that data collection must be equivalent of entering a check mark and that the displayed data be easily translated into useful information.

#### **3.2.6. Histograms**

The histogram evolved to meet the need for evaluating data that occurs at a certain frequency. This is possible because the histogram allows for a concise portrayal of information in a bar graph format.

The histogram clearly portrays information on location, spread, and shape that enables the user to perceive subtleties regarding the functioning of the physical process that is generating the data. It can also help suggest both the nature of, and possible improvements for, the physical mechanisms at work in the process.

It is possible to calculate the process variability from the data and from the frequency distribution curve. The flatter and wider the frequency distribution, indicate greater the process variability. The taller and narrower the curve, indicates less variability (<http://deming.eng.clemson.edu/pub/tutorials/qctools/histm.htm>).

#### **3.2.7. Scatter Diagrams**

The sixth of the seven tools is the scatter diagram. It is the simplest of the seven and of the most useful. The scatter diagrams are used to determine the correlation (relationship) between two variables. Scatter diagrams are useful in

testing the correlation between process factors and characteristics of output flowing out of the process (<http://deming.eng.clemson.edu/pub/tutorials/qctools/histm.htm>).

### **3.2.8. Stratification**

Stratification, is also a simple tool, involves investigating the cause of a problem by grouping data into categories. This grouping is called stratification. The data groups might include data relative to the environment, the people involved, the machine(s) used in process, materials, and so on. Grouping of data by common element or characteristic makes it easier to understand the data and pull insight from it.

As in the case of cascading Pareto chart the power of the stratification lies in the fact that if you stratify far enough you will arrive at a root cause of the problem. Only when root causes are corrected will the problem be solved.

## **4. Quality Improvement Application in Turkish Infantry Battalion**

In every quality improvement application, quality improvement team members have to be trained on the issues we discussed in previous chapters. In this study we did not carry out all the training needed. If we had had more time; we know that we had to assess the training needs of the improvement team and had to prepare a training curriculum (as used in Turkish Army military and displayed on Appendix A) in consistence with training needs and had to carry out the training.

We carried out a questionnaire for the internal customers who are enlisted soldiers in the Battalion. We applied 8 categories and 32-question survey in order to assess the potential causes of quality. The survey applied to 30 enlisted soldiers who are chosen randomly. The commanders of the soldiers were not in the area where the survey taken place. The questions of the questionnaire are displayed on Appendix B, but as a brief summary of the results we got the followings (Detailed results can be seen on Appendix C). After the analysis of the survey the following potential causes of low quality have been figured out.

- Problems with *nutrition system* agreed on by % 30,95 of the responders of the survey as the most important issue.
- As a second problematic area, enlisted soldiers have chosen *military canteen service* (% 19,05).
- Problems with *meeting with visitors, visitors lounge* ranked as 3<sup>rd</sup> in problem list (%17,86).

No	Code	Problematic Area	Votes in numbers	Votes in percentages
1	Ta	Nutrition System	26	<b>30.95%</b>
2	Tb	Cloth-washing System	5	5.95%
3	Tc	Dormitory Condition	0	0.00%
4	Td	Bathing System	10	11.90%
5	Te	Equipment	5	5.95%
6	Tf	Visitor's Lounge	15	<b>17.86%</b>
7	Tg	Canteen	16	<b>19.05%</b>
8	Th	Soldiers' Club	2	2.38%
9	Ti	Barber Service	0	0.00%
10	Tj	HealthCare System	5	5.95%
		<b>Total</b>	84	100.00%

After discussing these problems with steering committee members who were higher command officers in the brigade, we agreed on establishing a quality improvement team. The team charter can be seen on Appendix D.

At the first meeting of the quality improvement team, team members studied on improvement process and analyzed the problem assessment survey. Nutrition system is chosen as the most important and urgent problem to solve. In the following meeting the team applied the suitable TQM tools.

Team members prepared a flowchart diagram in Figure 4.1. to depict the nature and flow of the steps in the nutrition process. The team found it helpful to compare this as-is flowchart with the way the process is supposed to work.

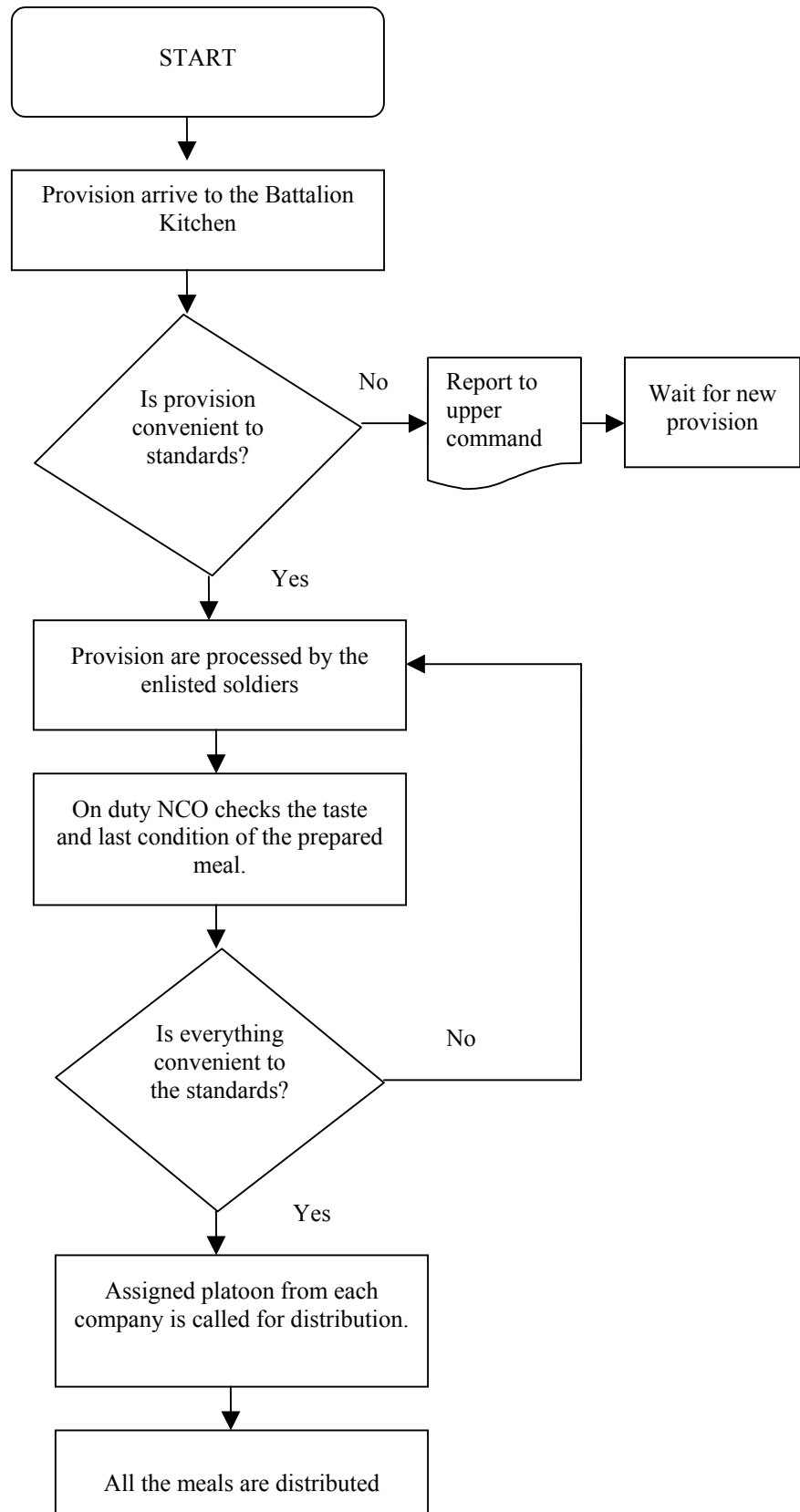


FIGURE 4.1. Flowchart of nutrition system in Turkish Infantry Battalion.

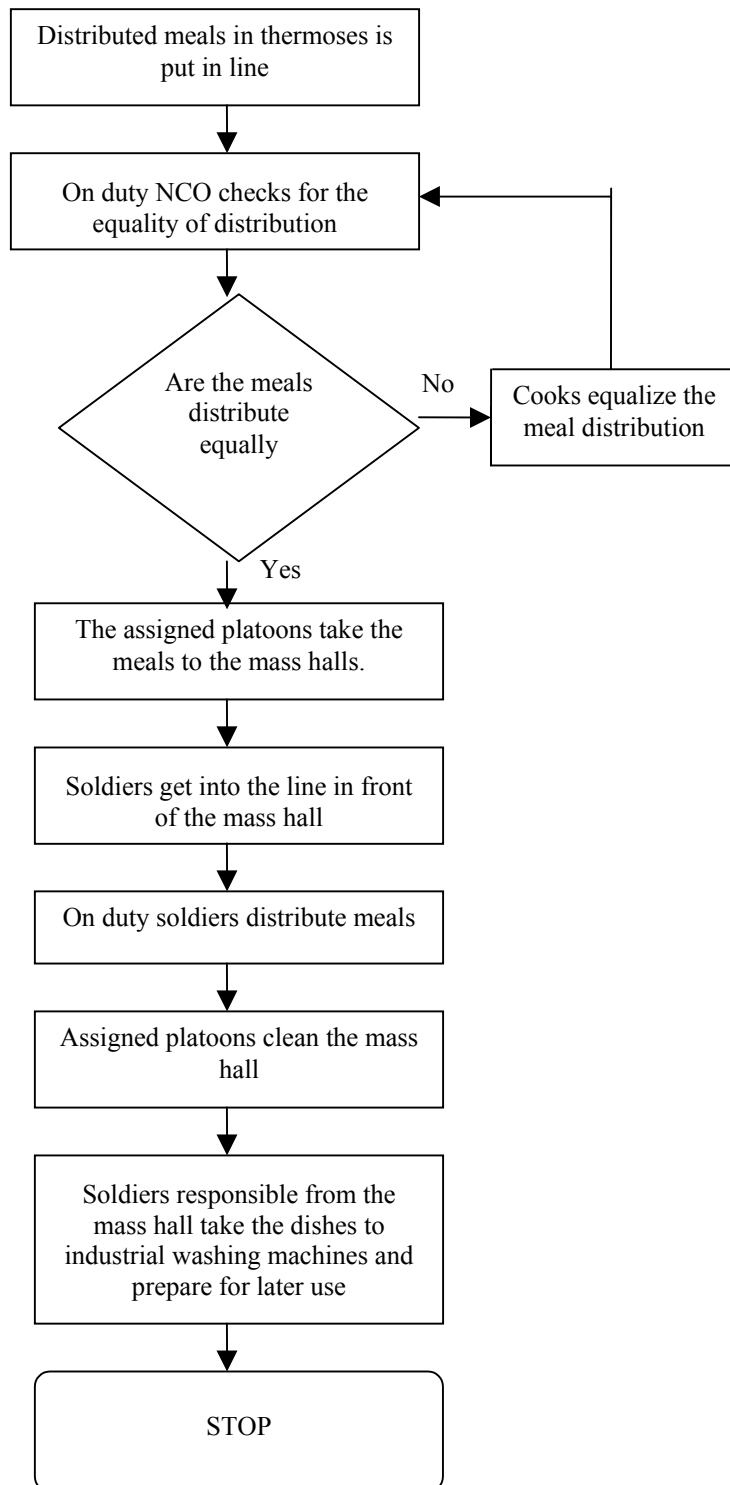


FIGURE 4.1. Flowchart of nutrition system in Turkish Infantry Battalion (Continued).

After the process flowchart has been drawn, the team generated many logical and illogical ideas freely by a brainstorming session. Team members discussed the generated ideas and while some of them canceled, remaining causes are ranked in accordance with their importance and satisfaction status. In this phase multi-voting is used as a main tool to create a consensus and to avoid power distance among the members.

Brainstorming tool also facilitated cause-and-effect diagram set up. Cause and effect diagram was the main tool for choosing a starting point. Quality improvement team constructed the cause-and-effect diagram in Figure 4.1. Main problems and their votes related with main 4 categories could be summarized as below.

**1. Problems related with equipment and materials;**

- Provision allocated is not enough (8).
- Provision allocated is not quality assured (5).
- Stream based cooking does not produce good results (6).
- Tools used in kitchen and in mass-hall are worn out (4).
- Tools are not designed for fair distribution of the meals (5).
- Tools are not hygienic (6).

**2. Problems related with environment;**

- Mass-hall is too crowded (6).
- Mass-hall is too far away (10).
- Queue is too long (7).
- No music broadcasting in mass-hall (5).
- Too many units share the same mass-hall (8).

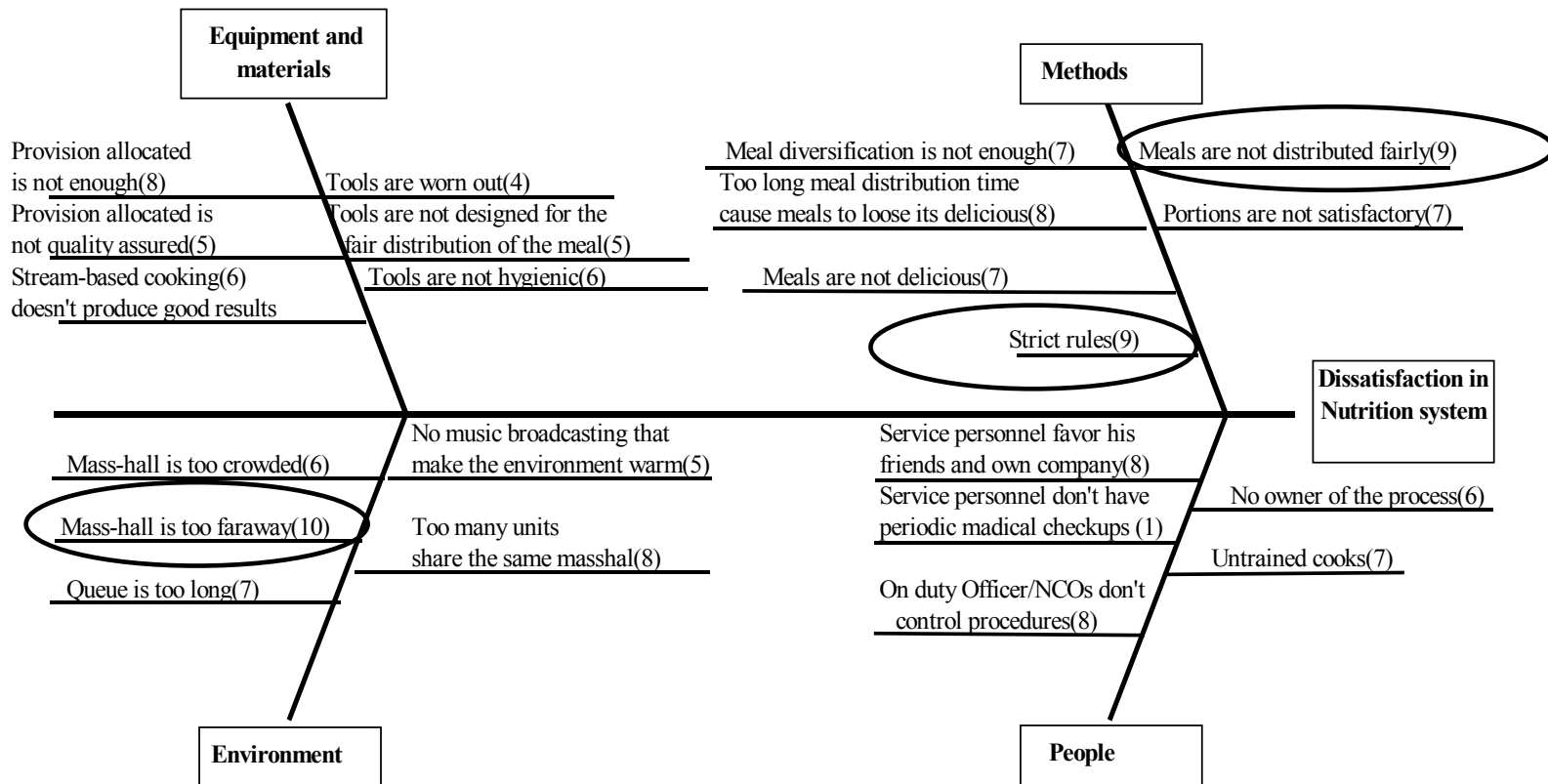
**3. Problems related with methods;**

- Meal diversification is not enough (7).
- Too long meal distribution time cause meals to loose its delicious (8).
- Meals are not delicious (7).
- Meals are not distributed fairly (9).
- Portions are not satisfactory (7).
- Strict rules (9).

**4. Problems related with people;**

- Service personnel favor for his friends, his own company soldiers (8).
- Service personnel do not have periodic medical check-ups (1).
- On duty officers/NCOs do not control procedures (8).
- No owner of the process (6).
- Untrained cooks (7).



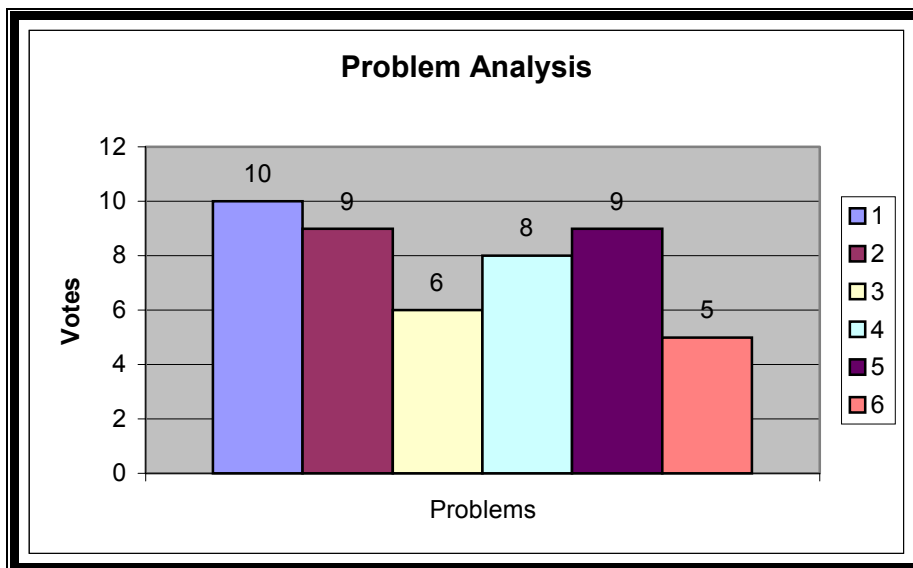


Most voted causes of the problems are put in the first ranks when beginning to investigate the sub causes of the problem. As a result of this analysis “unfair distribution of meals” which got 9 votes from team members, has emerged as the root causes of dissatisfaction, and improvement team started with that issue.

Team used another tool of the TQM, which is cascading Pareto analysis. At the first phase improvement team members decided on figuring out the potential root causes of unfair distribution of meals. After a short brainstorming session, members decided on 5 root causes of the problem with their votes and ranked them as follows:

No.	Problem Root Causes	Votes
1.	<b>Soldiers working in mass-hall favor and serve more to their citizen and their own company friends more than the other enlisted soldiers</b>	10
2.	Tools are not designed for fair distribution of meals.	9
3.	Soldiers working in mass-hall are not trained on fair distribution issues.	6
4.	Organizational cultural issues.	8
5.	On duty officers/NCOs do not control fair distribution of the meals.	10
6.	Service plates are not designed for fair distribution of the meals.	5
7.	The kitchen on the measures of distribution of each meal does not inform from Service personnel.	7

**Cascading Pareto Analysis Number 1**

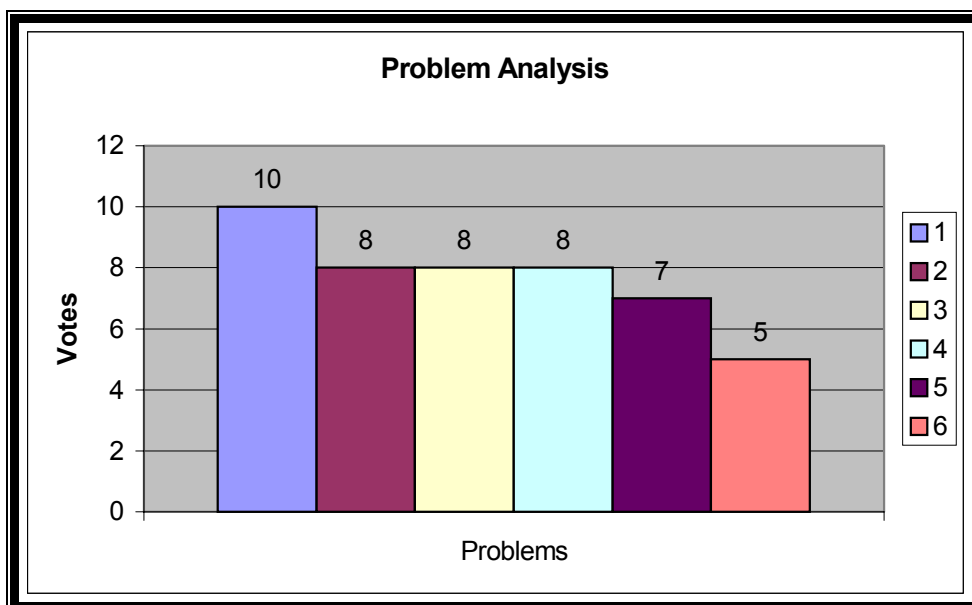


After the initial cascading Pareto analysis we observed, “A soldier working in mass-hall favor and serve more to their citizens and their own company friends more than the other enlisted soldiers” constituted the main cause of the problem. Improvement team went on trying to find out the main causes of this sub cause of that problem.

Brainstorming again came to the picture and team members submitted their ideas and voted as follows:

No.	Problem Root Causes	Votes
1.	No rotation in soldiers working in mass-hall	10
2.	Soldiers with psychological problems working in mass-hall	8
3.	Organizational culture (citizenship force them to unfair distribution of meals.	8
4.	No precautions taken to prevent unfair distributions	8
5.	Battalion/Company are not aware of such a problems of the enlisted soldier	7
6.	No reward and punishment for unfair / fair distribution of meals	5

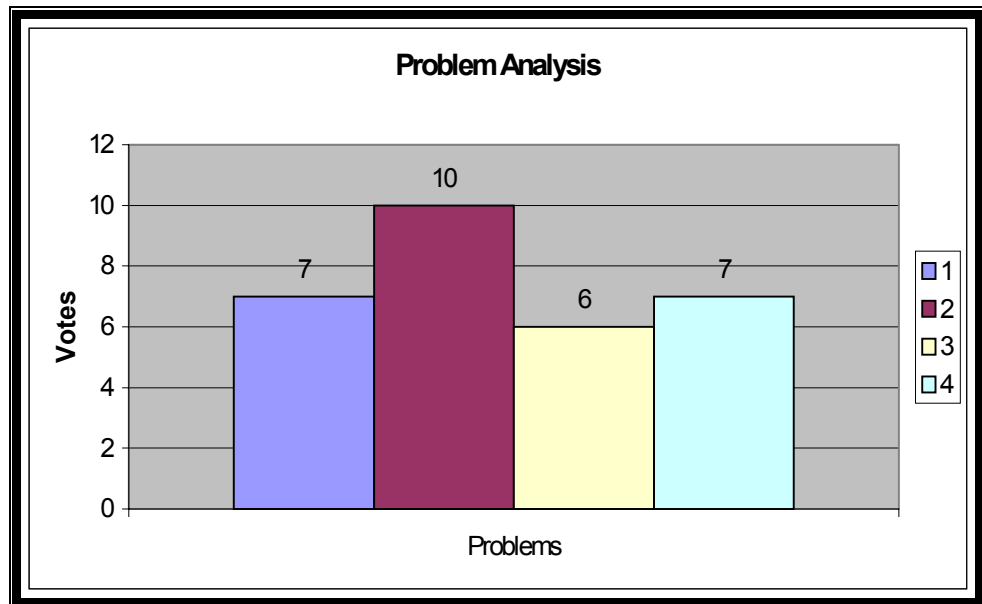
**Cascading Pareto Analysis Number 2**



In the second phase of the analysis, team observed that ”No rotation in soldiers working in mass-hall” constitutes the main sub-cause of the problem. Analysis went on by brainstorming once more in order to find out the main sub-causes again. In the third phase we obtained the following results:

No.	Problem Root Causes	Votes
1	Company commanders have intention to attain worse personnel to the mass-hall and keep the qualified personnel within the company.	7
2	<b>No professionalism exists in these duties.</b>	<b>10</b>
3	Service personnel stay too much in this	6
4	Enlisted soldiers are reluctant to be attained to this duty.	7

### Cascading Pareto Analysis Number 3



As can be seen in the last cascading Pareto analysis second choice took the most votes and team members decided to find out solutions for this main sub-cause. Solutions for professionalism can be achieved by three ways:

1. Whole replacement of all personnel with professional soldiers.
2. Employing civilian personnel in the kitchen and in the distribution desk.
3. Ending the military cuisine system and charging a catering service for the nutrition system.

It was not possible to achieve the first two preferences since employment of new personnel; and transformation to professional army requires longer procedures and more detailed researches than the thesis time horizon can cover. In such a challenging situation we applied again the previous 8 categories, 32-question survey,

and an additional comparison questionnaire to another battalion, which is in trial period of a new system. In the second battalion a civilian-catering firm was serving in the nutrition system.

As in the previous survey, questionnaire applied to 30 enlisted soldiers who are chosen randomly. In the second battalion also the commanders of the soldiers were not in the area where the survey was taken place. After the analysis the following potential causes of low quality has been figured out

- Only 1.23 % of the responders observed the *nutrition system* problems as the main problem of the battalion. This was a severe drop when compared with the previous military unit (30.95 %), which was using military cuisine.
- In the second military battalion that we applied the survey enlisted soldiers chose *problems soldier's club chosen* (% 30.86) as the main problematic area.
- Problems with *visitor lounge and visitors hours* ranked as the second main problem (% 27.16).
- Problems with *canteen service* ranked as 3<sup>rd</sup> problem (%16.05).

No	Code	Problematic Area	Votes in numbers	Votes in percentages
1	Ta	Nutrition System	1	1,23%
2	Tb	Cloth-washing System	0	0,00%
3	Tc	Mass hall Condition	10	12,35%
4	Td	Bathing System	0	0,00%
5	Te	Equipments	0	0,00%
6	Tf	Visitor's Lounge	13	16,05%
7	Tg	Canteen	22	27,16%
8	Th	Soldier's Club	25	30,86%
9	Ti	Barber Service	9	11,11%
10	Tj	Healthcare System	1	1,23%
		<b>Total</b>	81	100,00%

We applied also an additional questionnaire. This additional questionnaire can be seen on Appendix E. We asked enlisted soldiers in the second infantry battalion 13 additional comparison questions. Comparison of these two systems was easy for them because they were the customers of both systems. Catering firm was serving for two months in this battalion. After the analysis of the questionnaire we observed great improvement as listed below. Improvement percentages are calculated directly from the answers given to the comparison questions.

- |   |               |
|---|---------------|
| 1. Satisfaction after the implementation              | : % 97 better |
| 2. Portions in meals evaluation                       | : %90 better  |
| 3. Evaluation of taste                                | : %100 better |
| 4. Quality of provision in meals                      | : %93 better  |
| 5. Warmness of meals                                  | : %93 better  |
| 6. Fairness of distribution                           | : %86 better  |
| 7. Diversity of meals                                 | : %71 better  |
| 8. Queue in meals                                     | : %100 better |
| 9. Consistence in keeping of meals for duty personnel | : %93 better  |
| 10. Crowd in mass-hall                                | : %52 better  |
| 11. Interest of duty NCOs in mass-hall                | : %81 better  |
| 12. Service personnel's interest in hygienic issues   | : %86 better  |
| 13. Service tools' hygiene                            | : %79 better  |

**4.1.1. COST RELATED ISSUES IN NUTRITION SYSTEM**

Introducing a civilian firm to the nutrition system generated improvements. On the other hand, we thought that we had to deal with the cost and other issues related with the new system. We interviewed officers in Army

headquarters and used cooperative benchmarking with a leading civilian catering firm serving only to civilian firm in the market.

Using military cuisine system or contracting with a catering firm brings costs for the Army.

***a. Cost related with using military cuisine system;***

- Human resources allocated for managing a mass hall and kitchen, allocating cooks, service personnel, dishwasher personnel, and a duty officer/NCOs for kitchen and mass hall.
- Time allocated by company commanders and NCOs for managing a mass-hall and kitchen; responsibilities related with perpetuating a mass-hall (Equipment responsibilities, hygienic rules, buying cooking and servicing responsibility load heavy responsibilities that drive commanders to spare time them).
- Conflicts related with distribution of meals between soldiers.
- Unsatisfied soldiers (which are main customers of the system).
- Allocated personnel to the mass-hall and kitchen do not get enough military training (Although these personnel will be used in the battlefield as cooks they have to get elementary military training such as surviving in battlefield).
- Transportation of provisions from sales points to military kitchen.
- Cleaning cost of mass-hall and sustaining a military dishwashing system.
- Employing a professional cook in the military kitchen.

***b. Cost related with using catering service;***

- Cost of a soldier in military cuisine system and in contracting with civilian catering firms can be summarized as below. (Table 4.1. and Appendix F)

- Cost of one personnel in military cuisine system : \$ 1,48

- Cost of one personnel when served with catering service : \$ 2,00

- Allocated human resources for controlling the activities of the catering company.
- Efforts for controlling security issues related with catering company.
- Efforts for battle-time readiness (In previous system cooks were doing their own job what they will do in the battle-time; now additional training is needed for military cuisine to function in battlefield properly).

**4.2. FURTHER STUDIES ON THE OTHER PROBLEM OF NUTRITION SYSTEM**

In further team meetings members discussed the other branches of the cause-and-effect diagram and decided to advise higher command the following measures and improvements in the nutrition system.

**4.2.1. Studies related with problem of crowd in the mass-hall**

Results of a short brainstorming session short and long-term solutions for this problem suggested by the team members were as below:

1. Long-term solutions;
  - Building another mass-hall.



- Relocating and combining some of the facilities in order to gain a new place for redecorating a new mass-hall.
- Increasing fast-food alternatives and allowing customers to make choices between them.

2. Short-term solutions;

- Redecorating mass-hall.
- Increasing distribution desks and increasing service personnel.

**4.2.2. Studies related with tools used in distribution desk and in kitchen;**

- Putting scales (as used some of the Turkish fast-food centers) in distribution desks would decrease complaints related with unfair distribution of the meal.
- Using tools that are designed especially for each meal for fair distribution of the food (As used some of the fast food centers such as serving potato fringes). Using plates for distributing rice; using scale for distributing meat, using scaled containers for etc.
- Replacing service tools with more elegant ones. Using porcelain service tools instead of chrome service tools.

**4.2.3. Studies related with problems in food diversification;**

- Officers/NCOs responsible from nutrition system would use more data collection methods in order to get more feedback from the customers related with their tendencies in meal choices.

- Officers/NCOs responsible from nutrition system would visit commercial catering facilities, in the market in order to benchmark the military cuisine.
- An effective quality improvement circle (obviously must be supported by the steering committee which is the high command levels) could introduce more creative ideas and would allow more enlisted soldiers to participate in decision-making process.
- Different brand of provisions would be used in cooking process. Such as different brand of cooking oil would cause different tastes.

**4.2.4. Studies related with human resources in the nutrition system;**

- Attaining personnel to the system to be the owners of the process.
- In distribution and cooking process more educated enlisted soldiers can be attained.
- In quality improvement circles studies, professional people would be invited in order to get different perspective on the issue.
- A complaint box would be a deterrent instrument for people who are accustomed to distribute meals unfairly.
- Rotation of the enlisted soldier who are working in the mass-hall systematically.
- Officers and NCOs would be motivated to control cooking procedures and distribution procedures.
- A sergeant or corporal would be attained to coordinate queue between the distribution desks.
- Using civilian waiters/waitress as service personnel.
- Training of the personnel working in the mass-hall and in the kitchen.

**4.2.5. Studies related with environment in the nutrition system;**

- Music broadcasting in the mass-hall would create a better atmosphere for the customers.
- Redecorating the environment (Mass-hall's painting, locating pictures and plants, using tablecloths) would create a better environment.
- Locating bench and chairs outside the mass-hall for waiting.
- Locating daily newspaper pages or military lessons on the walls of mass hall entrance.

**4.2.6 Studies related with system;**

- Improving relationship with suppliers on providing better provisions to the nutrition system.
- Giving more emphasis on the standards in accepting suppliers' service and provisions.

**4.3. A BENCHMARKING STUDY**

As a last phase of our study we decided to benchmark military cuisine system with two civilian-catering firms, one of the firms is already serving to military units, and the other one only serves to civilian companies.

The main idea for using benchmarking was to identify deficiency in military cuisine system and try to constitute goals for the system in specific areas that previously do not have standards.

After the interviews with the civilian-catering companies' managers, and after the interviews with the officers in the Army headquarters, we prepared a benchmarking table as can be seen on Table 4.1.

In the benchmarking table the *Goal column* displays acceptable standards in the Army. *Current results column* gives military cuisine systems' data. *Benchmarking I column* shows civilian catering firm's data, which is serving, to military units (first firm). *Benchmarking II column* provides a leading civilian catering firm's data, which is only serving to civilian companies in the market (second firm).

In the benchmarking study we observed that although first catering firm's price is cheaper than second company's prices in the market, it's 30 percent higher than military cuisine system's costs. (Table 4.1.)

- |   |   |                |
|---|---|----------------|
| 1. Cost of producing by using military cuisine                | : | \$ 1,48        |
| 2. Cost of buying the service from outside                    | : | \$ 2,00        |
| 3. Price paid by civilian companies to civilian catering firm | : | \$2,93-\$ 4,00 |

According to a report submitted to the Ministry of Finance by Army headquarter; additional resources are needed for applying catering system in the whole Army. This report's summary can be seen on Appendix F.

Satisfaction in every issue is higher than expected. In calculating the cost of foods, which was not consumed by soldiers and wasted was not included. If we take into consideration these two issues: contracting with a civilian catering firms seems to be better.

- |   |   |      |
|---|---|------|
| 1. Satisfaction rate in military cuisine figured out by questionnaire | : | 37 % |
| 2. Satisfaction rate in units served by catering firms                | : | 84 % |
| 3. Satisfaction rate in civilian companies served by catering firms   | : | 79 % |

While the daily calorie, which, is provided by every institution, do not change, civilian firms could achieve meal diversification.

1. Satisfaction rate in diversification issue in military cuisine : 40 %
2. Satisfaction rate in diversification in units served by catering firms : 68 %
3. Satisfaction rate in diversification in civilian companies : 77 %

We observed that even the service quality and the environment in the second firm better than the first firm, we obtained higher results in the first one. This was a controversy. After interviews with the soldiers we learned that responders of the questionnaires tested both military cuisine system and civilian catering service system. They had compared both the system and were pleased with the new system. This phenomenon draw them to vote higher rates on the civilian catering firm' services.

After the introduction of civilian catering firms to the system soldiers observed an improvement in issues such as *justice in meal distribution, satisfaction from amount of portions, and taste.*

Table 4.1. Success factors and Benchmarks

Success Factors	Goal	Current Result	Benchmarking 1	Benchmarking 2
Overall Satisfaction in customers' satisfaction surveys	95%	37,27 %	83,96 %	79,20 %
Daily calorie served	5700	5700	5700	4500-6000 kcal
Satisfaction From Diversification In Meals	95 %	40 %	67,86 %	76,80 %
Satisfaction From Portions In Meals	95 %	26,67 %	86,67 %	79,20 %
Satisfaction From Meal Distribution Injustice	95 %	13,79 %	96,67 %	100 %
Satisfaction of customers from taste of meals.	95 %	46,67 %	84,62 %	78 %
Waiting time for a customer in the row.	<10	15'-20'	10' – 15'	10' – 15'
Service time in the distribution desk.	N.A.	30 sec	28 sec	20 sec.
Service time in every meal.	1 hour	2 hours	2 hours	2 hours
Satisfaction from hygienic issues	95 %	N.A.	79 %	81,20 %
Daily nutrition cost (For an employee)	N.A.	\$ 1,48	\$ 2,00	\$ 2,93 - \$ 4,90
Highest wage for a cook	N.A.	N.A.	\$ 600	\$ 545
Do the distribution desk use tools with measurement.	Yes	No	Yes	Yes
Satisfaction from meal warmness	95 %	72,41 %	71,43 %	100 %
Is there any quality assurance license?	To have	No	ISO 9001	ISO 9001
Satisfaction feedback time interval from customer	Monthly	In Every 3 Months	N.A.	In Every 3 Months
Does company benchmark regularly?	Yes	No	No	No
Does the company have cooperative benchmarking partner company?	Yes	No	No	No
Does the company have competitive benchmarking partner company?	Yes	No	No	No
Does the suppliers work with company for along period of time or not?	Yes	Yes	No	Yes
Does training available for quality?	Yes	No	Yes	Yes
Does training available for employees in their professional areas?	Yes	Yes	Yes	Yes
Does the company use MIS or not?	Yes	Yes	Yes	Yes
Does the company measures meal temperatures or not?	Yes	No	Yes	Yes
Is there any internal training	Yes	Yes	Yes	Yes
Is there any outside training	Yes	No	Yes	Yes
Is service available for the customer not able to be on time due to unusual an activity?	Yes	Yes	No	Yes

Goal column : Acceptable standards by the Army.

Current results column : Military cuisine systems' data.

Benchmarking I column : Civilian catering firm's data, which is also serving military units.

In benchmarking II column: A leading civilian catering firm's data, which is only serving to civilian companies in the market.

#### **4.4. Summary of 13 Steps Quality Improvement**

**4.4.1. Step 1:** "Select the process to be improved and establish a well-defined process improvement objective."

In the thesis, we applied a survey for assessing the problem areas in the infantry battalion. After the survey results were analyzed, the soldiers accepted *problems with the nutrition system* as the most troubling issue. After establishment of the quality improvement team, *increasing the soldiers' satisfaction in nutrition system* designated as the process improvement objective.

**4.4.2. Step 2:** "Organize a team to improve the process."

In Brigade X with the contributions and permission of the Brigade Commander, a quality improvement team was established. Team was consisted of 9 soldiers and 1 Lieutenant. Assoc. Prof. Erdal EREL was the advisor for the team.

**4.4.3. Step 3:** "Define the current process using a flowchart."

The quality improvement team drew the flowchart as displayed on Figure 4.1.

**4.4.4. Step 4:** "Simplify the process by removing redundant or unnecessary activities."

- Getting into the line in front of the mass hall.
- Allocating a platoon everyday for tasks related with nutrition process.
- Gathering all soldiers at the same time in front of the mass hall for performing the meal.
- Allowing the same soldiers to distribute the meals everyday.

**4.4.5. Step 5:** "Develop a plan for collecting data and collect baseline data."

- A member of the team assigned to obtain data from the leading catering firm's activities and processes.

- A member assigned to collect data from the firm, which is serving for the Army as the catering firm. (Visiting and surveying soldiers in the battalion.)
- A member assigned to collect data to figure out dissatisfaction issues in the nutrition system, in the military cuisine system.
- A quality improvement team assigned in order to discuss and brainstorm the solutions to the problematic areas.
- A member assigned to interview in Army headquarter about advantages and disadvantages of the both military cuisine system and contracting for a catering firm.

**4.4.6.Step 6:** “Assess whether the process is stable.”

With the data we collected we did not analyze if the system is stable or not.

**4.4.7.Step 7:** “Assess whether the process is capable.”

We did not analyze if the system was stable or not since the data collected did not allow us to test this issue.

**4.4.8.Step 8:** “Identify the root causes which prevent the process from meeting the objective.”

Problem related with the root causes discussed in Chapter 4.

**4.4.9.Step 9:** “Develop a plan for implementing a change based on the possible reasons for the process’s inability to meet the objective set for it.”

According to an interview in the Army headquarter we figured out that the cost of contracting a civilian catering firm is too much expensive, (benchmarking table), but solutions generated by the team members in the quality improvement process could increase satisfaction from the military cuisine system.



**4.4.10.Step 10:** “Test the changed process and collect data.”

Time limitations and hierarchical structure of the Army did not allow us to test the all the proposals generated by the quality improvement team. Benchmarking study has verified that the dissatisfaction from the military cuisine system is high. Introducing a new system increases the satisfaction but causes additional cost to Army budget.

**4.4.11.Step 11:** “Assess whether the changed process is stable.”

With the data we collected we did not analyze if the new system is stable or not.

**4.4.12.Step 12:** “Assess whether the change improved the process.”

Introducing civilian catering system to Army nutrition system has caused improvement in the process.

**4.4.13.Step 13:** “Determine whether additional process improvements are feasible.”

Even if the civilian catering system is introduced into the Army: additional preparations are needed in order to transform this system in the battlefield. Leading companies operating in the market have quality departments. Military units, which become the main customers of these firms, must cooperate with their quality departments even have to work within these departments in order to preserve the satisfaction level from the new system.

## ***5. Conclusions and Further Research***

Our objective in this thesis was to make a short review of the TQM philosophy and to present what possible advantages could be gained if its tools were introduced into Turkish Infantry Battalion's Processes.

Related with our sample study we concluded that, at the first phase short-term recommendations would be helpful to improve the battalion's nutrition system.

Introducing catering companies to the military nutrition system nearly load another nearly \$ 250,000 cost daily. (Nearly \$ 0.50 higher cost incurs for every soldier by choosing a catering company to contract nutrition system of 500,000-people populated army). When we discussed with the people from Army headquarter, they expressed that 10 percent increase in costs would be acceptable for the Army but at the benchmarking table we faced with more than 30 percent increase in cost.

Long term recommendations such as employing professional cooks, and waitresses in the distribution, replacing and increasing the number of tools, building a better environment, training soldiers who have responsibility in mass-hall and in the kitchen would help to the process improvement.

Although the recommendations for improvement of process would go on the solutions would be different for each military unit. The people who are close to the problems can only observe the best solution for them. Establishment of TQM philosophy is important for this reason.

Throughout our studies we witnessed that even uneducated enlisted soldiers were happy that their ideas were asked. They felt they were valuable for their

commanders. They were too much enthusiastic with the issues because the result would affect their daily activities. For this reason we would say that motivation was the byproduct.

We observed that this philosophy can also be a perfect tool for the commanders who want to reduce power distance between themselves and their subordinates.

The commander was pleased with the activities performed because the decisions already taken by the improvement team would be realized easier since the decisions already taken by the enlisted soldiers themselves.

There was no cost related with introducing TQM if we neglect training costs. The other quality assurance systems induce monetary costs.

TQM philosophy seeks continuous improvement and it is accepted an endless journey. This feature forces all the members of the organizations to improve themselves continuously and makes TQM different from other quality philosophies. TQM needs continuous effort to search for the best. If it were not such an effort it would be nonsense for the Army to adapt such a philosophy since its members change in every 18 months periods and its service does not have customer directly experiencing it.

With benchmarking tool TQM allow commanders to see their own units' deficiencies and take measurement related with it. Having a cooperative benchmarking partner would provide a communication channel with the outside.

TQM served itself as a perfect communication channel between layers of the organization too. While we were carrying out our studies, Army branches that have to cooperate in battlefield found opportunity to communicate freely without barriers.

We advise researchers that they must allocate more time for training of the team. If training is not sufficient for each member of the team, two or three members carry out most of the workload and rest of the team members' loose enthusiasm.

In order to obtain better results, we believe such studies need more time. Although we stressed that 4 or 5 months is sufficient for a process improvement, in hierarchical organizations, resistance to innovations needs more time to overcome.

Involvement of senior officials in such teams could be effective in overcoming the resistance to innovations.

Team leader and members must not lose their enthusiasms even they could not convert their findings into the real life.

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# *APPENDICES*

**A Sample Training Program Applied in Turkish Army Academy Toward Achieving**

TARİH	ZAMAN	FAALİYETLER KONULAR	SORUMLU UNİTE	KURSun YER
22.01.2001	9:30-10:30	OPENING CEREMONY	DEAN'S OFFICE	BRF. ROOM
	10:30-11:30	INTRODUCTION	DEAN'S OFFICE	BRF. ROOM
	11:30-12:30	OBJECTIVES	DEAN'S OFFICE	BRF. ROOM
	13:30-14:30	TQM IN TR. ARMY	AYHAN ARSLAN	508 LEC. ROOM.
	14:30-15:30	TQM IN TR. ARMY	AYHAN ARSLAN	508 LEC. ROOM.
	15:30-16:30	TQM IN TR. ARMY	AYHAN ARSLAN	508 LEC. ROOM.
23.01.2001	9:30-10:30	HUMAN RES. MAN. TODAY	YASAR OKE	508 LEC. ROOM.
	10:30-11:30	HUMAN RES. MAN. TODAY	YASAR OKE	508 LEC. ROOM.
	11:30-12:30	HUMAN RES. MAN. TODAY	YASAR OKE	508 LEC. ROOM.
	13:30-14:30	LEARNING ORGANIZATION	KADIR VARDAR	508 LEC. ROOM.
	14:30-15:30	LEARNING ORGANIZATION	KADIR VARDAR	508 LEC. ROOM.
	15:30-16:30	LEARNING ORGANIZATION	KADIR VARDAR	508 LEC. ROOM.
24.01.2001	9:30-10:30	TQM PHILOSOPHY	OZKAN METE	508 LEC. ROOM.
	10:30-11:30	TQM PHILOSOPHY	OZKAN METE	508 LEC. ROOM.
	11:30-12:30	QUALITY OBJECTIVES	R. ERKEN	508 LEC. ROOM.
	13:30-14:30	QUALITY OBJECTIVES	R. ERKEN	508 LEC. ROOM.
	14:30-15:30	LEADERSHIP	KEMAL GÖREN	508 LEC. ROOM.
	15:30-16:30	LEADERSHIP	KEMAL GÖREN	508 LEC. ROOM.
25.01.2001	9:30-10:30	CON. IMPROVEMENT	KEMAL GÖREN	508 LEC. ROOM.
	10:30-11:30	ORGANIZATINAL CUL.	SELİM OVUNC	508 LEC. ROOM.
	11:30-12:30	MOTIVATION	SELİM OVUNC	508 LEC. ROOM.
	13:30-14:30	MOTIVATION	SELİM OVUNC	508 LEC. ROOM.
	14:30-15:30	STRESS MANAGEMENT	N. BASIM	508 LEC. ROOM.
	15:30-16:30	STRESS MANAGEMENT	N. BASIM	508 LEC. ROOM.
26.01.2001	9:30-10:30	STATISTICAL TOOLS	A. YILMAZ	508 LEC. ROOM.
	10:30-11:30	STATISTICAL TOOLS	A. YILMAZ	508 LEC. ROOM.
	11:30-12:30	STATISTICAL TOOLS	A. YILMAZ	508 LEC. ROOM.
	13:30-14:30	PROBLEM SOLVING TOOLS	ADEM DEMİR	MAN. LAB.
	14:30-15:30	PROBLEM SOLVING TOOLS	ADEM DEMİR	MAN. LAB.
	15:30-16:30	PROBLEM SOLVING TOOLS	ADEM DEMİR	MAN. LAB.
29.01.2001	9:30-10:30	SEVEN TOOLS IN QUALITY	A. YILMAZ	MAN. LAB.
	10:30-11:30	SEVEN TOOLS IN QUALITY	A. YILMAZ	MAN. LAB.
	11:30-12:30	SEVEN TOOLS IN QUALITY	A. YILMAZ	MAN. LAB.
	13:30-14:30	PROCESS IMP. METH.	T. AKTAS	MAN. LAB.
	14:30-15:30	PROCESS IMP. METH.	T. AKTAS	MAN. LAB.
	15:30-16:30	PROCESS IMP. METH.	T. AKTAS	MAN. LAB.
30.01.2001	9:30-10:30	TEAMWORK	KERİM MERT	508 LEC. ROOM
	10:30-11:30	TEAMWORK	KERİM MERT	508 LEC. ROOM.
	11:30-12:30	TEAMWORK	KERİM MERT	508 LEC. ROOM.
	13:30-14:30	QUALITY CIRCLES	A. ARSLAN	508 LEC. ROOM.
	14:30-15:30	QUALITY CIRCLES	A. ARSLAN	508 LEC. ROOM.
	15:30-16:30	QUALITY CIRCLES	A. ARSLAN	508 LEC. ROOM.
31.01.2001	9:30-10:30	QUALITY CIR. PRACTICE	A. ARSLAN	508 LEC. ROOM.
	10:30-11:30	QUALITY CIR. PRACTICE	A. ARSLAN	508 LEC. ROOM.
	11:30-12:30	QUALITY CIR. PRACTICE	A. ARSLAN	508 LEC. ROOM.
	13:30-14:30	BENCHMARKING	ÖZKAN METE	508 LEC. ROOM.
	14:30-15:30	BENCHMARKING	ÖZKAN METE	508 LEC. ROOM.
	15:30-16:30	BENCHMARKING	ÖZKAN METE	508 LEC. ROOM.
01.02.2001	9:30-10:30	PERFORMANCE APPRAISAL	K. SÖYLEMEZ	508 LEC. ROOM.
	10:30-11:30	PERFORMANCE APPRAISAL	K. SÖYLEMEZ	508 LEC. ROOM.
	11:30-12:30	PERFORMANCE APPRAISAL	K. SÖYLEMEZ	508 LEC. ROOM.
	13:30-14:30	TQM IN ARMY UNITS	B. ÖZDİL	508 LEC. ROOM.
	14:30-15:30	TQM IN ARMY UNITS	B. ÖZDİL	508 LEC. ROOM.
	15:30-16:30	TQM IN ARMY UNITS	B. ÖZDİL	508 LEC. ROOM.
02.02.2001	9:30-10:30	INSTITUTIONALIZATION OF TQM	C.YILDIRAY	508 LEC. ROOM.
	10:30-11:30	INSTITUTIONALIZATION OF TQM	C.YILDIRAY	508 LEC. ROOM.
	11:30-12:30	INSTITUTIONALIZATION OF TQM	C.YILDIRAY	508 LEC. ROOM.
	13:30-14:30	EVALUATION EXAM	DEAN' OFFICE	508 LEC. ROOM.
	14:30-15:30	FEEDBACK	KADIR VARDAR	508 LEC. ROOM.
	15:30-16:30	CEREMONY	DEAN' S OFFICE	BRF.OFFICE

### X PİYADE TUGAYI PROBLEM ANALİZ ANKETİ

#### 1. Taburda veya tugayda size sunulan hizmetlerden en çok sıkıntıçektığınız 3 tanesini işaretleyiniz.

- a. (.....) Yemek sistemi
- b. (.....) Çamaşırhane sitemi
- c. (.....) Koğuşların durumu
- d. (.....) Banyo durumu
- e. (.....) İstihkakların dağıtımı
- f. (.....) Nizamiye-ziyaretçi kabul yeri.
- g. (.....) Kantin hizmeti
- h. (.....) Mehmetçik gazinosu
- i. (.....) Berber hizmeti
- j. (.....) Revir hizmeti
- k. ....
- l. ....

#### 2. Yemeklerle ilgili aşağıdaki soruları cevaplandırınız ?

- a. Yemekler az çıkıyor mu ?. Doyuyor musunuz ?  
 Doyuyoruz  Doymuyoruz
- b. Yemekler lezzetli mi ?  
 Lezzetli  Lezzetli değil
- c. Yemekler soğuk çıkıyor mu ?  
 Soğuk  Soğuk değil
- d. Yemeklerin dağıtımı adil oluyor mu ?  
 Adil  Adil değil
- e. Yemeklerin çeşidi yeterli mi ?  
 Çeşit yeterli  Hep aynı yemekler çıkıyor
- f. Yemek almak için çok sıra bekliyor musunuz?  
 Çok sıra var  Sıra var ama uzun sürmüyor.

Diğer .....

#### 3. Çamaşırhane sistemi ile ilgili sıkıntılarınızı belirtiniz

- a. Çamaşırlar iyi yıkıyor mu ?  
 Yıkıyor  Yıkamıyor, elde yıkıyoruz.
- b. Çamaşırlar kayboluyor mu ?  
 Kayboluyor  Tam olarak geri geliyor.
- c. Çamaşır yıkama sırası çok uzun zamanda mı geliyor ?  
 Normal  Yeterli değil
- d. Çamaşırlarınız yıkamadan sonra yıpranıyor mu?  
 Normal  Çok yıpranıyor

Diğer .....

**4. Koşular ile ilgili sıkıntılarınızı belirtiniz.**

- a. Koşular kalabalık mı ?  
 Kalabalık  Koşular yeterli
- b. Koşular bölgesinde hava ağır mı / kokuyor mu.  
 Doğru  Yanlış
- c. Koşularda gürültü oluyor mu ?  
 Gürültülü  Gürültülü değil.
- d. Diğer .....

**5. Banyo hizmeti ile ilgili sıkıntılarınızı belirtiniz.**

- a. Banyo kabinleri temizliği yeterli mi ?  
 Temiz  Temiz değil
- b. Sıcak su herkese yetiyor mu ?  
 Yeterli  Yetersiz
- c. Banyo kabinleri yeterli geliyor mu ?  
 Yeterli  Yetersiz
- d. Görevli personel uygun davranış gösteriyor mu ?  
 Gösteriyor  Göstermiyor.

Diğer .....

**6. Mehmetçik gazinosu/kantin hizmetleri ile ilgili sıkıntılarınızı belirtiniz.**

- a. Gazino/kantin çalışma saatlerinden memnun musunuz?  
 Memnunum  Memnun değilim
- b. Çalışan personelden memnun musunuz?  
 Memnunum  Memnun değilim
- c. Satılan malların kalitesi ve fiyatı hakkında ne düşünüyorsunuz?  
 Kaliteli-pahalı  Kaliteli-ucuz  Kalitesiz-pahalı  Kalitesiz-ucuz
- d. Kantin ve gazino ihtiyaçlarımıza cevap veriyor mu  
 İhtiyacımı karşılıyor  İhtiyacımı karşılamıyor
- e. Satılan malların çeşitleri yeterli mi ?  
 Yeterli  Yetersiz
- f. Kantinde ve gazinoda devamlı istenen (sigara vs) mallar her zaman var mı ?  
 Her zaman bulunuyor  Bulunmuyor

Diğer .....

**7. Revir hizmetinin işleyişi ile ilgili sıkıntılarınızı belirtiniz.**

- a. Hastalara yeterli zaman ayrılıyor mu?  
 Yeterli ilgi var  Hastaya ilgi az
- b. İlaçlarınızı zamanında alabiliyor musunuz?  
 Zamanında alırız  Zamanında gelmiyor.
- c. Revirde çok sıra bekleniyor mu?  
 Normal  Çok sıra oluyor.

d. Sivil hayatınızla karşılaştırırsanız size sunulan sağlık hizmeti?

Daha iyi

Daha kötü

Diğer .....

**8. İstihkaklar ile ilgili sıkıntılarınızı belirtiniz.**

a. Bütün İstihkaklarınız alabiliyor musunuz ?

Evet, alıyoruz

Hayır, alamıyoruz

b. Dağıtılan istihkaklar yeterli mi ?

Yeterli

Yeterli değil

c. Dağıtılan istihkaklar size uyan ölçülerde (bedende) mi dağılıyor ?

Uymuyor

Uygun

d. Dağıtılan istihkak dayanıklı ve kullanışlı mı?

Değil

Dayanıklı ve kullanışlı

Diğer .....

**9. ŞİMDİ sizden istenen yukarıdaki belirtilen veya belirtilmeyen (siz yazın) aksaklıklardan en önemlisini ve nedenlerini varsa tekliflerinizle birlikte yazınız.**

En önemli sıkıntımız şudur; .....

Sonraki sıkıntımız .....

Sonraki sıkıntımız.....

Bu sorunların halledilmesi için benim tekliflerim şunlardır;

1.....

2.....

3.....



## X ARMORED BRIGADE PROBLEM ASSESSMENT SURVEY RESULTS

No	Code	Problematic Area	Votes in numbers	Votes in percentages
1	Ta	Nutrition System	26	<b>30.95%</b>
2	Tb	Cloth-washing System	5	5.95%
3	Tc	Dormitory Condition	0	0.00%
4	Td	Bathing System	10	11.90%
5	Te	Equipment	5	5.95%
6	Tf	Visitor's Lounge	15	<b>17.86%</b>
7	Tg	Canteen	16	<b>19.05%</b>
8	Th	Soldiers' Club	2	2.38%
9	Ti	Barber Service	0	0.00%
10	Tj	HealthCare System	5	5.95%
		<b>Total</b>	<b>84</b>	<b>100.00%</b>

**1. Main problem analysis related with nutrition system**

- Portions in meals are not satisfactory: % 73.33
- Meals are not delicious: % 53.33
- Meals are cold: % 27.59
- Meals are not distributed fairly: % 86.21
- Meal diversification is not enough: % 60
- Meals queue is long: % 75

**2. Main problem analysis related with cloth-washing system**

- Clothes washed by the soldiers themselves: % 54.17
- Clothes don't return as they handed in number: % 12.75
- Cloth washing turn come late: % 52.38
- Washing machines makes the clothes worn out: % 11.11

**3. Main problem analysis related with dormitories system**

- Dormitories are crowded: % 45.83
- Dormitories have bad air-conditioning: % 87.50
- Dormitories are noisy: % 52.38

**4. Main problem analysis related with bathing system**

- Shower cabins are not clean enough: % 53.85
- Hot water are not sufficient for all of them: % 89.66
- Shower cabins are not enough: % 96.43
- People responsible from the shower system don't serve well: % 15.38

**5. Main problem analysis related with canteen and soldier's club**

- Working hours of canteen and club not as expected: % 46.63
- People serving there are not appropriate: % 48.28
- Products can be judged as qualified and expensive: % 61.90
- Products sold don't satisfy needs: % 57.14
- Product diversity is not enough: % 72.41
- It is not possible to find basic needs (Such as cigarette) every time: % 79.31

**6. Main problem analysis related with HealthCare**

- Time allocated for diagnosis is not enough: % 78.57
- Our medicine don't arrive on time: % 20
- Too much time spent on queue: % 48.15
- Current HealthCare is worse than civilian life: % 76

**7. Main problem analysis related with equipment**

- Too much time spent on queue: % 48.15
- Not get all equipments allocated: % 23.33
- Equipments are not enough: % 63.33
- Equipments don't fit: % 80
- Equipments are not qualified and durable: % 24.14

## QUALITY TEAM CHARTER

**Name** : Team Harmony

**Chartered**

**By** : X th. Armored Brigade

<b>Team Leader</b> :	<b>Org./Unit/Code</b>	<b>Phone</b>
Captain G.Kasımlıoğlu	Infantry Battalion	2045

<b>Team Facilitator</b> :	<b>Org./Unit/Code</b>	<b>Phone</b>
Major A. Yılmaz	Infantry Battalion	2018

<b>Team Link</b> :	<b>Org./Unit/Code</b>	<b>Phone</b>
Sergeant K. Korkmaz	Signal Battalion	2222

<b>Name</b>	<b>Org./Unit/Code</b>	<b>Phone</b>
1. Ahmet Karşlı	Infantry Battalion	2115
2. Ali Yurdakul	Infantry Battalion	2115
3. Tayfun Kılıç	Infantry Battalion	2115
4. Ahmet Fidan	Infantry Battalion	2115
5. Murat Süslü	Infantry Battalion	2115
6. İlhami Aslan	Infantry Battalion	2115
7. Kültigin Canitez	Infantry Battalion	2115
8. Ayhan İşbilir	Infantry Battalion	2115
9. Orhan Kanlıer	Infantry Battalion	2115
10. Cemil Utku	Infantry Battalion	2115

## QUALITY TEAM CHARTER (Continued)

### PROCESS SELECTED FOR IMPROVEMENT

Military Nutrition System of X Infantry Battalion.

### PROCESS IMPROVEMENT GOALS

1. Improvement in tastes.
2. Improvement in satisfaction of soldiers from the meals.
3. Improvement in cost (if possible)

### RESOURCES

1. Military cooking system in infantry battalion's barracks.
2. Civilian catering services.
3. Human resources of Infantry battalion. (For measuring satisfaction)

### REPORTING REQUIREMENTS

1. Current satisfaction and trial of each alternatives will be reported in weekly periods.
2. Cost analysis of each alternative will be reported in monthly period.
3. quality improvement teams every meeting will be reported after each meeting.

### SUGGESTED TIMELINE

1. Every alternatives tried and proposal will be submitted following the improvement team establishment due.

İAŞE SİSTEMLERİ KİYASLAMA ANKETİ

**A. Daha önce kendi mutfağımızla pişen yemekle kıyaslayarak aşağıdaki soruları cevaplayınız.**

**1. Doyuruculuk açısından değerlendirin. (Assess the satisfaction from the meals)**

Eskiden daha çok doyuyorduk  Şimdi daha çok doyuyoruz

**2. Porsiyonları değerlendirin.(Assess portions)**

Eskiden daha iyiydi  Şimdi daha iyi, yeterli

**3. Lezzet açısından değerlendirin (Assess meals taste)**

Eskiden daha lezzetliydi  Şimdi daha lezzetli

**4. Sizce yemeklerde kullanılan malzemeyi kaliteli mi (Assess the provision quality)**

Eskiden daha kaliteliydi.  Şimdi daha kaliteli

**5. Yemeklerin sıcaklığını değerlendirin. (Assess the warmth of meals)**

Eskiden daha memnunduk  Şimdi memnunuz.

**6. Yemeklerin dağıtımı adil oluyor mu?(Is the meal distributed fairly?)**

Adil  Adil değil

**7. Yemeklerin çeşidi yeterli mi ? (Assess the diversification in meals)**

Çeşit yeterli  Hep aynı yemekler çıkıyor

**8. Yemek almak için çok sıra bekliyor musunuz? (Assess the time waited in line before the meals)**

Eskiden daha az sıra olurdu  Şimdi daha az sıra var

**9. Dış görev, nöbet durumunda yemekleriniz muhafaza ediliyor mu? (Is your meal kept for you when you are away for a task ?)**

Yemeğimiz ayrılmıyor.  Yemeğimiz ayrılıyor

**10. Yemekhane kalabalık mı? (Is mass hall crowded?)**

Normal  Kalabalık

**11. Yemekhanede yemek dağıtımı ile nöbetçi subay / astsubaylarınız ilgileniyor mu ? (Is your commander interested in your meals distribution?)**

Evet ilgileniyor.

Hayır ilgilenilmiyor.

**12. Servis yapan personel temizliğine dikkat ediyor mu? (Do the service personnels obey the hygienic rules?)**

Evet ediyor.

Hayır etmiyor.

**13. Yemekhanedeki servisler temiz(hijyenik) mi ? (Do service tools clean enough ?)**

Evet ediyor.

Hayır etmiyor.

**MSB.LIĞINCA BİLDİRİLEN YILLIK ORTALAMA GÜNLÜK YEMEK  
MALİYET ÇİZELGESİ**

	<b>ERBAŞ VE ER</b>	<b>ORTA DERECE AS. ÖĞC.</b>	<b>YÜKSEK DERECE AS.ÖĞC.</b>
<b>YİYECEK BEDELİ</b>	1,506,734	1,868,918	2,230,660
Elektrik Bedeli	16,183	16,183	16,183
Su Miktarı	58,033	58,033	58,033
Isıtma Bedeli	55,636	55,636	55,636
Piştirme Bedeli	1,205	1,205	1,205
<b>PERSONEL</b>			
Astsubay	3,466	3,466	3,466
Sivil Memur	19,494	19,494	19,494
Erbaş-Er	184,104	184,104	184,104
Bakım Onarım Bedeli	11,019	11,019	11,019
Temizlik Bedeli	17,735	17,735	17,735
Nakliye Bedeli	11,058	11,058	11,058
Depolama Bedeli	113	113	113
Genel Giderler Toplamı	378,046	378,046	378,046
<b>GENEL TOPLAM</b>	1,884,780	2,246,964	2,605,706
<b>Uygun Bedel</b>	2,350,000	2,950,000	3,500,000
<b>Fark</b>	<b>465,220</b>	<b>703,036</b>	<b>891,294</b>