POLITECNICO DI MILANO

Facoltà di Ingegneria dei Sistemi

POLO REGIONALE DI COMO

Master of Science in

Management, Economics and Industrial Engineering

TOTAL QUALITY IMPROVEMENT IN HEALTHCARE SYSTEM

Supervisor: Prof. Alessandro Brun

Master Graduation Thesis by: Nguyen Huu Kien

Student Id. number: 736458

Master Graduation Thesis by: Valentina Sironi

Student Id. number: 734008

Academic Year 2009/1010

POLITECNICO DI MILANO

Facoltà di Ingegneria dei Sistemi

POLO REGIONALE DI COMO

Master of Science in

Management, Economics and Industrial Engineering

TOTAL QUALITY IMPROVEMENT IN HEALTHCARE SYSTEM

Supervisor: Prof. Alessandro Brun

Master Graduation Thesis by: Nguyen Huu Kien

Student Id. number: 736458

Master Graduation Thesis by: Valentina Sironi

Student Id. number: 734008

Academic Year 2009/1010

ABSTRACT

Health care is a vital service that daily touches the lives of millions of people at significant and vulnerable times: birth, illness, and death. In recent decades, technology, pharmaceuticals, and know-how have substantially improved how care is delivered and the prospects for recovery. Health is also a very political issue in today's world. In most countries, the improvement of the healthcare system is a major issue. Several actors assume to know the best approach know to make their system more performance. This research sets out to challenge these assumptions. It seeks to examine our assumptions about what is a 'good' system. It will do this by pointing out and comparing many national systems of European countries. In each country, there is a different view of what a good healthcare system is trying to achieve. There are many perspectives which are trying to view the current situation in each country, the policy documents which tell us where each country is trying to get to, and comments gathered from key stakeholders to introduce a note of reality.

Notwithstanding these extraordinary achievements, the cost, quality, and accessibility of a health care system have become major topic of debate. Substantial increases in the cost of health care have placed considerable stress on federal, state, and household budgets, as well as the employment-based health insurance system. Health care quality varies widely, even after controlling for cost, source of payment, and patient preferences. Many people lack health insurance coverage at some point during any given year. The costs of providing uncompensated care are a substantial burden for numerous health care providers, other consumers, and tax payers. Therefore, we also aim to analyze causes behind ccountries in EU are beginning to introduce the concept of quality into their health care systems. Patients and purchasers increasingly tend to demand a major quality of care. The provision of mediocre care is no longer acceptable, nor is the provision of care without regard to optimum resource utilization.

We also focus on the concept of, and practical approaches to implement quality assurance and improvement in a health care system through customer satisfaction and total quality management. It is important that health care personnel pursue the same core functions in relation to public health that other levels now do, especially those related to assurance of

access to cost-effective, appropriate and quality health care. Development of health care is in the midst of a new era where ensuring access to health care is not enough; ensuring access to quality health care is the goal now.

While Lean and Six Sigma are recent developments in continuous improvement methodology that have been popularized by several high-profile companies, the success and complementary nature of these methodologies has led to their combination into a single methodology, commonly called Lean Six Sigma or Lean Sigma. Although there is considerable literature available and many consultants involved with Lean Six Sigma, very little published research addresses the practical experiences of companies that have implemented Lean Six Sigma. Therefore, our research question will mainly focus on: How and why are certain healthcare organization implementations of Lean Six Sigma successful or unsuccessful? The investigative questions further identified several factors that appeared to significantly contribute to implementation success. These factors are:

- Fusing business strategy with continuous improvement strategy
- Leadership commitment and involvement in the deployment and implementation processes
- The use of consultants that are proficient and experienced
- A defined organizational model that links the continuous improvement efforts with the performance measurement system and senior leadership
- Defined and standardized personnel selection criteria

Moreover, through development of this research, to analyze systematically and deeply the application of Six Sigma, a new model was developed and named as “ORIGAMI” which highlighted how Six-Sigma achieve the greatest on performance by binding with this model. This model built structure a continuous improvement framework that abates or eliminates the negative effects caused by deployment barriers and implementation challenges of existed models. Finally, we also discuss methods and techniques for the promotion and sustainability of quality in health care in a specific case study. The work will act as a guideline of steps and techniques for implementing practical applications for quality improvement in the health care system of Italy.

Acknowledgments

Without the leadership of our supervisor, Professor Alessandro Brun, this research effort simply would not have been successful. His guidance and support ensured that our experiences significantly added to the foundation of our career. He has provided valuable insights and guidance ensuring this research provides a value in correct direction. In additionally, the support on practical knowledge provided to us by Federico Spada helped shape our research effort and provided an audience for its results. We are grateful for the opportunities they each provided and for their consistent support.

Without their support and guidance, we simply would not be where we are today. The affect their counsel, motivation, and honesty has had on us, both personally and professionally. Thank you, Professor Alessandro Brun and Rina Leonardi, both had a significant impact on our work. To our friends, who helped us and brought joy and fun during difficult times. To our parents who had waited for long time of the day of completion. You've brought supporting and a purpose to encourage us for going further. Any success we have in life is because of your love and devotion.

Kien and Vale.

Contents

List of Tables

List of Figures

List of Annexes

Chapter 1 Introduction & background

Overview the health care system

In general, a country's health care system is the combination of resources, organization, financing, and management that culminates in the delivery of health, services to a population an important, though not the sole, determinant of a population's health status (Roemer 1991)[1].In addition to affecting the health of its population, a country's health services system may also be an important sector of the economy in terms of employment, research and development, and exports, such as drugs, devices, and other medical technologies.

Most of modern healthcare system is financed through two streams of money: the collection of money for health care (money going in), and the reimbursement of health service providers for health care (money going out). In the EU countries, the responsibility for these two functions is shared by private insurance companies as well as the government and employers, the involvement of each role will create different systems, which are known as single-payer, employment-based, and managed competition system. Each type of system has been implemented in many different ways; we will look at detail of characteristic of each system in next sections. To understand more detail of how a health care system works, we must know some of functions of stakeholders who involved mainly in national health system which are:

- Individuals and businesses: both individuals and business pay income taxes to the government. In addition, they also give direct or out of pocket payments to provider for health care services.
- In other side, the government uses money generated from taxes to reimburse providers who take care of patients enrolled in these programs. The government also uses tax to pay private insurers a health insurance premium for federal employees and other public employees. In some countries, there is a tax subsidy of employer-based insurance that represents a major cost to the government. Employees receive health insurance benefits as tax-free compensation, and employers are able to deduct health insurance benefits as a cost of doing business. [Since employers are only taxed on profits, defined as any income above

the cost of doing business, being able to deduct health insurance benefits as a cost of doing business is a tax subsidy for employers].

- Private insurers: Private insurers accept premiums from individuals, businesses, and the government. In turn, they reimburse providers for taking care of patients with private insurance. In some systems, private insurers are prohibited or operated under very tight conditions with controlling directly from government.
- Health service providers: Providers (doctors, allied health professionals, hospitals, and other health care facilities) take care of individuals. They are reimbursed for their services by private insurers and the government.

By looking different points of view, there are many subsystems in a large system. In examining organization and structure of a Healthcare system, we can divide into multiple levels as known as subsystems in the followings: primary care: care provided by physicians' offices and clinics; secondary care: care obtained from specialists and hospitals; tertiary care: care obtained at regional referral centres; quaternary care: care obtained at national referral centres.

Typically, all governments should formulate national policies, strategies and plans of action to launch and sustain primary healthcare as part of a comprehensive national health system and in coordination with other sectors.

Quality Concept in Heath care

Quality has a number of definitions, although in primary health care, the most applicable and certainly most important definition is "meeting the requirements of the customer, both internally and externally, for defect-free products and services"[37].

Who will be customers? Patients, of course, are one important group of external customers, and providers need to learn about, investigate, understand and implement methods to satisfy them, and to maintain these actions. Basically, quality is a process of effective communication between the supplier and the provider of care or health service and the consumer or the receiver of that care or service. Quality is known as a continuous process of dialogue and understanding between the two. There are other customers in the system also: the internal

customers, the employees and other external customers such as patients' families, visitors, payers, etc. Each role has special needs and expectations and it is the duty of health professionals to meet them if a quality service is to be the goal in health care, whether private or public. Quality does not have to be the most expensive or the most prominent approach or product. It can be as simple as doing one's job better, continuously. It can also be as simple as providing appropriate and necessary care to the right health care consumer in the most efficient manner, utilizing the current available resources.

This study was developed in order to understand the health care practitioner in the field to the concept, the teachings, the principles and the applications of quality.

Why do we choose healthcare field for research?

Through reading, we highlighted the deficiencies in the design of the EU healthcare system. These reports have pointed out the inadequacies of the system for dealing with today's problems. But an even greater challenge lies in meeting the storms of the future. These include an aging population and the frequently associated increase in chronic illness; wide and growing disparities by ethnicity and income in access to care, provision of care, and outcomes of care; continued technological advances; and workforce challenges. As our society becomes more diverse, the currently documented differences in access to care, delivery of care, and outcomes of care by ethnicity and income will grow. These disparities will further exacerbate the problems and costs associated with chronic illness. In the meantime, new diagnostic, treatment, and preventive technologies are accelerating at a pace that is overwhelming the ability of the delivery system to use them and the financing and payment systems to reimburse for them. The growth of chronic illness, existence of disparities, and advance of new technologies also has important implications for the healthcare workforce in regard to size, composition, and the nature of the work to be performed. Quality in HC is hot topic of discussion in many countries in both micro and macro level.

Why is Six Sigma in Healthcare?

During the past centuries, industry deployed a large arsenal of tools and innovation approaches to achieve high levels of operational efficiency in manufacturing. Economic history indicates that

efficiencies in industry were obtained primarily as the cumulative effect of a large number of incremental improvements. Six Sigma is one process- innovation approaches that is currently popular in industry. It provides a systematic approach to facilitate incremental process innovations. Six Sigma, originally introduced by Motorola, is the culmination and synthesis of a series of century long developments in quality improvement (QI) (Box & Bisgaard, 1987; Garvin, 1988; Snee, 2004) building on a number of other approaches, in particular, Juran's Trilogy (Juran, 1989). Six Sigma has gone through developments in recent years where Six Sigma optimizes the system to provide significant impact on quality and cost.

Main target of Six Sigma is to reduce process variation and then improving capability of the process. The pressure on hospitals and clinics to find solutions that can mitigate the need for capital and also streamline processes are the highest priorities, so Six Sigma is considered as killer to help change variables that can be controlled in an unpredictable environment.

In this regard, one logical example is waiting time of patient. If one time patient waits for 10 minutes and next time, he waits for an hour, and then it does not mean that patient will count it as average waiting time of both. But it will dissatisfy customer due to large variation in waiting time. Six Sigma is methodology to reduce errors and defects by applying different statistical and managerial tools. Main target is to achieve a target of 3.4 DPMO. This means that if a product has 1 million opportunities of defect, then in Six Sigma terms it must be within 3.4 defects or 99.99975% error free product or service. So, if a company is working at 2.8 Sigma level, then it means that 200,000 wrong drug prescriptions will be written as compared to Six Sigma level, where rate of wrong prescription will be only 68 per year. Similarly, operating at 2.8 Sigma level, 5000 incorrect surgical operation will be carried out weekly as compared to Six Sigma level, when rate of wrong operations will be 1.7. These were some simple description of health related errors. These errors can be minimized to protect human health and increase customer satisfaction level and also providing health services to more customers within the same span of time. But one question comes in to mind, that how to select Six Sigma project. For this some possible areas in health care are given below:

- Patient satisfaction
- Reduction in customer waiting time

- Increase in patient safety level
- Reduction in medical errors
- Human resources Management
- Documentation errors
- Speed and accuracy in admission of patients
- Insurance claim processing accuracy and time
- Bed availability
- Billing accuracy
- Care co-ordination
- Supply chain of medicines, equipments and instruments.
- Laboratory results accuracy level
- Quick emergency room treatment
- Inventory control of medicines
- Surgery planning & scheduling

Problem Statement

Although most organizations want to improve quality and cut costs, the deployment and implementation of continuous improvement methodologies is commonly viewed as a daunting undertaking. Many organizations fail to properly structure or support continuous improvement initiatives which ultimately doom them to failure.

The need for quality improvement is now clear. With a demand for the reduction of error, a parallel need to reduce costs in an effort to adapt to declining reimbursements, and also bring higher level of patient satisfactions. As hospitals and clinicians join together to create an improved field of service, they seek models that have proven their efficacy and that can be applied to healthcare efficiently. The combination of need, motivation, and resources is presented with great clarity in this work. Therefore, this research seeks to identify which key issues must be addressed to successfully manage or eliminate the barriers and challenges of implementing continuous improvement initiatives.

Research Questions

The focus of this research effort is to answer the research question: "How can we improve customer's satisfactions through implementations of Six Sigma in Healthcare system?"

To answer the main research question, this research investigates the implementation processes of healthcare organization by addressing the following investigative questions:

1. How has Lean Six Sigma been deployed and implemented in the healthcare systems?
2. What are barriers& challenges to Lean Six Sigma deployment and how are they overcome?
3. What are challenges for understanding the customer's satisfactions and how did they overcome these challenges?
4. How is customer's satisfaction implementation success defined in the healthcare system?

Scope of work and Limitations of the Research

Through development of new model and study about application of Six Sigma to solve existing problems in health care system. In limited time and resources, we try to define our scope of current work, and future research.

We define a list of the main topics that will develop through this chapter until the end of work as followings:

a. Study about how are the healthcare systems in European countries working
b. Identify and understand the issues of health care policies in different countries in Europe.
c. Understand quality's perspectives and quality improvement in the healthcare system
d. Introduce concept of Six Sigma in quality improvement, then suggest possible solutions to implement in Italian healthcare system. Focus on application of Six Sigma on some main components which include:
    i. Six Sigma on reduction of usage of resources
    ii. Achieve customer satisfaction through Six Sigma application.
e. Evaluate the quality service through patient's satisfaction.

f. Build up and define main components of a new model. This new model is used to maximize the performance of an organization with the support from six sigma's methodology.
g. Define and analyze the relationship among components inside the new model, provide a full- perspective focus quality we develop a new model to describe all the components of organization whereby the interaction and relationship are studied and analyzed in term of achieving high performance.
h. Implement the concept and the key success factor of customer satisfaction through tunnel of new model.

Although the data for the research is gathered from the health care systems in Italy, the barriers and challenges encountered are believed to be generalized to the management of large organizations in general, and thereby applicable to general use in typical systems are similar to Italian ones.

This work is devoted to the issues of quality and its quality improvement in health care systems of European countries. It is intended to be a practical reference for practitioners in the field and, as such, it will be a comprehensive manual on the different applications of quality assurance and improvement in health care, in particular in EU countries.

Structure of work

The work consists of five chapters. We start with chapter one that consists of overview of our research topic and the purpose we want to achieve and it also states about scope and limitations of work. While in chapter two, we will step on understanding of healthcare systems in EU countries; we analyze the current situation of each system, the strength and weaknesses of them. We also generalize the problem and issues that is the base to develop the understanding of Six Sigma through chapter 3.

During the chapter three, we will examine the quality perspective; we will study about quality in term of customer satisfactions in context of health care. We will discover how can Six-Sigma achieve the greatest impact on performance of a Health care system, we start with concept of the Six Sigma primer, define the needs and values for customer's point of view, also understand

the Quality Dimension in care service. We try to answer the question of quality perspective related to customer satisfaction. In this chapter we also illustrate the implementation of Six Sigma through the usage of Six Sigma in improving the Workflow in N-Medicine Department. In the last section, the challenge of merging between Six Sigma and Balanced Scorecard will mention in detail of how the company's ability apply Six Sigma with the monitoring system. Also, this chapter will describe important related application of the core activities of quality improvement in Italy, it is important for an organization to implement to be more effective and more efficient in delivering its services throughout Italy's regions.

In chapter 4, we combine the learning of Six Sigma with the development of a new business model. We list and describe the components of the new model; we analyze how each component can maximize performance of the overall organizational activities. We develop the model with the main concept of continuous improvement.

In the chapter 5, we study about the quality system of a hospital in Cremona city in which this study was conducted through interviewing with quality managers of the hospital and collected data from the quality department, we will learn about the history of quality management of long development for over 20 years. How they adapt organization with new requirements for changing from old system to a new system, how they applied Six Sigma and Quality model for their success in business operation. We will point out the benefit of Six Sigma created a competitive advantage to this organization. The data are collected through site-visiting and interviewing directly with several format such as surveys, questionnaire.

Continuing with chapter 6, we analyze and give a short evaluation of our result work. We talk deeply about the pros and cons of the new model Origami. How this model will help practitioners to improve the services and care they provide to their patients, and can improve regional primary health care, even we will mention about the application of this model in other areas which efforts towards total quality improvement. We evaluate the contribution of our work in both academic and practical perspectives.

The last chapter will summarize conclusions on each topic and give the recommendations for future research.

Methodology

Research questions are used to initialize the objectives for this research. The main methodology may consider as “break-down” approach, which the research starts with study of Healthcare analysis in macro view then deeper understanding of characteristic of healthcare system in micro view to find out the opportunities of improvement and solving the current issues of health care system. The logic framework of this research is described in figure 1.1. We summaries the methodology in 4 main steps as defined by: Macro Analysis, Micro Analysis, Problem Solving, and Evaluation. This research employed many cases that design to gather data on the Six Sigma implementation process. These cases were solicited following a predetermined protocol that improved the reliability of the research by standardizing the data collection techniques. The companies selected for this study were limited to those that have, or were in the process of, implementing an integrated Six Sigma methodology. The case is used to analyze Six Sigma operational models, barriers to deployment, challenges during implementation, and internal methods of defining the program’s success. Other case also is used to answer the investigative questions and ultimately the research questions.

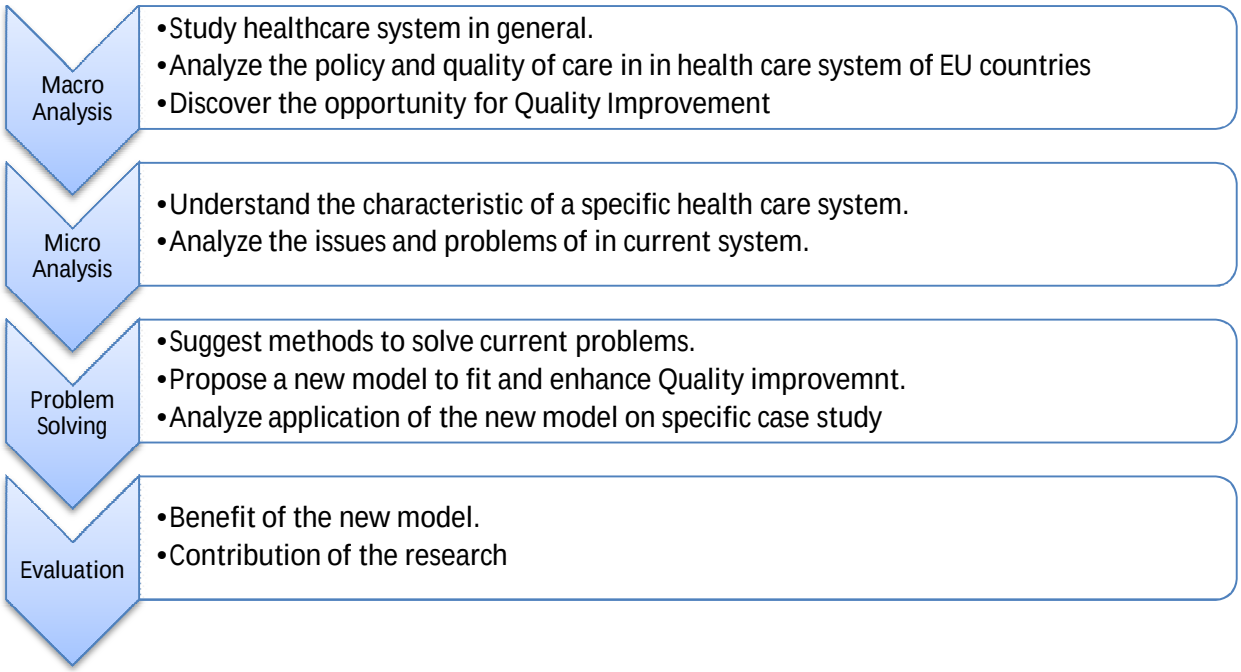


Figure 1.1 The methodology using for research

Chapter 2 Health Care Systems across European Countries

I. Types of national health care systems

Several studies have attempted to classify the type of health care systems, in general, three models have been implemented in many different ways which are single-payer, employment-based, and managed competition system. Each model has its own characteristics, and was created by history, politics, and national economy.

a. Sing-Payer System: The country has this kind of system, its government pay for health care of all citizens. The fund is collected through tax, the pays back directly to the providers. Typically, the government plans and establish a budget, and then decides how much should locate to health care system; price or reimbursement is set for providers. Italy and France are the most typical examples of this system.

b. Employment-based System: As characterized by its name, this system requires employers provide workers with health insurance often though quasi-private insurance funds. These insurance funds may operate within or across industry sectors, with benefits and premiums set by the government. Often premiums are simply a form of payroll tax paid directly to the fund. Providers remain independent and reimbursement rates are negotiated with the funds, sometimes individually, sometimes on a national level. Germany has long been the model for an employment- based system.

c. Managed market competition: Managed market competition leaves the provision of health care in private hands but within an artificial marketplace run under strict government control and regulation. In most cases, the government mandates that individuals purchase insurance, though this is often paired with a requirement for employers to provide insurance to their workers. Individuals have a choice of insurers within the regulated market- place and a choice of providers. Although the government sets a standard benefits package, insurers may compete on price, cost sharing, and additional benefits. Switzerland is the clearest example of a managed-competition.

II. Quality of care in some industrialized countries

France

Some of the most thoughtful proponents of national health care are trying to look to France as a model of how such a single-payer system could work effectively. Jonathan Cohn of the New Republic has written that "the best showcase for what universal health care can achieve may be France."[1]The French system is at the top of most cross-country comparisons and it is ranked number one by the WHO.[2]

The following table describes the main characteristics of French health care system.

Table 2.1 Main characteristics of French health care system

Country	France
Rank by WHO	1
Type of system	Single Payer
Covered service	**Cost sharing**
For inpatient and outpatient care, physician and specialist services, diagnostic testing, prescription drugs, and home care services. The services covered are explicitly specified in regulation.	Requires substantial co-payment, ranging from 10 to 40 percents of the cost. On the average, consumers of France pay for roughly 13 percents as out of pocket for health care service. [4]
Insurance	**Fund & Financing**
About 99 percents of French citizens are covered by national health insurance. General National Health Insurance Scheme covers most non-agricultural workers and their dependents, about 83 percent of French residents. Separate insurance plans cover agricultural workers, the self-employed, and certain special	French system is financed through the main stream of payroll tax which provides the largest sources of contribution to the fund. Third expensive system, costing roughly 11 percent of GDP, behind only the United States (17 percent) and Switzerland (11.5 percent). Employers pay 12.8 percent of wage for

occupations like miners, transportation workers, artists, clergy, and notaries public. Another fund covers the unemployed. Approximately 92 percents of French residence purchased private insurances for additional services. [3]	employees; employee contributes 0.75 percent of wages. 5.25 percent of contribution from tax on income. Dedicated taxes are required for tobacco, alcohol, and pharmaceutical company revenues. France's overall budget deficit (2.5% of GDP), about €10.3 billion in 2006. [5]
Satisfaction & perceived quality	**Level of technology**
The quality of French health care is high. Avoided the waiting lists associated with other national health care systems. Patient free to move among available doctors, increasing costs of system. French had the highest level of satisfaction with their health care system among all European countries, even threatens by high costs.[6]	Lack of capital investment, resulting in a shortage of medical technology and lack of access to the most advanced care. Limited queues exist for some specialized treatments and technologies.

Italy

According to the ranking by WHO, Italy's national health care system is rated in second after France's system.[7] We will look at a closer examination of the system to understand deeply troubled, plagued with crippling bureaucracy, mismanagement and general disorganization, spiralling costs, and long waiting lists. In common with other system, the Italian system is similar to the British National Health Service but enjoys more decentralization through regional management of local entities. The central government sets goals on how money should be spent, monitors the overall health status of the nation, and negotiates the labour contracts of medical staff. The Italian Constitution was changed in 2001 such that the national government now sets the "essential levels of care" regions must meet, but regional governments still control their own autonomous budgets, distribute resources to the local level.

Thus, while the national Ministry of Health continues to outline funding needs based on weighted capitation and past spending, recent reforms have shifted more and more power and responsibility to regional governments who set their own budgets. The regions establish one or more Local Health Authorities, which are responsible for the provision of care either through government-run hospitals and clinics or by contracting with private providers. [8] It should be noted that governance in Italy is often as much art as science and regions frequently fail to implement rules, guidelines, reimbursement schedules, and budgets set by the central government.[9]

Table 2.2 Main characteristics of Italian health care system.

Country	Italy
Rank by WHO	2
Type of system	Single Payer
Covered service	**Cost sharing**
About 90 percent of Italian population is covered by public insurance which provides inpatient care and primary care free at the point of treatment. However, co-payments are required for diagnostic procedures, specialists, and prescription drugs. Italians has also limited choice of physician. Patients must register with a general practitioner within their LHA. They are allowed to choose any GP in the LHA but may not go outside it. Except for emergency care, a referral from a GP is required for diagnostic services, hospitalization, and treatment by a specialist. [10]	Co-payments are required for diagnostic procedures, specialists, and prescription drugs. The size of such co-payments has increased steadily upward over the past decade and now runs as high as 30 percent for some services. Many impose co-payments for a broad range of services, including primary care, but have collapsed in the face of public protests. In addition, nearly 40 percent of the population (the elderly, pregnant women, and children) are exempt from co-payments. [11]
Insurance	**Fund & Financing**

Private health insurance is available but is not widespread; only the remaining 10 percent of Italians have private health insurance. Private health insurance allows free choice of doctors, including specialists and treatment in private hospitals. Many Italian use private health resources (pay out of pocket). Estimates suggest that as much as 35 percent of the population. [12]	Mainly comes from both payroll taxes and general revenues. Payroll taxes have a regressive structure, starting at 10.6 percent of the first € 20,660 of gross income and decreasing to 4.6 percent of income between €20,661 and € 77,480. [13] The remainder of funding comes from both federal and regional general taxation, including income and value-added taxes. The central government redistributes resources to compensate to some degree for inequalities among regions. Even so, most regional health authorities run significant deficits. Overall, regional deficits top 1.8 percent of GDP. [14]
Satisfaction & perceived quality	**Level of technology**
Public Italian government does not provides official information, particularly for diagnostic tests, many evidences have shows a growing and widespread trend of long list waiting. The Italian government has spent a lot of efforts to control costs, such as reducing reimbursement rates, increasing co-payments, reducing capital expenditures, contracting with private providers, and limiting prescription drugs. All of these measures have met with protests, including physician strikes, and many have been repealed after only a short time. [15]	In Italy, most hospitals in the northern part has the best equipments with best updated technology, as consequence they have even longer waiting lists since they draw patients from the poorer southern regions as well. If delays become excessive, patients may seek permission from the regional government to obtain treatment from private doctors or hospitals at NHS expense. Conditions of the public hospitals in the Southern part are considered substandard.

Dissatisfaction with the Italian health care system is extremely high, by some measures the highest in Europe.	They lack not just modern technology, but basic goods and services; and overcrowding is widespread.

Germany

Germany is ranked 25th in the WHO ratings. [16] The country is worth examining because it is frequently cited as a model by advocates of national health care. National health insurance in Germany is part of a social insurance system.

Table 2.3 Main characteristics of German health care system.

Country	Germany
Rank by WHO	25
Type of system	Employment-based System
Covered service	**Cost sharing**
There 2 main services covered mainly all part of the country which are Public ("social") health insurance (SHI) and private health insurance. The SHI benefits package covers preventive services; inpatient and outpatient hospital care; physician services; mental health care; dental care; prescription drugs; medical aids; rehabilitation; and sick leave compensation. [17] Substitutive private health insurance is regulated by the government to ensure that the insured do not face massively increasing premiums by age and that they are not overburdened by premiums if their income decreases. Starting in 2009, private insurers were offering substitutive cover will be	Traditionally, the SHI scheme has imposed few cost- sharing provisions (mainly for pharmaceuticals and dental care). However, in 2004 co-payments were introduced for visits by adults aged 18 years and older to physicians and dentists (€10 each for the first visit per quarter or subsequent visits without referral); other co- payments were made more uniform: €5 to €10 per pack of outpatient medications (except if the price is at least 30% below the so-called reference price, i.e., €10 per inpatient day (up to 28 days per year), and €5 to €10 for prescribed medical aids. For dental prostheses, patients receive a lump

required to take part in a risk adjustment scheme (separate from SHI) to be able to offer insurance for persons with ill health who could otherwise not afford a risk-related premium. This kind of insurance also involves a mixed complementary and supplementary role, adding certain minor benefits to the SHI basket, providing access to better amenities, such as single/double rooms, and covering some co-payments, especially for dental care.[18]	sum which on average covers 50% of costs. [19] The highest co-payments are 10 percent for prescription drugs. Overall, Germans pay out of pocket for about 13 percent of total health care spending, only slightly less than Americans. Cost-sharing is generally limited to 2% of household income. For additional family members, part of the household income is excluded from this calculation. [20]
Insurance	**Fund & Financing**
Publicly-Financed Scheme (SHI): is compulsory for people earning up to around €48,000 per year are required to enrol in one of approximately statutory "sickness funds." [250], including dependents who are included in the insurance. This applies to around 75% of the population. The SHI scheme is operated by over 200 competing health insurance funds (sickness funds; SFs): autonomous, not-for-profit, non-governmental bodies regulated by law. Less than 1% of the population has no insurance coverage. Overall, insurance coverage is nearly universal. However, the number of uninsured has been rising, roughly tripling in the last 10 years to 300,000 people. [21]About 9 percent of the population purchases supplemental insurance to cover items that are not included in the standard	SHI scheme is funded by compulsory contributions based on wages up to a limit of around €43,000 per year. F In 2008, the average insured employee contributes almost 8% of the gross wage, while the employer (or the pension fund) adds another 7% on top of the gross wage, so the combined maximum contribution is around €540 per month. This includes dependents (non-earning spouses and children) who are covered through the primary SF member. Unemployed people contribute in proportion to their unemployment entitlements, but for long-term unemployed people with a fixed low entitlement (so-called "Hartz IV"), the

benefits package. About 10% of the population are covered by private health insurance. Private health insurance plays a substitutive role in covering the two groups excluded from SHI (civil servants, who are refunded parts of their health care costs by their employer, and the self-employed), as well as high earners who choose to opt out of the publicly-financed scheme. Private health insurance (PHI) accounted for 9.1% of total health expenditure in 2005. [22]	government employment agency pays a fixed per capita premium. Currently, SFs are free to set their own contribution rates for all other insured. In 2005, public sources of finance accounted for 77.2% of total health expenditure. Sickness funds are supposed to be solvent and self- supporting but ran a €7 billion deficit in 2006. [22] In addition, general tax revenues finance capital costs for acute care hospitals and many rehabilitative services, especially for retirees.
Satisfaction & perceived quality	**Level of technology**
One frequently cited study suggests that Germans are no more likely than Americans to wait more than four weeks to see a specialist. [304] The WHO says, "Waiting lists and explicit rationing decisions are virtually unknown." [23] Waiting times were prolonged due to both a lack of capacity and hospital target budgets that make the treatment of sickness fund patients with serious conditions financially unattractive. In 2004 poll, 76 percent of Germans thought health care reform was "urgent," while an addition- al 14 percent thought it was "desirable."	Germans have less access to modern medical technology than Americans. The United States has four times as many MRI units per million people and twice as many CT scanners. [24] Private insurance puts competitive pressure on sickness funds, pushing them to expand their quality and services. At one time, CT scanners were even rarer in the public system, available only under exceptional circumstances and after long waits, yet relatively common in the private sector.

Switzerland

Switzerland is one of the most market oriented systems; the Swiss system is mainly based on the idea of managed competition. Managed competition lets the provision of health care and health insurance in private hands but creates a highly regulated artificial marketplace as a framework within which the health care industry operates.[25] Swiss law requires all citizens to purchase a basic package of health insurance, an individual mandate. Coverage is close to universal, estimated at 99.5 percent. [26] This level of compliance is due in part to the Swiss national character and may not be replicable in the United States where the record of complying with mandates is much more mixed.

Table 2.4 Main characteristics of Swiss health care system.

Country	Switzerland
Rank by WHO	20
Type of system	Market managed competition
Covered service	**Cost sharing**
The main package as named "basic benefits package" includes benefits are quite extensive, including inpatient and outpatient care, care for the elderly and the physically and mentally handicapped, long-term nursing home care, diagnostic tests, prescription drugs, and even complementary and alternative therapies. Supplementary insurance also allows access to private hospitals in those cantons that do not permit access under the basic insurance plan. Even within public hospitals, supplementary insurance can be used to pay for services such as private rooms that are not covered under the	Employers do not pay for workers' health insurance; the Swiss are exposed to the full cost of their insurance purchases. As a result, many Swiss have opted for high-deductible insurance. With high deductibles and extensive co-payments, the Swiss pay out o pocket for 31.5 percent of health care, twice as much as in the United States. [28] Recently, there has also been a growing market in managed care plans that, like those in the United States, offer lower premiums in exchange for limitations on access to specialists and other services. Premiums for such plans run

basic plan. By some estimates as many as 40 percent of Swiss citizens have purchased supplemental insurance.[27]	around $1,900 per year. [29] The Swiss government offers subsidies to low-income citizens to help them purchase a policy. Subsidies are based on both income and assets, and the maximum available subsidy covers the cost of an average premium in the individual's canton. Roughly one-third of Swiss citizens receive some form of subsidy, and approximately 19 percent of all health insurance premiums are paid with government funds.
Insurance	**Fund & Financing**
Insurance is generally purchased on an individual basis. Few employers contribute to the purchase or provide insurance. The policies are provided by private insurers. Currently, some 93 insurers operate in Switzerland, although not every insurer operates in every canton, or region. [30] Originally, insurers were required to be nonprofits entities, but that restriction was eliminated in 2002. Insurers cannot reject an applicant on the basis of health status, and all policies are community rated within a geographic area, meaning that the healthier pay higher premiums to subsidize the less healthy. Swiss insurers operate as cartels to negotiate provider reimbursements on a cantonal basis Providers must accept the negotiated payment	Since Swiss health care consumers are exposed to the cost consequences of their health care decisions, this trade-off between access and cost can be presumed to reflect the desires of Swiss patients. They have chosen high quality care even though it costs them more. Given that economists consider health care to be a "normal good" that is, consumption rises along with income and Switzerland is a wealthy nation, such a decision seems entirely reasonable. [31] At the same time, it is notable that Swiss health care spending remains below that of the United States for nearly comparable care. Strong evidence suggests that the exposure of Swiss consumers to the cost

and balance-billing is prohibited. If insurers and providers are unable to reach agreement on a fee schedule, canton governments are empowered to step in and impose an agreement. A separate supplemental insurance market is starting to develop to cover the cost which is presumed to offer higher quality or more advanced services	consequences of their health care decisions has made them more conscious consumers and helped limit overall health care costs.
Satisfaction & perceived quality	**Level of technology**
The transparency of the system also makes it responsive to consumer preferences. The Swiss do not impose a global budget on their health care system and have therefore avoided the waiting lists common in other systems. The Swiss generally seem pleased with their system. Earlier this year, Swiss voters over- whelming rejected a proposal to replace the current system with a single-payer plan; more than 71 percent of Swiss voters turned down the proposal in a nationwide referendum. [32] Nonetheless, the Swiss system has its own problems such as: possibility of the cost outweighs the value, the growth in covered benefits has helped drive up costs for the system as a whole, and the negotiations freeze in place a pricing structure that inhibits the development of innovative approaches that do not tie payments to specific benefits.	In addition, the Swiss have a high degree of access to modern medical technology, but it has come at a cost. The Swiss spend 11.5 percent of GDP on health care, second only to the United States. [33] Indeed, the Swiss government actually pays for a smaller amount of total health care expenditures than the U.S. government, 24.9 percent versus 44.7 percent. [34] (OECD Health Data 2007). The Swiss system gives consumers an overall incentive to make cost-versus-value decisions when purchasing health care, resulting in reduced costs while maintaining individual choice and quality care.

Chapter 3 How can Six-Sigma achieve the greatest impact on performance of ORIGAMI model in Health care system?

A Six Sigma Primer

The philosophy that underlies the Six Sigma process begins with the fundamental assumption that unless we understand a process mathematically, we know little about it. If we know little about it, we are not in a position to control it. If we are not in a position to control it, then we are at the mercy of chance variation. In the simplest of terms, Six Sigma is a quality improvement methodology that provides a systematic approach to the elimination of defects that affect something important to the customer. Those aspects of service that are of importance to the customer are termed "Critical to Quality," or CTQs in Six Sigma jargon. The tools associated with Six Sigma are qualitative, statistical and instructional devices for "observing" process variables, "quantifying" their impact on outcomes, as well as "managing" their character. Six Sigma is based upon three simple principles:

What is important to the customer? A customer is defined as anyone who receives a product, service or information. Therefore, when coupled with the Balanced Scorecard approach…internal quality impacts internal customers and external quality impacts external customers.

What defines success? Every result of an opportunity either meets the customer's CTQs and is a success, or fails to meet the customer's CTQs and is a defect. In Six Sigma, an indicator of success or failure is referred to as defects per million opportunities.

Every human activity contains variation. The term "Sigma" is a symbol for standard deviation, a measure of variation. Six Sigma refers to the idea of being able to achieve six standard deviations between the mean performance of the process and the customer-determined specification limit. If Six Sigma performance is achieved in a process, then that process will generate less than four defects (occurrences of getting it wrong) per one million opportunities.

The idea of measuring the number of standard deviations that fit between the mean performance of a process and the customer's expectation (translated into specification limits) is referred to as the process "Z-Score." The Z-Score allows for comparative analysis of the

performance of dissimilar processes, based upon the tendencies of each to either satisfy or disappoint their respective customers, the higher the Z-Score the less probability of customer disappointment.

I. Know the needs and VALUE

Value is relative, not absolute. External customers might consider something to be of better value if they have to pay less for a product or service that meets their expectations. On the other hand, suppliers may look on better value to be when they have to use fewer resources to provide a product, or service that satisfies the external customer.

Value (BSI, 2000; CEN/TC 279, 2000) may be expressed by the relationship:

$$\text{Value} \propto \frac{\text{Satisfaction of needs}}{\text{Use of resources}}$$

The symbol (read the symbol to mean 'is a function of') indicates that 'satisfaction of needs' and 'use of resources' can be traded off, one against the other, to obtain an optimum balance. Hence, from a Six Sigma viewpoint, optimization of value may be achieved in a number of ways. The better the needs are satisfied and/or the fewer the resources used, the greater is the value. This is illustrated diagrammatically in Figure 3.1.

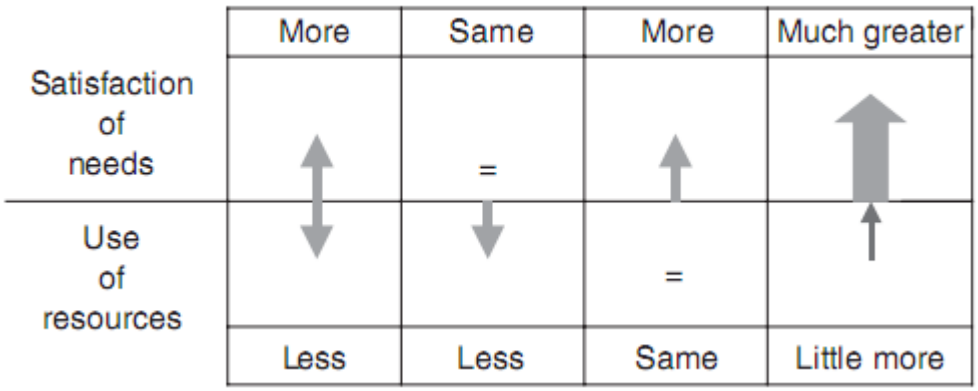


Figure 3.1 Value Satisfaction of needs Use of resources

Two different classes of needs are of particular interest to us in Six Sigma value-improvement projects. First, in applying a particular improvement method to reduce resource cost whilst retaining the original value, termed value analysis. Second, it is particularly important to

recognize that satisfaction of needs frequently involves more than just 'avoidance of failure to perform a function' or 'conforming to requirement'. Achieving an improvement of, say, 4 Sigma to 6 Sigma, namely going from 6210 to 3.4 failures per million opportunities would most certainly significantly decrease customer dissatisfaction with a product, or service. However, even achieving zero failures does not normally, in itself, create customer satisfaction but purely a feeling of neutrality about the product or service. These classes illustrate on the following tree diagram given in Figure 2.

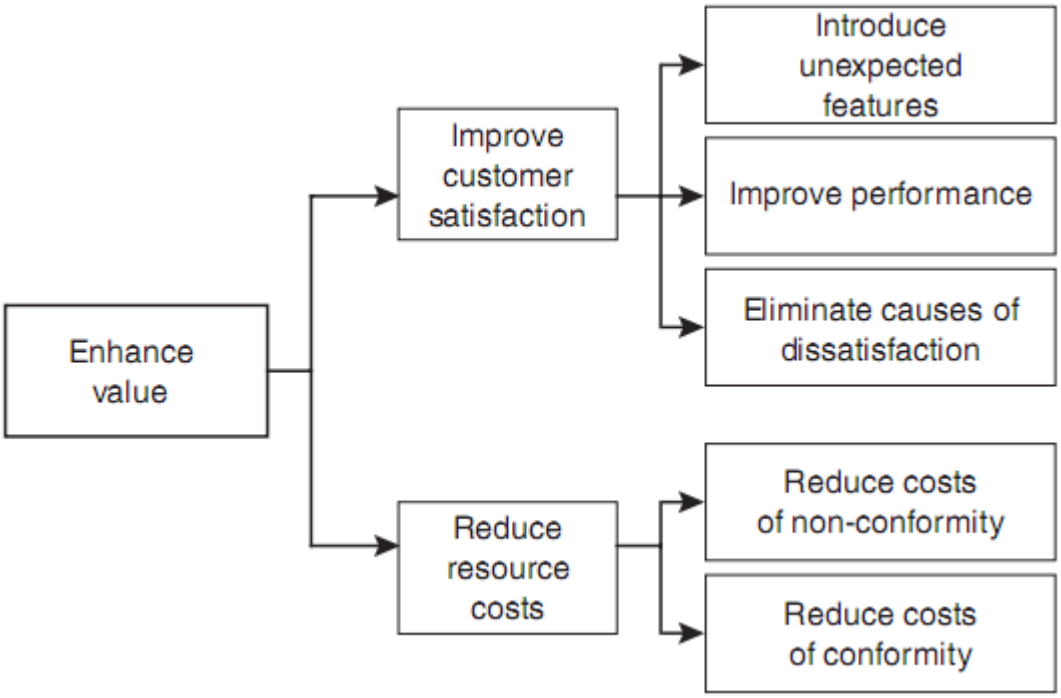


Figure 3.2: Value as a function of resources expended and satisfaction achieved

From a Six Sigma perspective, it is crucial that one does not become so set or resolute in the pursuit of the reduction of non-conformities per million opportunities, to minimize customer dissatisfaction, that opportunities are ignored, particularly in upstream activities, to create increasing degrees of satisfaction and even delight. Six-Sigma has an important role to play in upstream activities such as the identification, realization and performance improvement of critical to quality characteristics (CTQCs).

II. Understand the Quality Dimension in Health Care

Quality means different things to different people. There are different perspectives to quality in health care. From the provider's perspective, quality might mean providing the best possible care available to the patient. Quality from the perspective of the administrator is to provide effective care in a cost-conscious environment that may include the rationing of health care, especially when resources are limited. From the patient's perspective, on the other hand, quality is getting our care when and where we need it and from whomever we choose to cure my condition in the fastest possible way. Therefore, one quickly realizes that quality has different meanings for different health care players. So, what is quality? And how can we define it? Health services researchers and providers focus on whether the care that is provided is evidence-based. Economists typically view quality as a component of non-price competition. The IOM defines quality as "the degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge."[48] The Agency for Healthcare Research and Quality (AHRQ) defines quality health care as "doing the right thing at the right time in the right way for the right person and having the best result". [35]

In general, 'Quality' simply means the achievement of the desired objectives in the most efficient and effective manner, with the emphasis on satisfying the customer or the consumer. It is not necessarily the most expensive way to do things. On the contrary, it is a call for efficiency and cost saving. It is not necessarily the provision of luxury items or services. It is a product or a service that is acceptable, accessible, efficient, effective and safe, and that is continuously evaluated and upgraded.

Quality is measurable. A system is usually made up of three components: input, process and output. Quality of input (structure) can be measured. This includes the quality of personnel, supplies, equipment and physical resources. The system components of inputs, processes and outcomes have certain quality characteristics that are measurable and are important in quantifying the quality of a system.

The following are attributes and dimensions for health care quality in general which are equally applicable to primary health care. Data collected from several national and international surveys of consumers and providers of quality describe these dimensions as follows and in these sequences: Effectiveness, Efficiency, Technical competence, Safety, Accessibility, Interpersonal relations, Continuity, and Amenities.

Health care is a complex field, and without a good technical background the chance of professional survival is poor. Quality must be associated with high technical capabilities. No one would accept providing or receiving care in an environment that was unsafe or perceived as unsafe. From a risk management standpoint it is the duty of health professionals to secure a safe environment for their patients. Accidents have consequences, all of which are negative. Unsafe conditions may lead to physical and emotional injury and legal liability, as well as loss of good will and reputation. Apart from that, an unsafe environment is counterproductive as people will spend their time answering complaints and defending lawsuits. Safety is an expected and a required dimension of quality and especially health care quality. Accessible care is care that is available, acceptable, and affordable. Accessibility includes physical, financial, and intellectual accessibility. The later even has a more important role in an environment where there is a multiplicity of cultures, beliefs and educational backgrounds, as is the case with the international health care community.

Crossing the Quality Chasm has provided a blueprint for the future and has expanded the taxonomy and unifying framework in scoping the six aims for improvement, chain of effect, and simple rules for redesign of healthcare. The six aims for improvement, viewed also as six dimensions of quality in Health care, are as follows (Berwick 2002):

- Safe: Care should be as safe for patients in healthcare facilities as in their homes.
- Effective: The science and evidence behind healthcare should be applied and serve as the standard in the delivery of care.
- Efficient: Care and service should be cost effective, and waste should be removed from the system.
- Timely: Patients should experience no waits or delays in receiving care and service.

- Patient centered: The system of care should revolve around the patient, respect patient preferences, and put the patient in control.
- Equitable: Unequal treatment should be a fact of the past; disparities in care should be eradicated.

In other perspective, if we look at the quality in health care in two dimensions: Technical excellence: the skill and competence of health professionals and the ability of diagnostic or therapeutic equipment, procedures, and systems to accomplish what they are meant to accomplish, reliably and effectively. The other dimension relates to the subjective experience, and in health care, it is quality in this subjective dimension that patients experience most directly in their perception of illness or well-being and in their encounters with health care professionals and institutions, i.e., the experience of illness and healthcare through the patient's eyes. Health care professionals and managers are often uneasy about addressing this "soft" subject, given the hard, intractable, and unyielding problems of financing, access, and clinical effectiveness in health care. But the experiential dimension of quality is not trivial. It is the heart of what patients want from health care enhancement of their sense of well-being, relief from their suffering. Any health care system, however it may be financed or structured, must address both aspects of quality to achieve legitimacy in the eyes of those it serves.

Gathering and analyzing patient's information concerns based on Quality Dimension

A starting point for gathering this information is through voice-of-the-customer (VOC) research. These are studies, typically resulting in both qualitative and quantitative data that detail patient's wants and needs. This data is presented in a hierarchical structure and prioritized in terms of relative importance and patients' satisfaction with current alternatives. Often it is compiled in a complaint log or database.

There are a number of ways VOC data is traditionally collected:

- Patients' asset metrics: Leveraging existing corporate customer-behavior data (i.e., when patients enter the organization and for what purpose)
- Complaint catcher: Collecting actionable real-time data points from patient feedback
- Survey questions: Using questions to gain patient's thoughts and opinions
- Operational metrics: Listening to the operational management of the organization

- Formal research results: Using focus groups to validate what is already being done to listen, respond to and manage patient complaints

Although the concept of VOC may seem straightforward, it is actually quite complex. Surveys, focus groups and interview processes are not easy to set up in a manner that gathers unbiased data. People often give the answer that they believe the interviewer wants to hear – as opposed to their actual opinions. This leads to biased results that may not correlate with the customer's actual satisfaction.

In healthcare, patient satisfaction or patient experience of care surveys are perhaps the most common method used to evaluate quality through the eyes of the patient. In the past few decades, there has been a strong push to develop surveys that measure the processes of care that matter most to patients and their families, in lieu of older instruments that tended to focus on processes of care or departments that healthcare managers had some control over or decided on their own were important (e.g., food services, housekeeping, admitting). These departments and services all contribute to a positive experience, but they may or may not be at the core of what matters most to patients and their families.

For design a survey to explore patients' needs and concerns, as patients themselves define them, to inform the development of new surveys that could be linked to quality improvement efforts to enhance the patient's experience of care. The research survey should define the following eight dimensions of patient-centered care that could be measured:

- Access to care;
- Respect for patients' values, preferences, and expressed needs;
- Coordination of care and integration of services;
- Information, communication, and education;
- Physical comfort;
- Emotional support and alleviation of fear and anxiety;
- Involvement of family and friends;
- Transition and continuity.

An important design feature of these survey instruments is the use of a combination of reports and ratings to assess patients' experiences within important dimensions of care, their overall

satisfaction with services, and the relative importance of each dimension in relation to satisfaction. In focus groups of healthcare managers, physicians, and nurses to facilitate the design of “actionable” responses, complaints about the difficulty of interpreting ratings of satisfaction came up repeatedly. Clinicians and managers expressed well-founded concern about the inherent bias in ratings of satisfaction and asked for more objective measures describing what did and did not happen from the patient’s perspective. The end result has been the development of questions that enable patients to report about their experiences with care.

III. Quality Improvement in a Health Care System

Any healthcare system may be defined as a collection of encounters among stakeholders. At its simplest, the encounter is between a patient or care recipient and a professional or care-giver. However, as we have seen, each stakeholder in those encounters has their own perspective, and the reality is that each encounter is part of a series of encounters with a complex range of stakeholders. In spite of the fact that many of the key characteristics of a healthy population and a successful care system are determined by what goes on in those individual encounters, decisions about planning and policy are necessarily made at the macroscopic level. In particular, decisions taken at the macroscopic level tend to be about prioritisation within the healthcare system. Few politicians are prepared to speak of the rationing of healthcare, but in reality all systems have finite resources, so planning decisions are as much about deciding what is not going to happen as what is. The challenges facing any healthcare system may therefore be represented in terms of a series of conflicts pulling the system in different directions.

3.1 Customer satisfaction – What do they feel?

Customer satisfaction is a person's feeling of pleasure or disappointment resulting for comparing a product/service's perceived performance or outcome in relation to his or her expectations. As this definition makes clear, satisfaction is a function of perceived performance and expectations. If the performance falls short of expectations, the customer is dissatisfied. If the performance matches the expectations, the customer is satisfied. If the performance exceeds expectations, the customer is highly satisfied or delighted.

Therefore on applying this concept to the health care sector, "Customer satisfaction in a care service is basically a state of mind of the patient. It is the ability of care service to meet the expectations of the patient. Customer delight is all about exceeding the expectations of the patients to make him highly satisfied with the service".

The customer should aim for high satisfaction or customer delight because customers have no qualms in shifting when a better offer comes along from a different hospital. Those who are highly satisfied or delighted with the hospital are much less ready to shift. High satisfaction or delight creates an emotional bond with the hospital in the mind of the patient, not just rational preference. The result is high patient loyalty, which is what every hospital is looking at, to cut the competition.

The need to achieve patient satisfaction has made hospitals realize the importance of healthcare marketing. Hospitals are therefore today making efforts to determine what healthcare customers need, tailoring their services to meet those needs and then attracting patients to use these services. In a care, marketing is essential at all points. Every member of the care service has to be an active agent in satisfying and delighting the patient, which would translate into a source of strength for the community and the hospital. In all service industries, customer retention is a vital issue. The cost of customer retention can vary from a smile to an investment in a Customer Relationship Management (CRM) system.

3.2 Total quality management (TQM) in Health Care and implementation of Six-Sigma

The increase in public, professional and political interest in TQM is especially obvious in the United States of America. These are interrelated and included rapid advances in medical science, paradoxically demonstrated poor healthcare, rising costs of medical care, increased consumer education, expectations and power, the proliferation of service institutions and also increased Government involvement in healthcare provision and regulation. As in many other countries, TQM in healthcare came from industrial experience in the development of TQM concepts, theories and practices. However, to implement the same concept into the healthcare industry would be a disaster. Although anecdotal evidence suggests that the healthcare industry is not uniquely different from any other organization or industry; closer examination suggests

that the healthcare industry is, in fact, uniquely different on five major counts: its closer linkage to politic; its complex organizational structure; its inherent characteristics: intangibility, heterogeneity, inseparability, perish ability, labor intensive, a credence product; its objective is continually shifting, its environment is under siege from concurrent government changes v. differences in the perceptions, values and work ethic of the healthcare providers

Recognizing these differences is imperative to the successful implementation and development of a TQM system in healthcare. Whatever the differences and problems, TQM should not be directly transferred into the healthcare industry. It is up to the quality professionals in healthcare to define principles, philosophies and techniques that will determine the quality standards appropriate for their own industry. We establish the principles of TQM in a hospital setting, as TQM is very complex when implemented through the many processes and areas within a healthcare facility. In our work, the following definition of TQM sums up the principal elements of TQM: TQM is the integration of a customer-focused, continuous improvement philosophy, analytical skills, people skills and a structure and organization , within an internal and external culture affected by leadership (Gaucher and Coffey, 1993). [36]

Based on this definition, the principles of TQM are:

- The Theme: TQM must be grounded in a continuous improvement philosophy.
- The Focus: TQM is customer-focused. It is based on customer expectations and on meeting customer needs. However, in healthcare, the identification of the customer is a relatively new concept. The patient is not traditionally viewed as the ultimate 'external' customer. The idea of the patient and the existence of other external customers such as the government, employers, third party payers have only been recently acknowledged.
- The Control: TQM requires analytical knowledge and skills and an organization's long-term commitment. The use of analytical tools and techniques to evaluate and improve processes and in business decision-making is very important to the TQM process.
- The Approach: TQM requires a structure and organization that must be tailored to the unique internal and external culture and environment
- The Scale: TQM involves interpersonal or people skills. The Scope: TQM's focal point is leadership and collaborative teamwork.

3.3 TQM in Practice in Italian Hospitals

The TQM movement, while strong in many other industries, is still in its infancy in Italian healthcare services. Although the need for quality exists at all levels of healthcare provision, tertiary healthcare is of the greatest importance because the hospitals are where the medical technology is most advanced, where the greatest social and economic cost to society is incurred and where the opportunity for abuse and sub-optimal care is clearly present. Hence, the authors conduct an empirical study to determine the level of top management understanding of what is required to develop a TQM culture and the current TQM practices of Italian hospitals. The policy implications formed through subjective and objective evaluation instead of data-mining would also be compared to the principles of TQM discussed earlier.

IV. TQM and implementation of Six Sigma Improves Workflow in N-Medicine Department

In this section, we will analyze the implementation of Six Sigma in the nuclear medicine department of a hospital located in Northern Italy[37]. This hospital has always been recognized as a national and international reference site for its clinical competencies and innovative facility design. When the nuclear medicine department originally opened, it was structured to provide the best possible service to patients. At the beginning, it focused on state of the art equipment, the latest clinical protocols and diverse professional competencies of its staff. Nowadays, this department is still working hard to deliver excellent service to patients, at the same time being concerned about staff satisfaction and facing new challenges like, for instance, budget constraints.

Opening the Door to a Six Sigma Project: From the beginning of a Six Sigma continuous improvement, the key stakeholders were driven by an open-minded approach to sharing the department problems and issues, in order to improve efficiency of the department as much as possible. In computed tomography (CT) or magnetic resonance imaging (MRI) modalities, patients rely on equipment to obtain diagnostic images. In functional imaging, however, patients are injected with a radioactive pharmaceutical and the patients themselves emit rays, which are detected by gamma camera or a positron emission tomography (PET) system,

according to the energy window of the radioactive drug used for the clinical investigation needed. In almost all types of exams, from the time of the injection to image acquisition, it is necessary to wait some time in order to have the radiopharmaceutical fixed in the region of the patient's body where the pathology is located. This uptake time is the fundamental element to be taken into account during daily and weekly scheduling for each kind of exam. Another important issue is the characteristic of the acquisition systems, considering that in this department there are four gamma cameras (three single-head, and one dual-head system) and one PET-CT scanner. On the whole, the number of exams performed yearly is about 20,000 (including 11,000 in vivo studies, 4,200 dual-energy x-ray absorptiometry (DEXA), 2,700 thyroid endoscopies and 2,800 PET-CT investigations) divided among inpatients (15 percent), outpatients (80 percent and emergency department patients (less than 5 percent).

From CTQs to the Define Phase

During the project kick-off meeting, the critical-to-quality elements (CTQs) came up clearly and the project focus was set on the evaluation of the nuclear medicine department activity and workflow, as well as the thyroid endoscopy. The PET-CT environment was kept out of the project scope as noted in the table 1 below.

Table 3.1 Input and output of the project

Input and output of the project	
In Scope	**Out Scope**
Personnel with standard shift	Personnel with overtime
Four Gamma Camera Activity	PET/CT and DEXA Personnel Activity
Inpatients, Outpatients and ED Patients	Nuclear Medicine External Activity (e.g., Operating Room)
Nuclear Medicine and Thyroid Endoscopy Activity	

The application of Six Sigma methodology was well suited to addressing a long process cycle time (from exam booking to report delivery), and the need to track it in order to check where and why it was delayed. Actually, the nuclear medicine department had already mapped the process workflow in a high level process map from exam booking until report delivery. This

provided a head start for the Six Sigma project. In addition, the department had other issues related to staff communication and patient satisfaction as well as a long waiting list for bone and cardiac exams (20 and 40 days).

Going to the Measure Phase

The project team began the data collection by setting up two separate forms – one for nuclear medicine department and one for endoscopy activities to capture the timing of every single step of the processes from exam booking to report delivery date. This included the type of investigation, the camera used, the number of acquisitions executed, the waiting time in between the different steps, etc. Both processes were divided in two parts from exam booking to report delivery and patient wait time in the department. The wait time was defined as from administrative admission to the exit. The team wanted to study in detail which process steps plays a key factor (Figure 3.3), keeping into account for endoscopy, and the parts in which the physician is in charge (Figure 3.4).

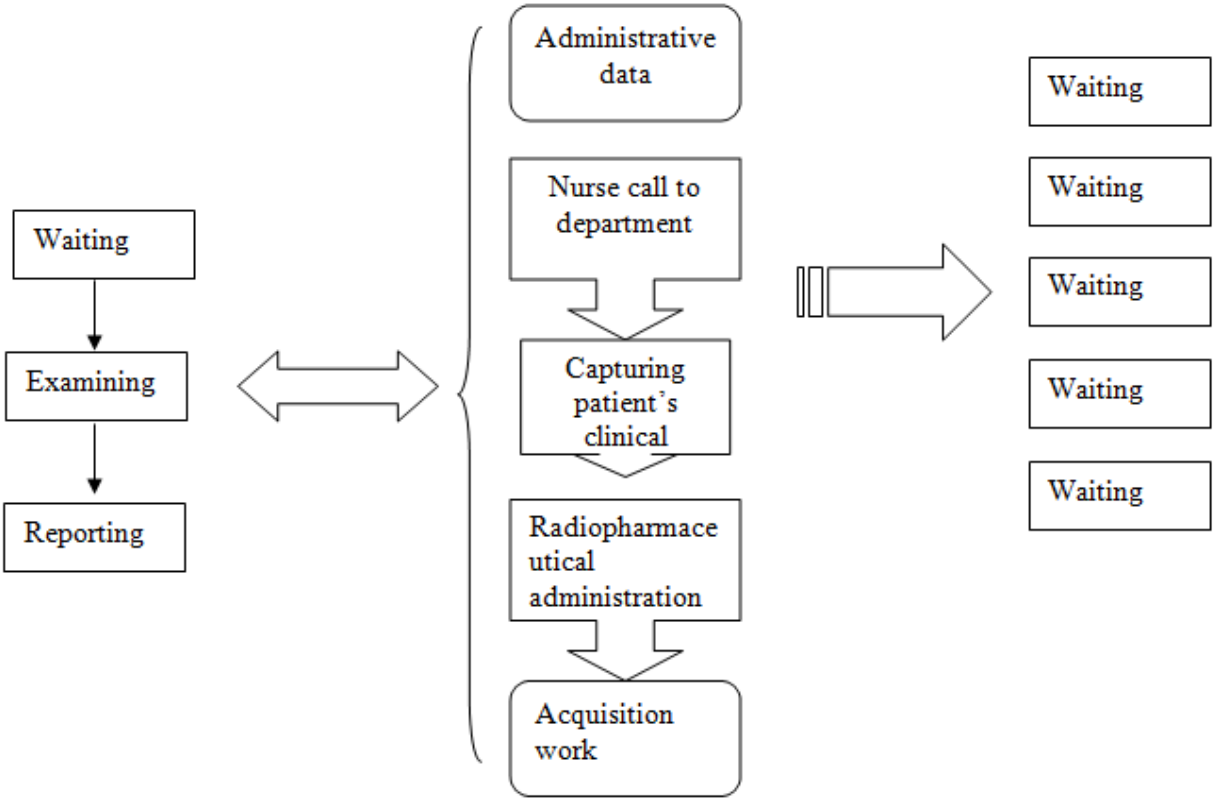


Figure 3.3 Medicine Cycle Time Process and Exam

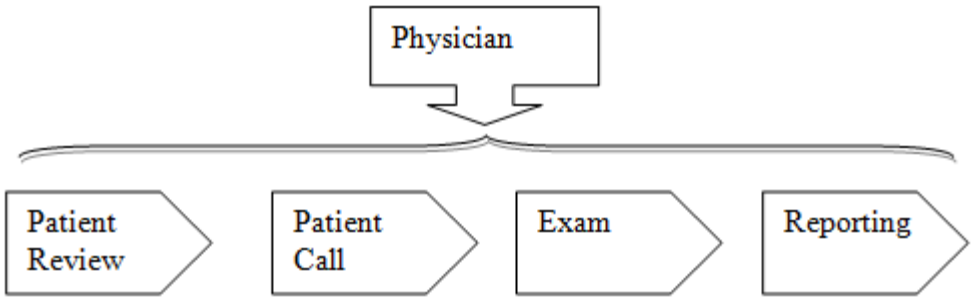


Figure 3.4 Thyroid Endoscopy

What is the analysis of the Project Team: The data analysis pointed out some surprising situations, in other cases; problems were exactly as expected, such as the bottleneck for the clinical history capture. It had a long wait time (24 minutes) due to the fact that there was just one physician and one ward dedicated to this activity. From the statistical analysis of the process cycle time, the waiting list for cardiac and bone exams turned out to be quite long as expected, 43 and 23 days for outpatients, although still within the local requirements (60 days). As a matter of fact, the cardiologists' availability for the nuclear medicine department activity was fixed and related to their activity in the cardiac department, but it represented the key to decreasing the waiting list, adding a weekly session and helping the department gain a competitive advantage over the hospitals located nearby. The problem about the bone scan waiting list had been figured out when the project team analyzed the camera workload. The data was not consistent with the daily agenda as scheduled. For example, the whole body acquisition, which is one of the longest scan, had been performed from time to time with the single-head camera even though the dual-head one was available. It takes the single-head camera twice as long to scan. According to the camera workload analysis, 40 percent of the acquisitions had been performed by the dual-head system, while the exam length and the downtime were too long for the single-head ones.

In addition to the suggestion of new equipment, these other ideas were raised during the project: an additional ward for the patient clinical history capture, a dual-head camera room, a physician reporting room, minimize the patient path, keeping the attention on the

radioprotection issue, as the team considered physical changes in the department, it used a spaghetti chart, a Lean tool, to help in redesigning the layout.

From Analysis to Improvement: The opportunity to have a reporting room could solve a workflow problem raised by the data analysis: The patient length of staying in the gamma camera room compared to the acquisition length was too long. This was because, after the acquisition, the technologist had to look for a physician to see if there was any need for further investigations. This left the patient in the acquisition room and delaying the schedule. In the analysis of endoscopy activities, the data showed the process cycle time was extremely long with excessive variability – an average of 50 days with a standard deviation of 36 days. Statistical analysis indicated three different sub-processes for inpatients, outpatients and patients with a check-up fixed from 60 to 90 days (70 percent out of the total exams). This fact explained the process cycle time length.

Another big issue was related to the fact that at least 15 percent of scheduled outpatient appointments did not present themselves at the endoscopy exam. The reason was the unacceptable waiting list of 15 days. This was considered by patients as too long compared to the same investigation done in private centers. The project team checked the feasibility and suggested adding a patient in the daily agenda in order to shorten the waiting list and become more competitive.

Result: Overall, the Six Sigma project helped the nuclear medicine team to better understand and uncover some of the issues it has been facing in the routine workflow management. The project ultimately led to a 30 percent reduction in patient waiting time and an increase of the equipment utilization rate, while maintaining staff and patient satisfaction. Regarding to the costs, there is a cost of consulting in a mid-sized hospital of $500,000. While according to recent surveys it is said that implementing Six Sigma of case study could save from 1-1,8 billion $. From this result, we can see that, successful implementation of Six Sigma could get significant benefit to any organization.

V. A new challenge of merging between Six Sigma and Balanced Scorecard

In an era of complexity and contradiction, many healthcare organizations are seeking bold strategies for leading and managing change. While concepts behind the Balanced Scorecard and

core Six Sigma methodologies are not new, a powerful management tool can be implemented through the unification of these two strategies. This new approach that combines the targeted performance indicators of a Balanced Scorecard with the statistical rigor of Six Sigma can be used to effectively focus an organization on the achievement of strategic goals. The adoption of this structured approach to planning, managing and monitoring improvement brings cohesion to conflicting constituencies and builds confidence in proposed process improvements; it could have a measurable impact on the organization by accelerating the implementation of change, often viewed as a delicate balance between cost, quality and efficiency.

4.1 Healthcare's Value Chain

Understanding healthcare, from a business perspective, is critical to insuring the long-term viability of a delivery system. It is also a prerequisite to applying both the Balanced Scorecard approach and Six Sigma methodology. Six Sigma originally grew from a setting that was primarily industrial and product-focused. Within this environment, operations are performed on raw materials and as a result they become more valuable component parts. These component parts are then built into higher-level assemblies and ultimately products of progressively increasing value. The value chain for healthcare differs significantly from this model and is illustrated below in Figure 3.5. The value chain for healthcare starts with highly satisfied, dedicated and well-motivated care providers. This produces high internal quality, which relates to process steps that are felt by the institution and are not directly felt by the patient or referring physician. An example of an internal quality metric is the cycle time for the transcription of a radiology report. This represents an interim step in the process that begins with the recognition of need for the exam and ends with the authenticated report in front of the clinical decision maker. Naturally then, high external quality follows from high internal quality. In other words, quality in those steps that are felt by the customer leads to high customer satisfaction and loyalty. This, in turn, leads to revenue and margin, completing the value chain.

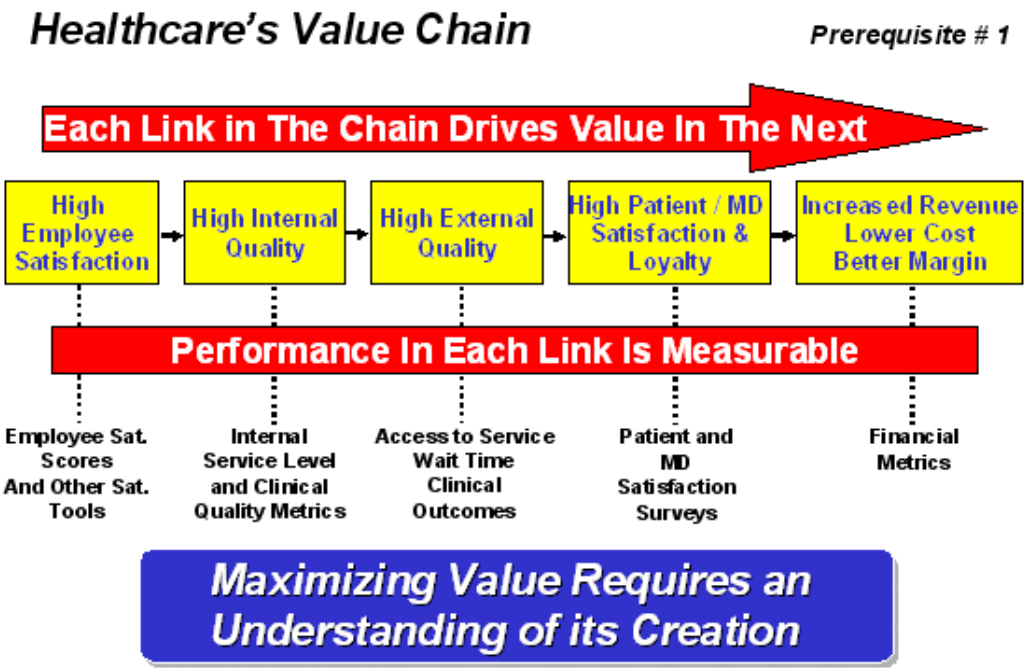


Figure 3.5 Healthcare's Value Chain

When appropriate performance metrics are aligned along the value chain, they provide greater insight into how the system is performing today, and what it may anticipate in the future. This concept is illustrated in Figure 3.6.

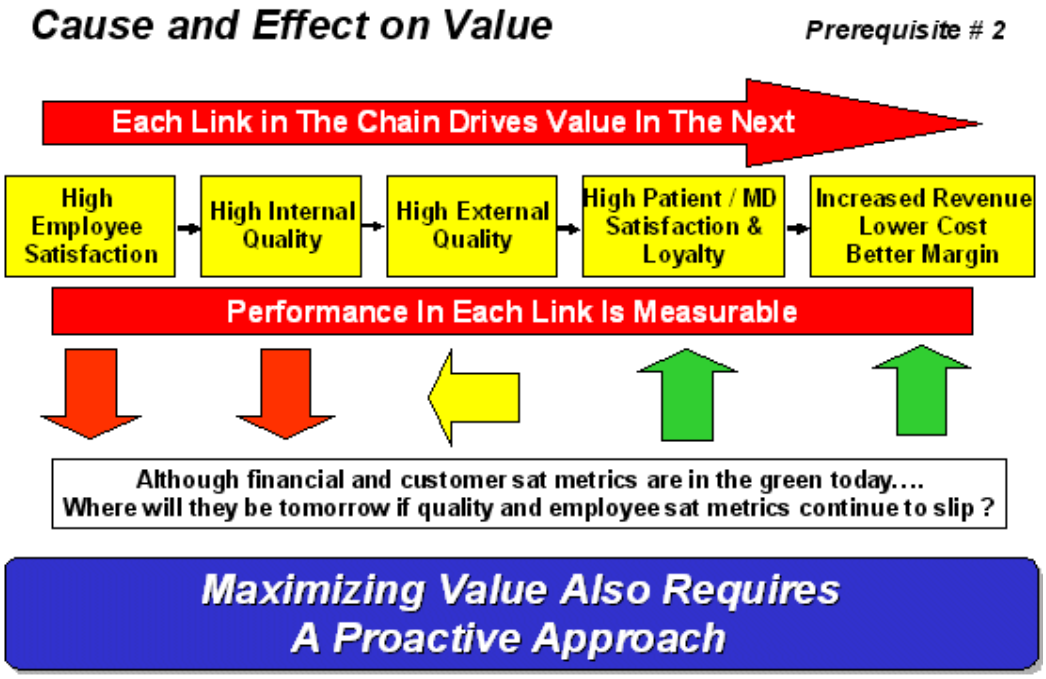


Figure 3.6 Causes and Effects on Performance of Value Chain

In this illustration the organization under consideration is operating well in its financial and customer satisfaction metrics as indicated by the upward pointing green arrows. Employee satisfaction and internal quality are poor as indicated by the downward pointing red arrows. As a result, external quality felt by the customer is beginning to decline as indicated by the yellow arrow pointing sideways. It is intuitive that if this trend continues, customer satisfaction and financial performance will begin to decline as well.

The Balanced Scorecard approach is based upon understanding healthcare's value chain and aligning both strategy and the extended delivery teams' behaviour to focus on those activities necessary for the sustained creation of value. Six Sigma's methodology is based on statistically quantifying the impact of causal factors on the variability of results. When applied in concert, they represent powerful tools that can be effectively deployed to align the organization's vision, mission, strategy and specific behaviours toward the sustained creation and delivery of value.

4.2 Creating Organizational Alignment

Most institutions undergo a rigorous annual planning process. Fewer organizations take one more step by translating the resultant strategic imperatives into families of clear, simple metrics aligned to the value chain. Even fewer have made these metrics appropriately visible and actionable at all levels. Generally written at the 30,000-foot level, vision and mission statements are designed to elicit basic agreement from all team members. When vision and mission are translated into specific behaviours, however, agreement is less immediate and conflict may arise among various stakeholder groups. Translating strategic imperatives into a network of clear, simple metrics is the first step in the Balanced Scorecard approach. Alignment of these metrics along the value chain is Step 2, and is illustrated in figure 3.7 below.

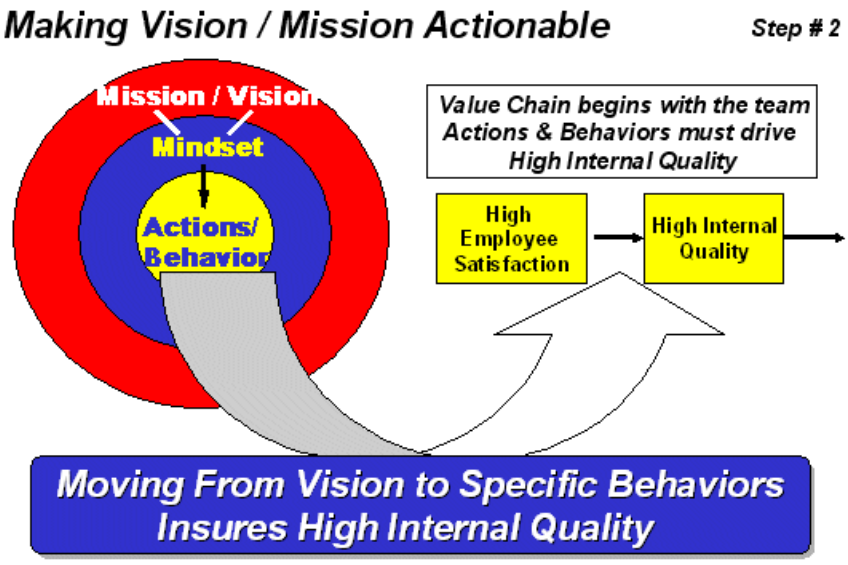


Figure 3.7 Making Vision and Mission Actionable

The remaining steps in using the Balanced Scorecard approach to create organizational alignment include the following:

- ✓ Step 3 - Assessment of the Organization's Capabilities
- ✓ Step 4 - Cause Analysis
- ✓ Step 5 - Resource Deployment
- ✓ Step 6 - Alignment of Systems and Structures
- ✓ Step 7 - Monitoring Progress and Continually Raising the BarMany of the statistical tools and process improvement techniques associated with Six Sigma lend themselves well to the accomplishment of these subsequent steps and are illustrated in the following sections.

Making Quality the Operating System: Each metric in the value chain is assessed based upon its ability to satisfy or disappoint its customer. Referring back to Figure 4, this is the method whereby the status of each link in the chain is evaluated. Employing this approach allows the institution to essentially make quality the operating system. A top level institutional Scorecard must be translated to the department level. At the department level, those factors that have the greatest impact on the top level Scorecard must be identified and rigorously controlled. This is another significant opportunity to employ Six Sigma methodology. A typical Six Sigma project

will focus on a specific metric referred to as the project's "response variable" or Y. The variation in this Y is a function of one or more causal factors, referred to as Xs. The idea is to mathematically understand the contribution of causal factors to variability of the project's response variable or Y, before specific solutions are designed, thereby maximizing the impact of the solution.

By creating statistical linkages between the Y, metrics on the Balanced Scorecard and the X(s), causal factors, the Six Sigma methodology augments the Balanced Scorecard approach in two important ways. First, every link in the value chain is a causal factor to the subsequent link. Referring back to Figure 3.4, each link may be thought of as a Y in and of itself, and as an X to the next downstream link in the chain. Second, as the value chain metrics at an institutional level are flowed-down to departments, quantification of the causal Xs at a department level will pinpoint specific processes and behaviours that have the greatest impact on the value chain. This provides the foundation for Step 4 (Cause Analysis).

In Cause Analysis, two strategies are deployed with the same objective - focusing limited resources on those activities that represent the greatest return on investment. First, by retaining performance data month to month along the value chain, a regression model may be built indicating the potential impact of changes in one link of the value chain on performance in successive links. This model also can highlight where there is no verifiable statistical linkage, leading to three critical outcomes:

1. Insuring the right metrics have been selected.
2. Insuring these metrics are measured properly.
3. Focusing senior level management on one overall deployment strategy

During the analysis phase, the team identifies the factors or Xs likely to have the greatest impact on the response variable. These factors are classified as either controllable or uncontrollable. If a causal factor (X) is controllable and contributes significantly to variability in the response variable (Y), then an opportunity to achieve a better result presents itself by controlling the causal factor. By focusing on causal factors that have a statistically proven impact on a process, the organization gains an important advantage in being able to predict the effect of proposed changes and create an easily understood family of value propositions.

Aligning Systems and Structures

So far, we have translated the organization's strategy to the value chain, assessed the organization's capabilities and discovered which projects will have the greatest impact. In the analysis phase, we explored the underlying factors that actually drive results. Each phase is integral to the overall process and ensures that the team is using the right techniques to focus on the right objectives for the right reasons.

Taking an improvement initiative to the next level, however, also requires a careful examination of existing systems and structures. In many cases, the way an organization's systems and structures are aligned fundamentally conflicts with the objectives they are trying to achieve. It's important to begin by making sure appropriate resources are deployed where they will have the greatest impact. It is also necessary to look at seven additional elements that are key to the success of the initiative, and critical questions that must be answered:

Organizational design: Is your quality program contained within a single department or is the concept of quality spread across every part of the business?

Staffing: Are you selecting the "best and brightest" from your staff to lead quality and process improvement efforts?

Development: Have you provided options for continuing education, experiential or project-based training and cross-functional capabilities?

Measurement: Are your projects supported by the right metrics and aligned with your strategic objectives? Are your performance measurements designed to drive organizational success?

Rewards/recognition: Is there a consistent process in place for rewards and recognition linked to key metrics?

Communication: Does the organization understand the importance of clear and consistent communication?

Information Technology: Are there sufficient IT solutions in place for project funnel management, financial.

Gaining Control

The last and continuing step in this process involves monitoring changes and key metrics. That's the purpose of the Balanced Scorecard itself - to serve as a tool that assures the achievement of

the organization's strategy on an ongoing basis. The Balanced Scorecard should have a top level appearance similar to the illustration in Figures 3 and 4, along with the ability to drill down in each one of the five top level sections and review the metrics associated with those activities that create the greatest organizational leverage. The challenges confronting healthcare are complex, and no overnight solution will make the problems disappear. Taking a calibrated approach to performance improvement, however, can help hospitals and health systems regain control and realize substantial benefits. Combining Six Sigma with the Balanced Scorecard may be the best way to reach and sustain a new level of organizational excellence.

Chapter 4 Origami model for high performance and integrated quality

I. Why a new model with Six Sigma?

What is the philosophy of the new model?

When we stated to think about solving and applying of existing frameworks on problems of healthcare system, we met many obstacles to fill the gap between Six Sigma and other model. Most existing could not fill the gaps of "How to apply Six Sigma on overall system", Six Sigma while mainly focus on process improvement and does not show the inner-relationship among components inside a system. Cause and effect from one side to other side of system, we also recognized the lack of Six Sigma when applying to a system without consideration of overall system. So, our model was built to fill this gap, with combination of Six Sigma, the system will archive very high performance operation, with high quality control of all aspects. The model includes the main features as describe in the followings (in generic description):

- Link every part of the organization links, every part of the organization not only the quality point of view and quality department.
- Provide accuracy of the performance measurement
- Combine all the different perspective of business environment
- Separate the physical organization into two logical entities: processes and organization
- Consider processes is central of system which face directly to customers
- Consider the requirements and customer satisfaction on different perspective (perceived quality different from actual quality)
- Provide all the aspects for measuring the total quality
- Give quickly access for organization to define strategic decision to increase the customer satisfaction and reduction of the cost optimization.
- Be easy for organization to integrate the six sigma methodology, easy combination and enhance existing tools of Six Sigma
- Be able to quickly define the main factors to effect on customer satisfactions

II. Overview description of model

The model consists of 2 main sides as front and back side. We named the model as ORIGAMI where it comes from the Japanese game of building various shapes by folding the paper. The idea behinds the name for our model includes 3 key elements:

- Transformation from customer perspective to total quality perspective
- Process focus on customer requirement and satisfaction
- Continuous improvement through the movement of all the components

We take the helix as icons of continuous improvement. This icon expresses the meaning of adaptation of the organization according the change of external environment such as the wind and weather which causes the transformation to energies in the windmill. Nowadays, in a very complex and competitive business environment, the organization need interact, change and improve itself to provide high quality of products and services to bring high level of customer satisfaction and gain a substantial profit.

Front side :

Table 4.1 Components related to quality perspective of Front Side

Component	Function	Quality Perspective
Central compenent	Internal entity	Design Quality
Input component: resources component.	Provide the resources for system	Availability
Output component	Produce by process , give to customer	Actual Quality
Customer requirement	Customer expectation	Expected Quality
Customer satisfaction	Conformance to customer requirement.	Perceived Quality

Back side :

Table 4.2 Components related to quality perspective of Back Side

Component	Function	Quality Perspective
Organization structure with supply chain model	Provide, support for Front Engine.	Total Quality of an Organization
Gate 1(matrix) : mapping between The customer requirement and Input	Provide the information and evaluations of the level of resources and the level of customer requirements in order to achieve the best strategic decision for both short and long term	Quality achieved through voice of customer for better design process. Lean production and waste reduction.
Gate 2 : Customer requirement and output	Define the level of output based on the customer requirements	Quality control and quality assurance.
Gate 3 : Output and Customer satisfaction.	Measure the actual quality conforms to customer satisfaction: perceived quality.	Quality achieved through customers' feedbacks and Six Sigma applies in output control.
Gate 4 : Resources and Customer satisfaction	Provide information about level of resources in relation to customer satisfaction to help organization optimize use of resources and obtain the high level of customer satisfaction	Reflection of customer satisfaction on the capacity and level of resources

Graph of model

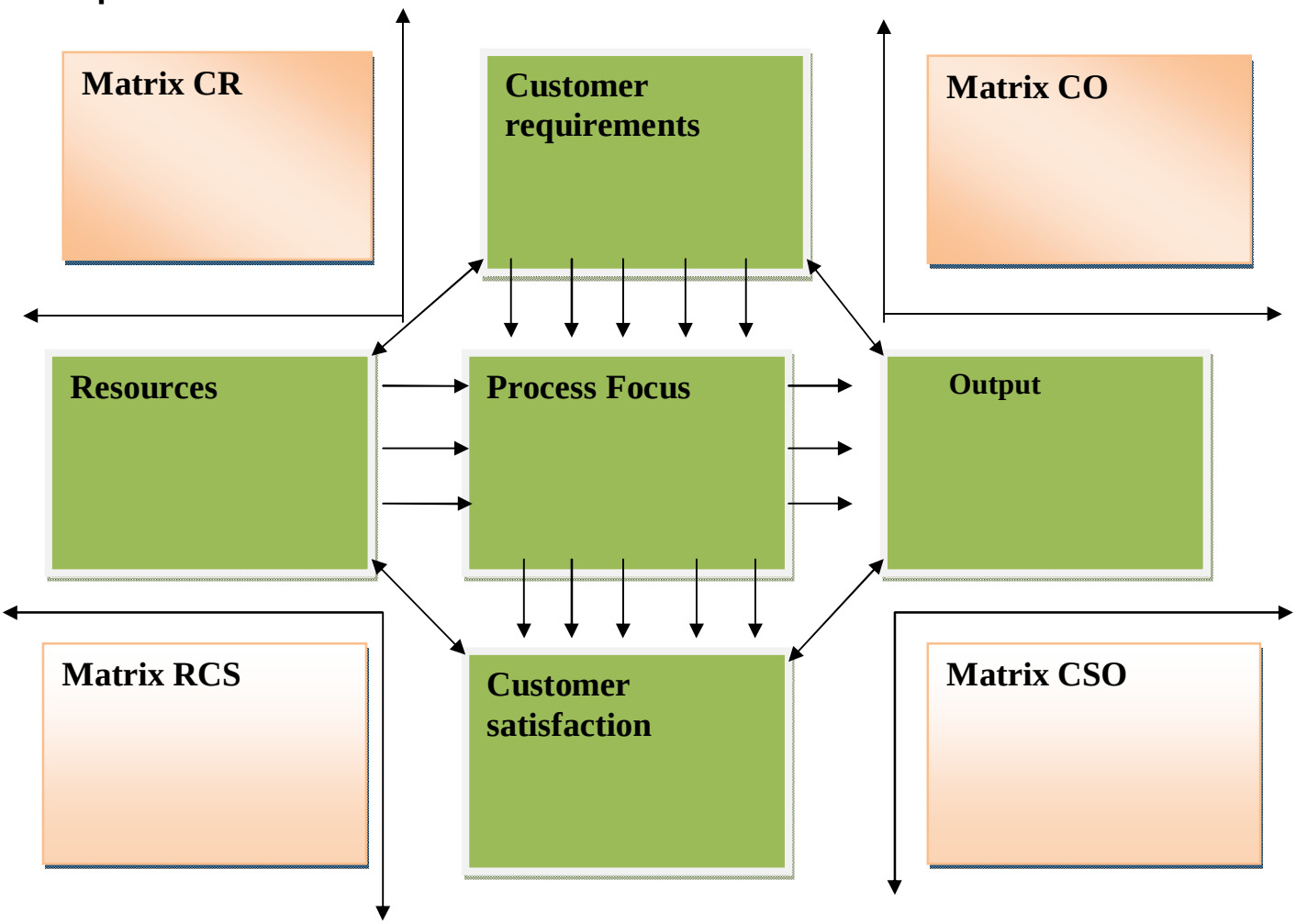


Figure 4.1 Main components and matrixes of the model

PART I. Front tier side

The frontier side has 5 main blocks to address different aspects of an organization, this side explicit directly to all about business of organization as follow:

a. Resources

b. Business Output: This block and output of Processes, it shows the organization's performance and in key business areas, products and services performance according to market and customer requirements.

c. Processes : As centrally, this block all processes of an organization includes the key production, logistics and other business processes to create customer and organization value, and key support involving in all work units

d. Customer's Requirements: This block determines how an organization understands the customer requirement, expectation and preferences of customer and markets.

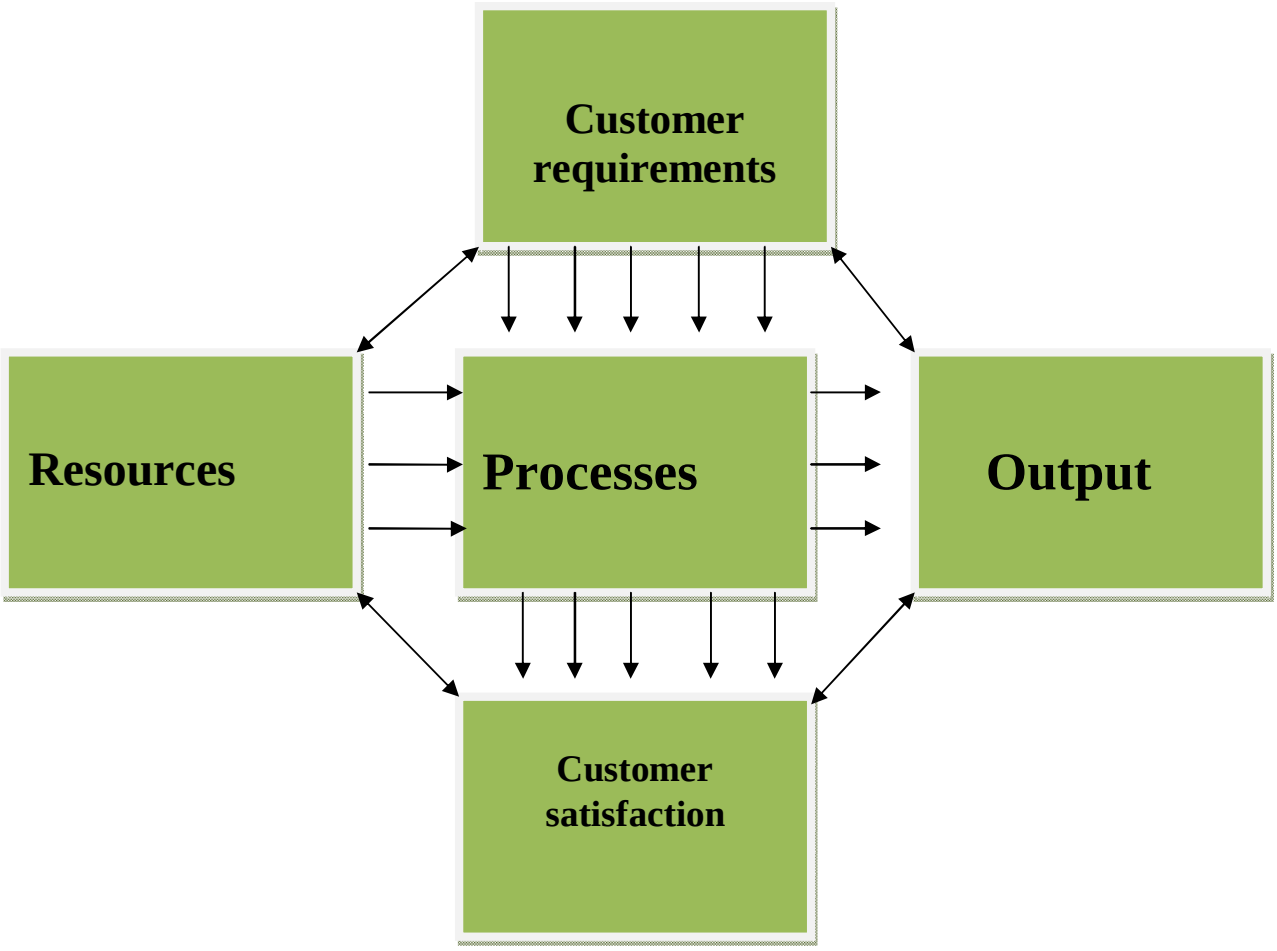


Figure 4.2 Main components of frontier side of the model

1. Processes as a central component

The central block includes all about processes which dealing directly or indirectly with other blocks. They can view in 2 different perspectives:

- Process management
- Process Improvement

Process management involves planning and administering the activities necessary to achieve a high level of performance in key business processes, and identifying opportunities for improving quality and operational performance, and ultimately, customer satisfaction. Process management activities help to prevent defects and errors, eliminate waste and redundancies, thereby lead to better quality of output and improved company performance through shorter cycle times, improved flexibility, and faster customer response.

There are many processes in the block of processes, including important processes throughout the value chain that affect customer satisfaction. They fall into two categories: Value creation processes and support processes.

Value creation processes are core processes, those processes are "running the business", maintaining or achieving a sustainable competitive advantage. The drive the creation of products and services is critical to customer satisfaction, and has major impact on the strategic goals of an organization. While, support processes that are most important to an organization's value creation processes, employees, and daily operations. They provide infrastructure for value-creation but generally do not add value directly to the product or service. In general, value creation processes are driven by external customer needs while support processes are driven by internal customer needs. The classification of processes type is depending on the nature of products and services, customer and market requirements, global focus and other factors.

a. Understanding each process

Key elements of a process includes: Input, Output, Events, Phases, Resources, Management tools.

Input can come from directly from customer requirements, or from other processes. The output of the process depends on many factors, while events can occurs during the flow of the process, this is the time dimension, describe the starting of process and ending of process. Events are potential occurrences related to controls. By using the management methods provided by Six Sigma methodology such as Control Chart, Graph… which can help coordinate activities, make decisions and monitor progress of processes.

In different point of view, the process is described in the figure 2, where a process is the transformation of a set of inputs into outputs that satisfy customer needs and expectations, in the form of products, information or services. Everything we do is a process; so in each area or function of an organization there will be many processes taking place. For example, a finance department may be engaged in budgeting processes, accounting processes, salary and wage processes, costing processes, etc. Each process in each department or area can be analysed by an examination of the inputs and outputs. This will determine some of the actions necessary to improve quality. There are also cross-functional processes. The output from a process is that which is transferred to somewhere or to someone – the customer. Clearly to produce an output that meets the requirements of the customer, it is necessary to define, monitor and control the inputs to the process, which in turn may be supplied as output from an earlier process. At every supplier/customer inter- face then there resides a transformation process (Figure 10), and every single task throughout an organization must be viewed as a process in this way. Once we have established that our process is capable of meeting the requirements, we can address the next question 'Do we continue to do the job correctly?', which brings a requirement to monitor the process and the controls on it. If we now re-examine the first question "Have we done the job correctly?". We can see that, if we have been able to answer the other two questions with a yes, we must have done the job correctly. Any other outcome would be illogical. By asking the questions in the right order, we have moved the need to ask the 'inspection' question and replaced a strategy of detection with one of prevention

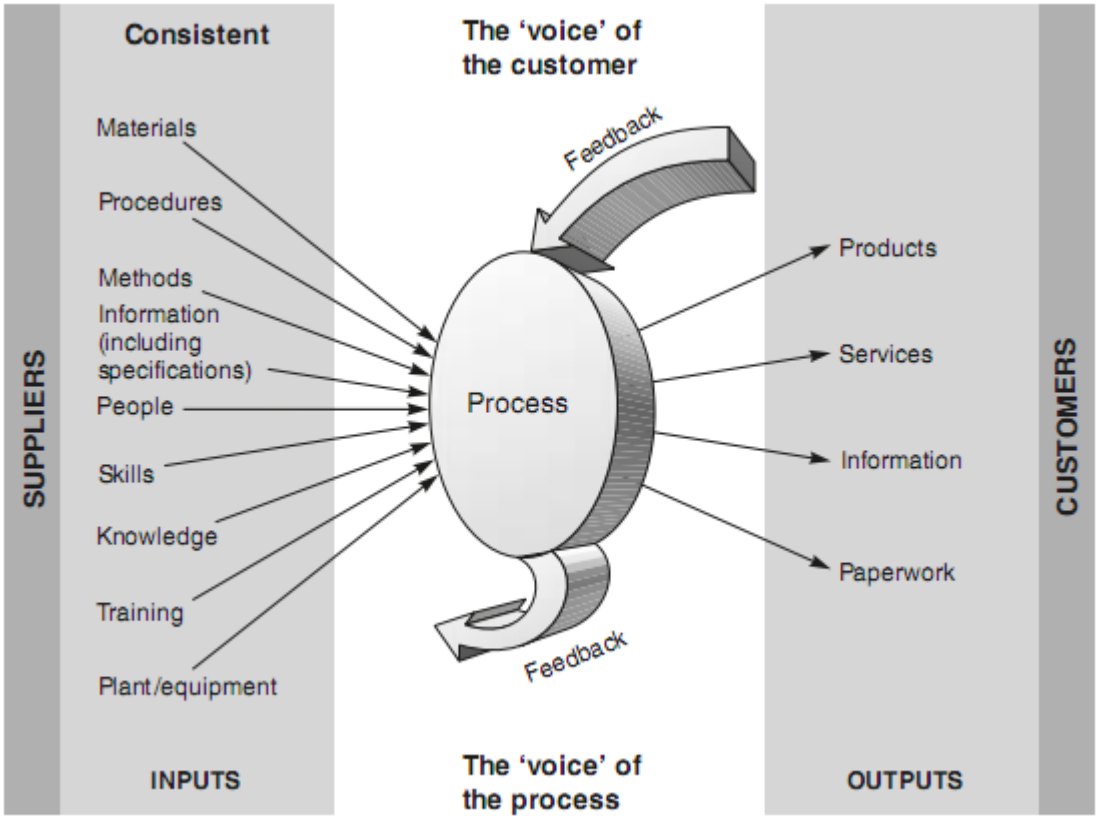


Figure 4.3 Supplier/customer interface through a process

This concentrates all the attention on the front end of any process – the inputs – and changes the emphasis to making sure the inputs are capable of meeting the requirements of the process. This is a managerial responsibility and is discharged by efficiently organizing the inputs and its resources and controlling the processes. These ideas apply to every transformation process; they all must be subject to the same scrutiny of the methods, the people, skills, equipment and so on to make sure they are correct for the job. A person giving a lecture whose audio/visual equipment will not focus correctly, or whose teaching materials are not appropriate, will soon discover how difficult it is to provide a lecture that meets the requirements of the audience.

b. Understanding the link between 2 processes

Two processes are linked together as output of one process will be the output of next process. Through understanding of linkage between 2 processes, it will help to discover to relationship or "Cause and effect" phenomenon.

c. Analysis of Critical chain of processes

Further, through the chain of the processes, leading practices will focus on Critical Chain of Process which is a collection very important process. The manager needs to optimize this chain in order to get the best performance for customer satisfaction.

Process improvement:

Any process performance measure naturally fluctuates around some average level. Abnormal conditions cause an unusual deviation from this patter. Removing the causes of such abnormal conditions and maintaining level performance is the essence of control. Improvement of process gives changing the performance to a new level.

For leading practices, process management requires a disciplined effort involving all managers and workers in an organization. Companies that are recognized world leaders in quality and customer satisfaction share some common practices.

a. They define and document important values creation and support processes, and manage them carefully.
b. They translate customer requirements into product and service design requirement early in the design process, taking into account linkages between product design requirements and manufacturing or service process requirements, supplier capabilities and legal and environmental issues.
c. They ensure that quality is built into products and services and use appropriate engineering and qualitative tools and approaches during the development process.
d. They manage the product development process to enhance cross-functional communication reduce product development time and ensure trouble free introduction of products and services.
e. They define performance requirements for suppliers, ensure that requirements are met and develop partnering relationships with key suppliers and other organizations.
f. They control the quality and operational performance of key processes and use systematic methods to identify significant variations in operational performance and output quality, determine root causes, make corrections, and verify results.
g. They continuously improve processes to achieve better quality, cycle time, and overall operational performance.

Design Process for quality

The design of the processes that produce and deliver goods and services can have a significant impact on cost (and hence profitability), flexibility (the ability to produce the right types and amounts of products as customer demand or preferences change) and the quality of the output. Standardized processes establish consistency of output. Today, many companies use a strategy of mass customization, providing personalized, custom-designed products to meet individual customer preferences at prices comparable to mass-produced items. Mass customization requires significant changes to traditional manufacturing processes that focus on customized, crafted products or mass-produced, standardized products. These products include flexible manufacturing technologies, just in time system, information technology, and an emphasis on cycle time reduction.

Process improvement is an important business strategy in competitive markets because

a. Customer loyalty is driven by delivered value
b. Delivered value is created by business processes
c. Sustained success in competitive markets requires a business to continuously improve delivered value
d. To continuously improve value creation ability, a business must continuously improve its value creation processes.

Many opportunities for improvement exist, including the obvious reductions in manufacturing defects and cycle times. Organization should also consider improving employee morale, satisfaction, and cooperation; improving managerial practices; improving the design of products with features that better meet customer's need and that can achieve higher performance, higher reliability , and other market driven dimensions of quality and improving the efficiency of manufacturing systems by reducing workers' idle time and unnecessary motions, and by eliminating unnecessary inventory, unnecessary transportation and material handling and scrap and rework. One popular methodology as known as "kaizen" which is a philosophy of Just-In-Time for improvement, Kaizen focuses on small, gradual and frequent improvements over the long term with minimum financial investment, and participation by everyone in the organization.

Process Control: is important for ensuring the conformance to the requirements and taking corrective action when necessary to correct problems and maintain stable performance. Process control methods are the basis for effective daily management of processes. For long-term improvements, it can be made to a process unless the process is first brought under control. Any control system has three components:

a. A standard or goal
b. A means of measuring accomplishment
c. Comparison of actual results with the standard, along with feedback to form the basis for corrective action.

Goals and standards are defined during planning and design processes. They establish what is supposed to be accomplished; these goals and standards are reflected by measureable quality characteristics, such as dimensions for machined parts, numbers of defectives, customer complaints, or waiting times.

Process management and Six Sigma

Six Sigma and Lean are applied on total aspects of organization

Even though, Six Sigma is based on understanding and improving processes on a project by project basis. But, we extend the concept and approach to all process design, control and improvement for overall supply chain and to each process and chain of processes as illustrated in figure 11.

i) On each process
ii) Horizontal chain of processes (A1 > A2 > A3 > A4 > A5)
iii) Vertical chain of Process (A1 > B2 > C3 > D4 > E5)
iv) Through Overall of Supply chain
v) Optimization through
    - Best cost competitiveness
    - Optimal Critical Path Processes (A1 > B2 > C3 > D4 > E5)
    - An high performance, integrated competitive IT system

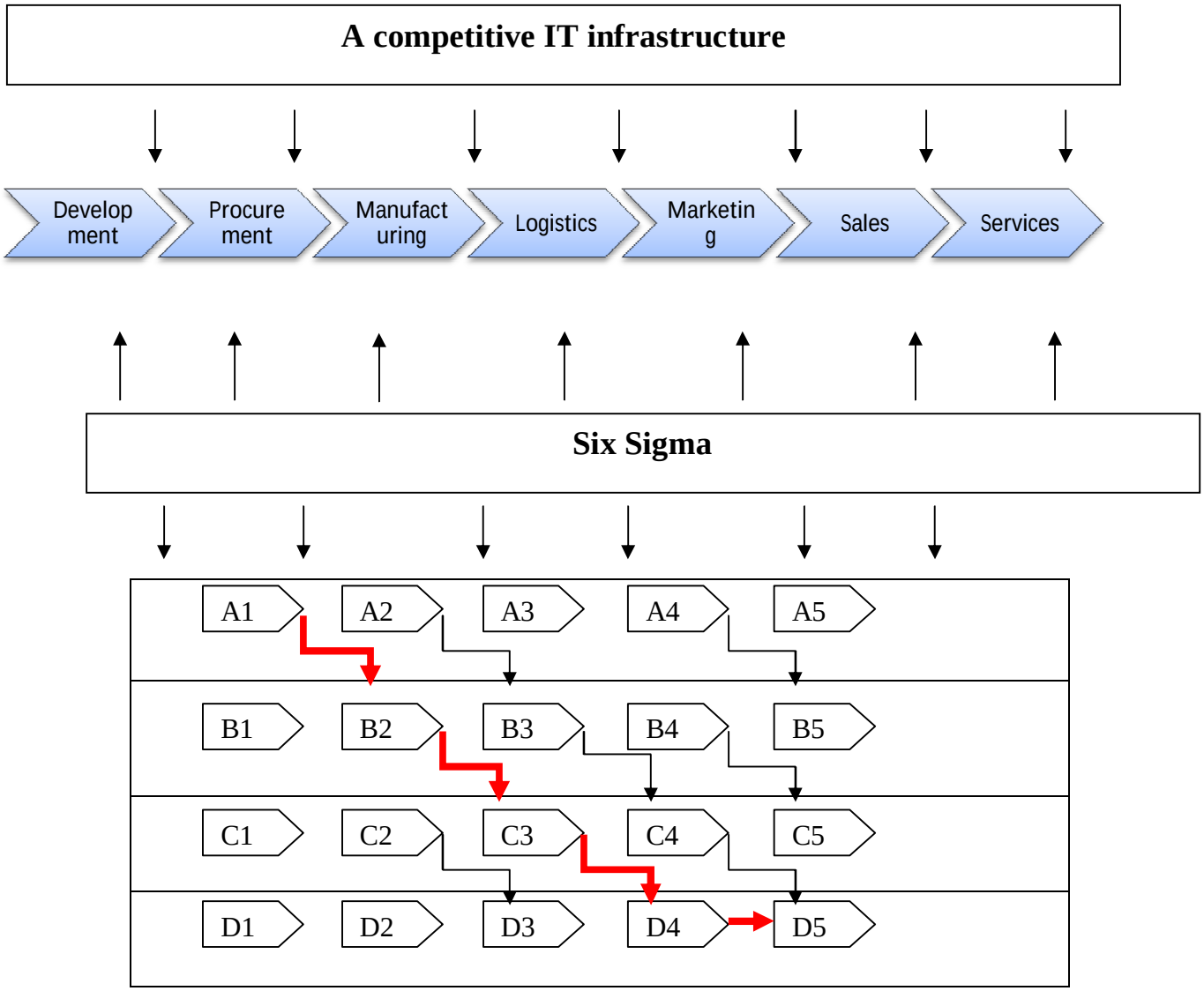


Figure 4.4 Applying Six Sigma on Chain of processes

2. Customers' requirements

As input of Process Block, it is the first input of all system, the output of the system also depends upon how we can define the customers' requirements. To create satisfied customer, the organization needs to identify customers need, design the production, and service system, to meet those need, and measure the result as basis for improvement.

Using the Customer-driven Quality cycle, we can understand how customers need related to quality perspective, they consider as expected quality.

Quality dimension of customers' needs

For understanding the customer needs, there are some dimensions of quality as pointed out by David A. Garvin:

1. Performance: a product's primary key operating characteristics.
2. Features: The "bells and whistles" of a product. This expression it seems to be related to the equipment, accessories and features that are often to the customers as plusses but are not really indispensable for the device of work.
3. Reliability: probability of the products surviving over a specific periods of time under state conditions of use
4. Conformance: the degree which physically and performance characteristics of a product match pre-established standards.
5. Durability: the amount of use before it physically deteriorates or until replacement is preferable.
6. Serviceability. The speed, courtesy, and competence of repair work.
7. Aesthetics. How the product look, feels, sounds, tastes or smells.

To define the customer needs, a company must know who its customers are. They include external customer and internal customer whereby the external customer may fall between the organization and the consumer and who has distinct needs and expectations.

While the internal customer who contribute to the company mission and depend on the department of functions products and services to serve the consumer and external customer.

For any enterprise the first step to define the customer is customer segmentation which customer segmentation may be based on geographic, demographic factors, ways in which products as used volume or expected level of service. By using segmentation allow a company to prioritize customer growth by considering for each group the benefits of satisfying their requirements and consequences of failing to satisfy their requirements. Successful companies in every industry engage in variety of customer-oriented practices that lead to profitability and market share. In leading practices, they are described in following list:

1. They clearly defined key customer groups and markets considering competitors and other potential customer and segment their customer accordingly.

2. They understand both short term and long term customer needs and expectations in the form of voice of customer and employ systematic processes for listening and learning from customer.
3. Understanding the linkage between the voice of customer and design, production and delivery processes.
4. They build relationships trough the commitment that promote trust and confidence provide easy accessibility to people and information: set effective service standard, train customer contact employees and effectively follow up on products, services and transactions.
5. They have the effective complaint management processes by which customer can easily comment, complain and receive prompt solution of their concerns.
6. They measure the customer satisfaction compare the results related to competitors and using information to evaluate and improve internal processes business intelligence may used to track customer satisfactions through some indexes such as transaction customer satisfaction index for immediate feedback, annual relationship customer satisfaction index to learn about specific attributes of satisfaction and intend for repeat business and competitive study to see how it perform relative to its competitors.

Customer's requirements can express in the customer own term are called the voice of customer, therefore the company use variety of methods to collect the information about customer needs and expectation.

Some of the key approaches to gather customer information include the following:

- Comment cards and formal surveys
- Focus groups
- Direct customer contact
- Complaint analysis
- Internet monitoring

One useful tool for organizing large volumes of information efficiency and identifying natural patterns of grouping the information is the affinity diagram which it was developed in 1960 by Kawakita Jiro which is a technique for gathering, organizing a large number of ideas and facts.[30]

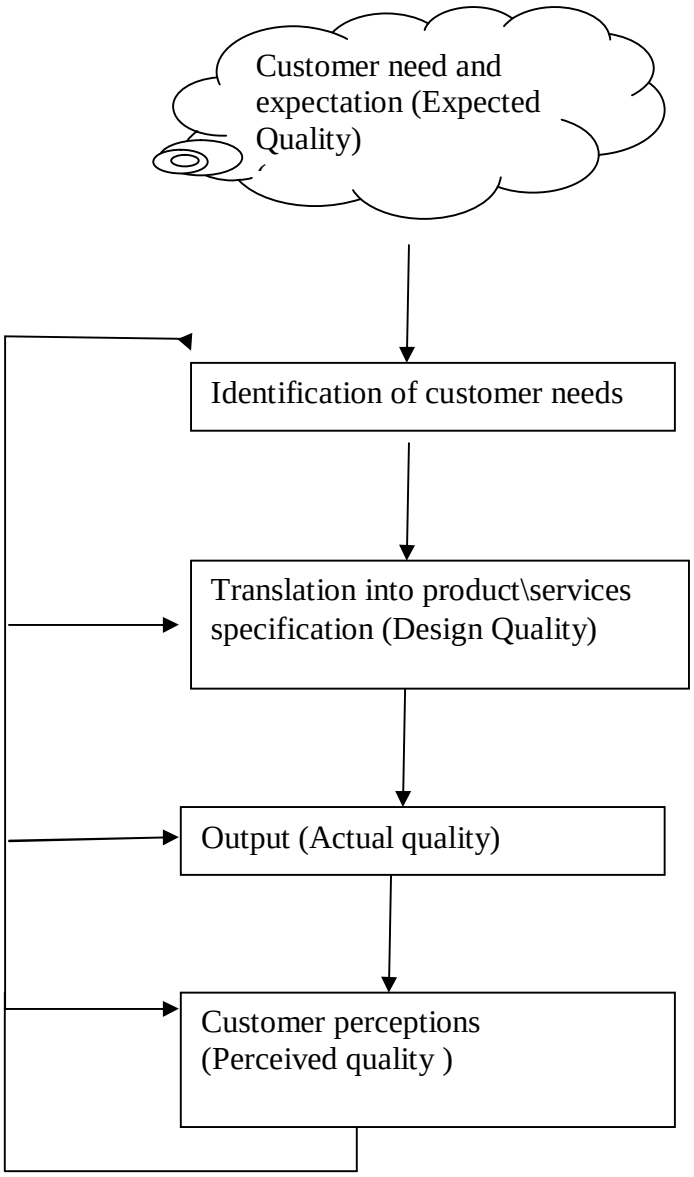


Figure 4.5 Quality Perspectives through quality chain.

3. Customer's Satisfactions

Customer's Satisfactions: This block examine how an organization build relationship with customer and identify the keys of customer satisfaction, loyalty and retention, and to business expansion.

As we know that, from the view in which customer needs and expectations are translated into perceptions during the design, production, and delivery. True customer needs and expectations as considered as expected quality. Expected quality is what the customer assumes will be

received from the product and service. The customers will assess quality and develop perceptions by comparing their expectations with what they received (actual quality). If the expected quality is higher than actual quality then the customer will probably be dissatisfied.

On the other hand, if actual quality exceeds expectations then the customer will be satisfied or even surprisingly delighted. One complication comes from the customer who sees and believes that the quality of the product is considerably different from what he or she actually receives, which might be shaped by advertising or prior negative experiences. Thus, perceptions are not always accurate, and may even change over time. In addition, understanding the relationships of customer satisfaction measurement and the ability to use customer feedback for improvement is very important to the company. This effort requires that the producers look at processes through the customers' eyes, not the organization's.

Even, many causes of dissatisfaction are not attributable to production or service defects or employee mistakes. Because customers may not use the product correctly or may have unreasonable expectations about what it can do, marketing sometimes makes promises it cannot keep, or advertising is misleading, these issues suggest that companies need to pay greater attention to overall customer experiences that impact perceptions. Such attention might include better user manuals or information on product packaging as well as unambiguous advertising.

How to measure customer satisfaction?

Customer feedback is vital to a business. Through feedback, a company learns how satisfied its customers are with its products and services and sometimes about competitors' products and services. Measures of customer satisfaction allow a business to do the following:

a. Discover customer perceptions of how well the business is doing in meeting customer needs, and identify causes of dissatisfaction and failed expectations as well as drivers of delight.
b. Compare the company's performance relative to competitors to support planning and better strategic initiatives.
c. Discover areas for improvement in the design and delivery of products and services, as well as for training and coaching of employees.

d. Track trends to determine whether changes actually result in improvements.

Through effective customer satisfaction measurement system results in reliable information about customer ratings of specific products and services features and about the relationship between these ratings and the customer's likely future market behaviors. Customer satisfaction measures may include product attributes such as product quality , product performance, usability , and maintainability; service attributes such as attitude , service time, on-time delivery, exceptions handling, accountability, and technical support; image attributes such as reliability and price; overall satisfaction measurement.

The most helpful customer data include comparisons with key competitors. To have better designing satisfaction surveys, the process of design needs to apply in order to obtain the best result. Surveys should span on main steps:

a. What is purpose of survey and output of survey?
b. Who is the customer?
c. Who should conduct the survey?
d. Selection of appropriate survey instrument.
e. Analyzing Customer feedback.
f. Using and making decision on result.

Determining and using customer satisfaction information should be viewed as a key business process. Just going through the motions can often lead to failure. According to Godfrye, many several reasons why customer satisfaction efforts fail to produce useful results as following:

a. Poor measurement schemes.
b. Failure to identify appropriate quality dimensions.
c. Failure to weight dimensions appropriately.
d. Lack of comparison with leading competitors.
e. Failure to measure potential and former customers.
f. Confusing loyalty with satisfaction.

Moreover, some companies have used "customer perceived value (CPV)" as an alternative measurement to traditional customer satisfaction measurement that focuses on customer loyalty than on satisfaction.

4. Input-Resources

In this block, we identify the main input (resources) which provides workforce, material, machinery, and technology, in other side; we also consider financial resource as belong to this block.

- Appropriate technology understood.
- Impact of new technologies analysed.
- Needs and expectations of partners understood
- Policies and strategies aligned with those of partners
- Financial strategies developed
- Appropriate buildings, equipment and materials identified/sourced

Resources

All organizations assemble resources, other than human, to support the effective operation of the processes that hopefully will deliver the strategy. These come in many forms but certainly include financial resources, buildings, equipment, materials, technology, information and knowledge.

Financial resources

Investment is a key for the future development and growth of business. The ability to attract investment often determines the strategic direction of commercial enterprises. Similarly the acquisition of funding will affect the ability of public sector organizations in health, education or law establishments to function effectively. The development and implementation of appropriate financial strategies and processes will, therefore, be driven by the financial goals and performance of the business. Focus on, for example, improving earnings before interest and tax (EBIT – a measure of profitability) and economic value added (EVA – a measure of the degree to which the returns generated exceed the costs of financing the assets used) can in a private company be the drivers for linking the strategy to action. The construction of plans for the allocation of financial resources in support of the policies and strategies should lead to the appropriate and significant activities being carried out within the business to deliver the strategy. Consolidation of these plans, coupled with an iterative review and approval, provides a mechanism of providing the best possible chance for success. Use of a 'balanced scorecard'

approach can help in ensuring that the long-term impact of financial decisions on processes, innovation and customer satisfaction is understood and taken into account. The extent to which financial resources are being used to support strategy needs to be subject to continuous appraisal this will include evaluating investment in the tangible and non-tangible assets, such as knowledge.

Other resources

Many different types of resources are deployed by different types of organizations. Most organizations are established in some sort of building, use equipment and consume materials. In these areas directors and managers must pay attention to:

- utilization of these resources;
- security of the assets;
- maintenance of building and equipment;
- managing material inventories and consumption (see earlier section on JIT);
- waste reduction and recycling;
- environmental aspects, including conservation of non-renewable resources and
- Adverse impact of products and processes.

Technology is a splendid and vital resource in the modern age. Exciting alternative and emerging technologies need to be identified, evaluated and appropriately deployed in the drive towards achieving organizational goals. This will include managing the replacement of 'old technologies' and the innovations that will lead to the adoption of new ones.

Construction projects rely on vast quantities of information, tens of thousands of documents prepared by numerous independent and, yet, interdependent parties. The authors estimate that the cost of information in the entire construction process can be large part of the total moneys expended to procure a complex building. To convert the entire system to computer systems takes time, training, development and investment. It also requires smaller operators in the sector to become more computer literate and to increase their investment in technology. The involvement of everyone, from one end of the process to the other, is essential if IT-based systems are to achieve their potential in the construction sector.

Most organizations' strategies these days have some if not considerable focus on technology and information systems, as these play significant roles in how they supply products and services to and communicate with customers. They need to identify technology requirements through business planning processes and work with technology partners and IT system providers to exploit technology to best advantage, improve processes and meet business objectives. Whether this requires a dedicated IT team to develop the strategy will depend on the size and nature of the business but it will always be necessary to assess information resource requirements, provide the right balance, and ensure value for money is provided. This is often a tall order; it seems, in the provision of IT services! Close effective partnerships that deliver in this area are often essential.

In the piloting and evaluation of new technology the impact on customers and the business itself should be determined. The roll-out of any new systems involves people across the organization and communication cycles need to be used to identify any IT issues and feedback to partners .IT support should be designed in collaboration with users to confirm business processes, functionality and the expected utilization and availability. Responsibilities and accountabilities are important here, of course, and in smaller organizations this usually falls on line management. Like any other resource, knowledge and information need managing and this requires careful consideration in its own right. In the design of quality management systems, resource management is an important consideration and is covered by the detail to be found in the ISO 9000:2000 family of standards.

Lean waste reduction

Lean production refers to approaches initially developed by Toyota that focus on elimination of waste in all forms, including defects requiring rework, unnecessary movement of material or people, waiting time, excess inventory and overproduction to optimize the use of material. There are some tools used in the lean production includes 5S's, visual controls, efficient layout, total productive maintenance and pull production as known as Kanban.

- 5S's. the 5S's come from Japanese terms: seiri (sort), seiton (set in order), seiso (shine), seiketsu (standardize) and shitsuke (sustain). They define a system for organize

workplace organization and standardization. Sort refers to ensure that every item, every material in a workplace is in a proper place.

Set in order means to arrange materials and equipment so that they are easy to find and use. Shine refers to clean workplace area. Not only for safety but also to avoid had the problem of lacking or defecting caused by dirty. Standardize mean to formalize the procedure and practice it, to create consistency and ensure that all staff are performed correctly. And finally sustain mean to keep the process going through chain communication and organizational structure.

- Visual control. Visual control is indicated for tools, parts and production activities that are placed in the plain side of all workers so that everyone can understand the state of the system quickly then can give the immediate action.
- Efficient layout and standardized work. The layout of equipment and process is designed according to the best operational sequence by physically linking and arranging machines and process steps more efficiently often in the cell arrangement. Standardize the individual tasks by clearly specifying the proper method reduce the waited human movement and energy.
- Pull production. In this system upstream supplier do not produce until the downstream customer signal need for parts.

Material management and purchasing: Purchasing occurs at the interface between organizations and since the construction procurement process is highly fragmented and many services are difficult to fully define, this is one of the most critical areas of management in the sector. Major traps relate to difficulties in the definition of scope and quality. It has been found that to be successful, purchasing has to be responsible for the entire product area: specification, selection, price, quality, delivery, acceptability and reliability. In construction, there is a history of buying on price to the detriment of one of the other areas and if any part of this sequence is wrong customer satisfaction will suffer. Another critical area is timely delivery, this can be problematic for the supply of both products and services. The authors are aware of numerous instances where suppliers have not met their commitments with severe consequences for the process on site. The purchasing or procurement system should be documented and include:

1. Assigning responsibilities for and within the purchasing procurement function.

2. Defining the manner in which suppliers are selected, to ensure that they are continually capable of supplying the requirements.

3. Specifying the purchasing documentation – written orders, specifications, required in any modern procurement activity.

5. Output

Output is the result of chain of processes or from each process. They consider as actual quality to external customer and even to internal customers among departments.

Output of one process will depend on many factors, including level of resources, efficiency of process, customer requirement, and external environmental factors.

The interactions among these components are not deterministic and need to be defined and controlled to ensure that the output meeting the requirement of customers and cost competitive.

The work in process or final product of production system needs a quality assurance for checking the output. There are many statistical tools to control and monitor the output such as: SPC and 7 tools.

The complex interactions of variations in materials, tools, machines, operators and environment are not easily to understood. The variation caused by individual sources randomly defect are present at the natural part of a process as referred to common causes of variance. Common causes as a result of design of the product and production system generally are cause for 82-95% of the output variation.

The remaining variation is the result of special causes often called as assignable causes. Special causes arise from external sources that are not inherent in the process.

To measure the variation o the output there are 2 important step needed to qualify including measurement instrument and human inspection performance. There are many popular methods which are sampling and hypothesis testing.

There are many methods of sampling; they can be as the followings:

- Simple random sampling.
- Stratified sampling
- Systematic sampling

- Cluster sampling
- Judgment sampling.

In addition a good sampling plan should select a sample at the lowest cost that will provide the best possible representation of the population consistent of the objective of the precision and reliability that have been determined for the studying.

Errors in sampling generally belong from 2 causes: sampling error and systematic error.

PART II: Backward Side

The backward side has other 5 blocks to determine what organization going to be, which includes the Organization House and 4 matrixes of performance measurement: The roof of the house which is leadership, this roof will examine how an organization's senior leaders address values, direction and performance expectations, as well as a focus on customer and other stakeholders, spanning from information technology, innovation and learning.

Main base of house will be the strategic planning in general, define the strategic objects and action plans, which can be classified in some sub strategies as well as financial strategy, market strategy and HR strategy. The main components of an organization consist of 5 aspects to build up an excellent organization, information technology, innovation, HR, culture, and partnership.

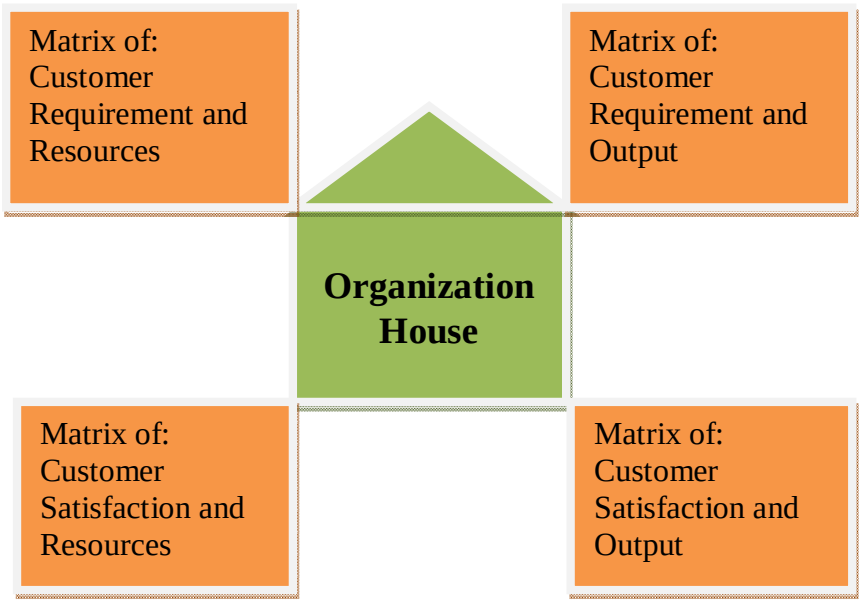


Figure 4.6 Organization house and four matrixes

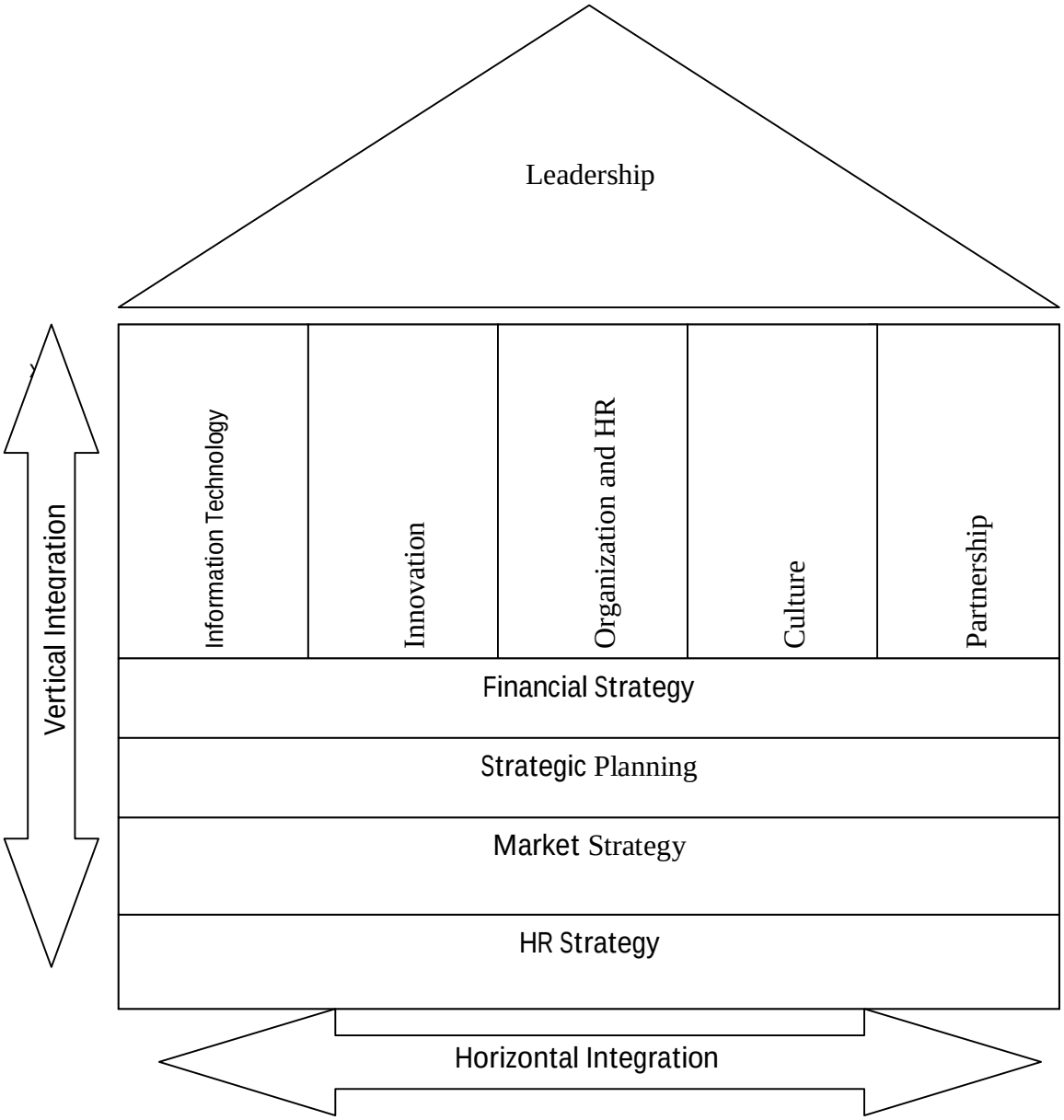


Figure 4.7 The components of Organization house

1. Organization House:

This block consists of several items that focus on major requirement to build up an excellent organization, they are mainly defined by

i. Leadership

ii. Innovation

iii. Strategy
iv. People
v. Organization and Human resources
vi. Partnership

b. The roof of the house which is leadership, this roof will examine how an organization's senior leaders address values, direction and performance expectations, as well as a focus on customer and other stakeholders, spanning from information technology, innovation and learning.
c. Main base of house will be the strategic planning in general, define the strategic objects and action plans, which can be classified in some sub strategies as well as financial strategy, market strategy and HR strategy.
d. The main components of an organization consist of 5 aspects to build up an excellent organization, information technology, innovation, HR, culture, and partnership.

1.1 Leadership for quality:

Leadership is the ability to positively influence people and system under one's authority to have a meaning impact and achieve important results. There are many activities which focus on the roles of senior managers in leading an organization to fulfill its mission and meet the goals. They can be described as followings:

- Defining and communicating direction
- Ensuring the goals and expectation are met
- Monitoring business performance and taking appropriate actions
- Leading creation of work environment and promote creativity and innovation with continuous improvement
- Soliciting input and feedback from customers
- Ensuring the employees are effective and contributed to business
- Motivating, inspiring and energizing employee and recognizing their contribution
- Providing the honest feed back
- Ensuring and creating sustainable profit to shareholder of company

In general, the effective leadership requires many core leadership skills which are: Vision, empowerment, intuition, self-understanding, and value congruence. Vision is first characteristic the leader must have, they are visionaries; they manage the current and they can see the future, get experience from the past. Vision is very crucial at every level during time of change. Leaders recognize the radical organization are changed which is taking place today as opportunity to move closer to Total Quality.

Leaders empower employees to assume ownership of problems or opportunities, and to be proactive in implementing improvements and making decisions in the best interests of organization. Empowerment threatens many managers, who are accustomed to wielding their power, often coercively through fear of punishment or sanctions. True power is not based on the form of official position and authority, but rather aids in spreading power downward and outward the lower level of organization.

Leaders are not afraid to follow their intuition. Even in the face of uncertainty and change, they must anticipate the future and must be prepared to make difficult decisions that will help the organization to be successful. Whereby, self-understanding requires leaders in ability to look at one's self and identify their relationship with employees and within the organization. It requires an examination of one's self weakness as well as strength. Finally, value congruence occurs when leader integrate their values into the company management system; values are basic assumptions and beliefs about the nature of the business, mission, people, and relationship of organization. Specially, values include trust and respect for each individual, openness, team work, integrity and commitment to quality. Day by day, they become standard by which choices are made and create an organizational structure in which quality is a routine part of activities and decision throughout organization.

To be a good leader, he should "lead for quality", that is, he should ensure that the principles of Total quality are adopted throughout the organization. They can do some actions as following:

a. Gathering data, before say option, and transform into actions based on the facts.
b. Being aware the quality in defined by customers and acting on that awareness.
c. Using quality tool when appropriate and making benefits clear to everyone, expecting and driving out the commitment and accountability throughout organization.

In general practice, the true leaders promote quality and business performance excellent in several ways as followings:

a. They focus on creating and balancing the values for customers and other stakeholder that served as basic for setting business direction and performance expectation at all level of organization.
b. They create sustainable leadership system and environment for empowerment, innovation, agility and organizational learning.
c. They set the higher expectation and demonstrate substantial personal commitment and involvement in quality, often with a missionary like enthusiasm.
d. They integrate the quality values into their leadership and management and communicate extensively through leadership structure to all employees.
e. They review organizational performance which including their own performance as leader to assess organizational success and progress, and translate review findings into priority for improvement and opportunity for innovation for the organization as a whole, as well as their own leadership effectiveness.
f. The create an environment that fosters legal and ethical behavior and a governance system that foster legal and ethical behavior and governance system that address management and fiscal accountability and protection of stakeholder and stockholders interest.
g. The integration of public responsibility and community support into business practices.

1.2 Strategic planning

Strategic planning is the process of envisioning, the organization future and developing the necessary goals, objectives, and actions plan to achieve that future. Through strategic planning, leaders mold an organization's future and mange change by focusing on the ideal vision of what the organization should and could be three, five or more years in the future. A focus on both customer driven quality and operational performance excellence, as opposed to traditional financial and marketing goals, it is essential to an effective strategy. To be competitive and profitable, an organization must focus on driver of customer satisfaction, customer retention, and market share and be operational capability including speed, responsiveness, and flexibility

to contribute to short and longer term productivity growth and cost per prices competitiveness. For many firms, quality is essential element of business strategy.

Effective organization shares several common approaches in their strategic planning efforts which are:

a. Top management, employees, and even customers or suppliers actively participate in the planning process.
b. They have systematic planning system for the strategy development and deployment which to optimize the use of resources ensure the availability of chain employees.
c. They gather and analyze variety of data and internal and external factors as inputs to the strategic planning process so the effectiveness of strategic planning depend upon a clear understanding of customer and marketing needs and expectations and competitive environment and capacity.
d. They align short term actions plan with long terms strategic objectives and organizational challenges and communicate them throughout the organization using measurements to track down the progress.
e. They derive the human resource plans from strategic objectives and action plan. Thus, it is important to consider organizational chain and plan for necessary human resources changes that may be needed which may include the training, work organization, and compensation and incentive approaches.

Strategy deployment

Deployment of the strategy includes defining the business the business in terms of its key processes that deliver the value to customers indentify what portions of these processes contribute to the most two strategic objectives and encouraging employees to complete the process change and improvement that we achieve the objectives to be comprehensive strategy deployment approach consider the following indicators:

a. Organization should be linked align with division department team, and individual goals. Everyone have to understand what the strategy means for them.
b. Strategic planning must indicate the resources improvement and change in the areas that are critical to the company business.

c. The company has an appropriate measurement system at the operational level to successfully implement a strategy. The systems have employees and managers to define and monitor the work for supporting the strategy.

In general practice managers can use many kinds of tools and techniques known as seven management planning tools to implement the policy deployment.

They can be as followings: Affinity diagram, Interrelationship diagraph, tree diagram, matrix diagram, matrix data analysis, process decision program chart, and arrow diagram. These tools are particular used in structuring unstructured ideas making strategic plan organizing, controlling large and complex projects.

Beside of it many companies integrated the tools into information system to make better decision and facilitate the implementation process, so they can utilize their time more effectively.

1.3 Human resources management for total quality

Human resource management consists of those activities designed to provide for and coordinate the people of an organization. These activities include determining the organization's human resource needs; assisting in the design of work systems, recruiting, selecting, training and developing, counseling, motivating and rewarding employees.

HRM is a modern term for what has been traditionally referred to as personnel administration or personnel management.

Human resource managers may still perform the traditional tasks of personnel managers, but the scope and importance of their area of responsibility expanded significantly. Instead of being corporate watchdogs, human resource managers now take on a strategic leadership role in their organization. They must view human resource requirements in an integrated way, that is, aligned with the organization's strategic directions, and at the same time, oversee day-to-day operation and maintenance of the HRM system.

Just as all managers are responsible for quality even though their organizations may have quality professionals, all managers have a responsibility for human resources, even if the formal organizational structure has HRM professionals. Developing skills through training and coaching, promoting teamwork and participation, motivating and recognizing employees, and providing

meaningful communication are important human resource skills that all managers must do for total quality to succeed.

Total Quality based HRM practices work to accomplish the following tasks:

- Communicate the importance of each employee's contribution to total quality
- Stress-quality-related synergies available through teamwork
- Empower employees to "make a difference"
- Reinforce individual and team commitment to quality with a wide range of rewards and reinforcements

These goals are realized by companies through the following practices:

a. They promote teamwork and skill sharing across work units and locations. Teams encourage participation and interaction among its members
b. They organize and manage work and jobs to promote cooperation, initiative, empowerment, innovation, and the culture of organization, capitalizing on the diverse ideas and thinking of employees.
c. They empower individuals and teams to make decisions that affect quality and customer satisfaction.
d. They develop effective performance management system, compensation, and reward and recognition approaches to support high performance work and a customer focus, and to motivate employees.
e. They have effective processes for hiring and career progression
f. They make extensive investment in training and education
g. They motivate employees to develop and use their full potential
h. They maintain a work environment conducive to the well-being and growth of all employees. Satisfied employees are productive employees.
i. They monitor the extent and effectiveness of human resource practices and measure employee satisfaction as a means of continuous improvement. Employee surveys and measurement of key HRM indicators monitor employee satisfaction and identify problem areas. These surveys frequently ask employees to rate their supervisors on leadership, communication, and support.

People: building effective teams

Team implementation should always begin with a period of investigation, reflection, and soul searching. Many companies rush out and form the wrong kind of teams for a specific job.

Managers should examine their organization's goals, objective, and culture to evaluate its readiness to develop and support team-based initiatives. This step may be the most difficult portion of the process, because it demands a hard self-appraisal of the organization as a whole. One enthusiastic manager can often get teams going, but solid support at a number of managerial levels is necessary to keep them going.

The key stages of a team's life cycle are called forming, storming, norming, performing and adjourning.

a. Forming takes place when the team is introduced, meets together, and explores issues of their new assignment.
b. Storming occurs when team members disagree on team roles and challenge the way that the team will function.
c. The third stage, norming, takes place when the issues of the previous stage have been worked out, and team members agree on roles, ground roles, and acceptable behavior when doing the work of the team.
d. Stage four, performing, characterizes the productive phase of the life cycle when team members cooperate to solve problems and complete the goals of their assigned work.
e. In the adjourning phase, the team wraps up the project, satisfactorily complete its goals, and prepares to disband or move on to another project.

The ingredients for a successful team are 10 things defined by:

- Clarity in team goals
- An improvement plan. A plan guides the team in determining schedules and milepost by helping the team decide what advice, assistance, training, materials, and other resources it may need.
- Clearly defined roles. All members must understand their duties and know who is responsible for what issues and tasks.
- Clear communication

- Beneficial team behaviors. Teams should encourage members to use effective skills and practices to facilitate discussions and meetings.
- Well defined decision procedures. Teams should use data as the basis for decisions and learn to reach consensus on important issues.
- Balanced participation. Everyone should participate, contribute their talents, and share commitment to the team's success.
- Established ground rules. The group outlines acceptable and unacceptable behaviors.
- Awareness of group process. Team members must understand group dynamics.
- Use of the scientific approach. With structured problem-solving processes, teams can more easily find root causes of the problems.

Teams are fundamental to Six sigma. Six sigma projects require a diversity of skills that range from technical analysis, creative solution and development, and implementation. Six sigma teams not only address immediate problems but also provide an environment for individual learning, management development, and career advancement. Six sigma teams are composed with several types of individuals:

- Champions: senior-level managers who promote and lead the deployment of six sigma in a significant area of the business. Champion understand the philosophy and tools of six sigma, select projects, set objectives, allocate resources, and mentor teams. More importantly, champion work toward removing barriers- organizational, financial, and personal-that might inhibit the successful implementation of a six sigma project.
- Master Black belts: Full-time six sigma experts who are responsible for six sigma strategy, training, mentoring, deployment and results. Master black belts are highly trained in how to use six sigma tools and methods and provide advanced technical expertise. They work across the organization to develop and coach teams, conduct training, and lead change, but are typically not members of six sigma project teams.
- Black belts: Full-trained six sigma experts with up to 160 hours of training who perform much of the technical analyses required of six sigma projects, usually on a full-time basis. They have advanced knowledge of tools and DMAIC methods and can apply them either

individually or as team leaders. They also develop and mentor Green belts. Black belts should be highly motivated.

- Green belts: functional employees who are trained in introductory six sigma tools and methodology and work on projects on a part-time basis, assisting black belts while developing their own knowledge and expertise.
- Team members: individuals from various functional areas who support specific projects.

Other aspects considered important for team success included management support and participation, communication during projects about six sigma as well as project progress, alignment of team members with organizational vision, mission and values.

1.4 Partnership

There are many essential ingredients to ensuring that partnership processes work well for an organization. Key aspects include a clear definition of goals, roles, responsibilities, processes and performance measures backed up by good communications and exchange of information. This supports learning between two organizations and often leads to innovative solutions to problems that have remained unsolved in the separate organizations, prior to their close collaboration. To ensure that objectives are achieved, activities should be supported by quality management processes that might include the use of system audits and reviews, certificates of competence or performance reviews and joint action plans. To make strong and

a. Identify key strategic partners
b. Design and develop relationships to deliver maximum benefit
c. Structure value – adding supply chain partnership
d. Ensure cultural fit and mutual development
e. Share knowledge and learning with partners
f. Improve processes together in partnership
g. Measure performance of partnership and feedback

When establishing partnerships, attention should be given to:

Maximizing the understanding of what is to be delivered by the partnership – the needs of the customer and the capability of the supplier must match perfectly if satisfaction and loyalty are to be the result; understanding what represents value for money.

Getting the commercial relationship right includes the clear understanding of scope and quality expectations and challenges. Understanding the respective roles and ensuring an appropriate allocation of responsibilities.

To the party best able to manage them; working in a supportive, constructive and a team-based relationship; having solid programmes of work, comprising agreed plans, timetables, targets, key milestones and decision points; identifying areas where the achievement of agreed goals requires training, and implementing joint training programmes between the partners; structuring the resolution of complaints, concerns or disputes rapidly and at the lowest practical level.

2. The four matrices of Performance and Strategy Measurement

In this section, we will analyze the four matrices which are considered as the main tools for helping define the strategy also building the measurement dashboard in order to monitor all aspects of business performance. These matrixes should be viewed in three different levels in an organization as show in Figure 4.9, for each level, define how the matrix will change according to strategic decision; analyze the use of each matrix.

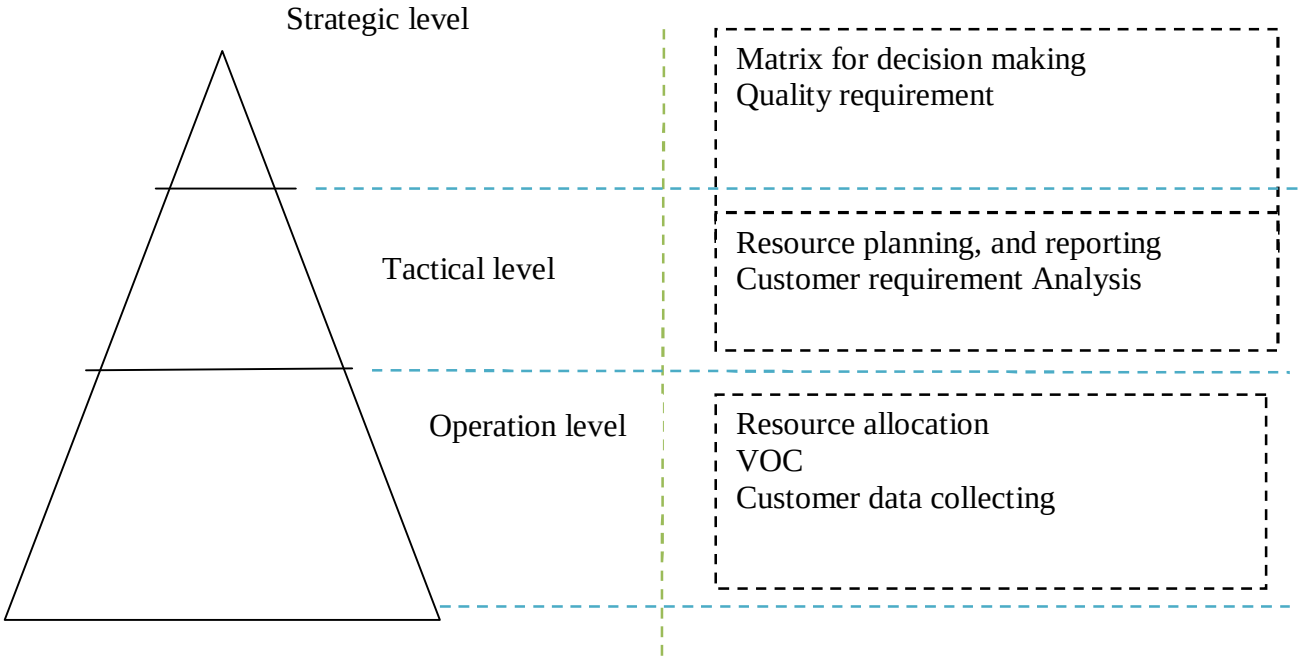


Figure 4.8 Three levels for implementation of matrixes in an organization

2.1. Matrix of Customer Requirement and Resources

This matrix is used to analyze the relationship between the customer requirements and resources as show in figure 4.9.

a. Understanding how the requirements effects to resources and via-verse.
b. Give the advice to top management to help them decide the strategic decisions.
c. Help managers to quickly get the screen of limitation and availability for specific requirements.

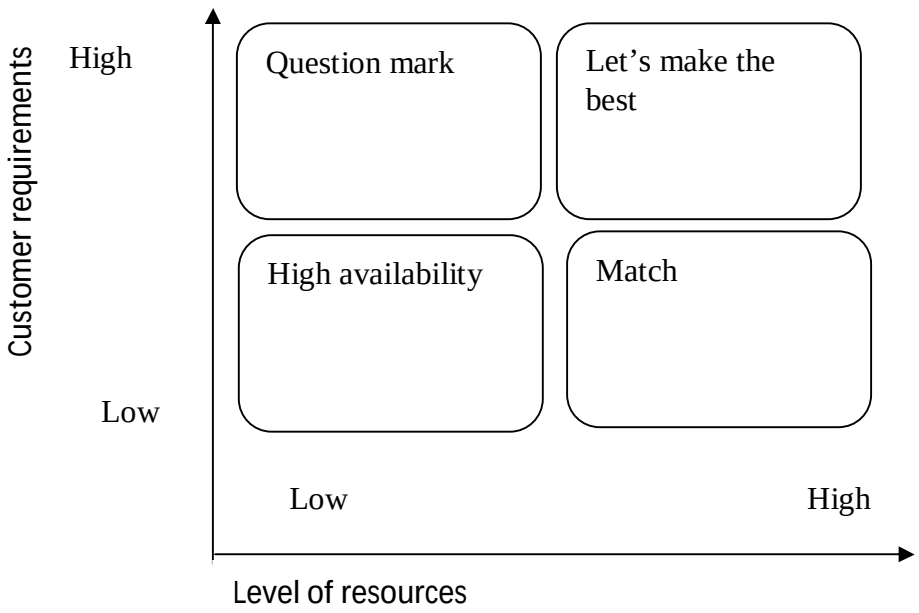


Figure 4.9 Matrix between level of resources and customer requirements

In this matrix there are 4 quadrants made of level of resources and level of customer requirement, which can define as the followings:

- High level of resources: This mean the firm have rich of resources available, this resources can explicit in variety types such as: workforce, machinery, technology…etc… While, low level of resources is showing that the firm does not have enough resources to supply and fulfillment when the needs are required, this can be happened during high seasonable period or limited investments.

- High customer requirements: Refer to the requirements with high expectation from customers in term of demand and flexibility, even with high specification of products and services. On the contrast, low customer requirements happen when customers ask for low level of expectation.

- Matching between high customer requirement and high resources, we label it as "Question Mark", when the customer requirements are high that mean the customer's request the features, specification of product or service are more, even complex. The firm itself, dealing with high requirements, if they have the high level of resources, they may be able to fulfill this requirements, they will accept the requests.
- Matching between high customer requirements and "low resources", as label " let make the best", because with high requirement, the firm needs to try the best effort in order to fulfill this requirement, otherwise, they will be out.
- Matching between "high resources" and "low customer requirements" lead to "High availability", even the firm has lot of sources, they can give resources fully to this requirement, they can serve these requirements easily.
- The last quadrant expresses in between "low customer requirement" and "low resources", it is labeled as "Match", the firm focus on the right section.

2.2. Matrix Customer requirement and output

Customer requirements: This matrix examines the correlation between customer requirement and output. Customer requirements are defined as the specification that customer require for a kind of product in order to meet her/his expectations; while output is defined in our model as the result of a process giving defined resources.

According to our model we try to map each key element putting it into the matrix so as to measure it according to a quality perspective.

In this matrix we can notice four different situations:

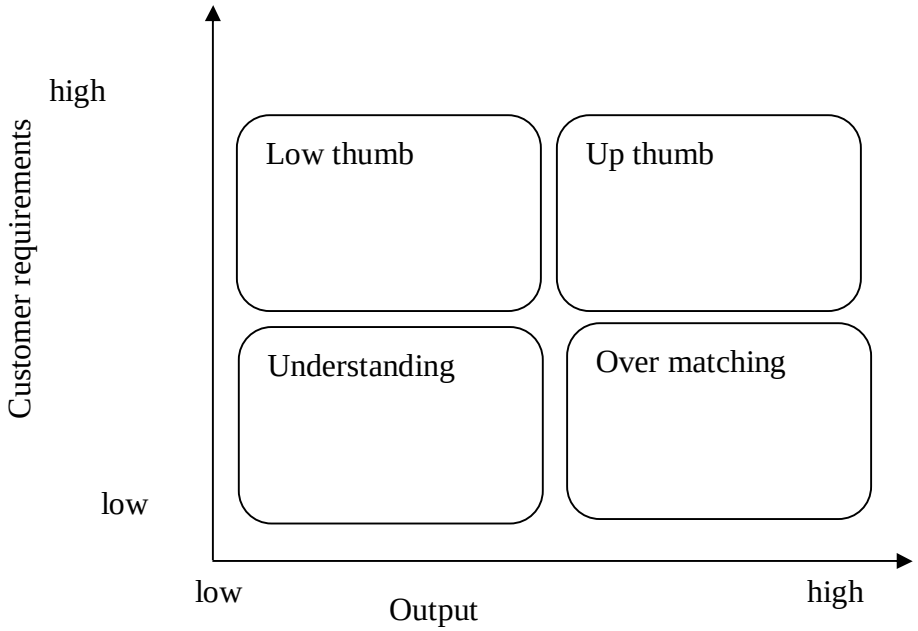


Figure 4.10 Matrix between output and customer requirements

- Low output but high customer requirement: low thumb. We labeled it as "low thumb because our output didn't respect customer expectations. In this case our customer required a high level output and we produced a poor quality product.
- Low output and low customer requirement: understanding. The customer requires a product with a poor level of quality and we are able to produce an output with a scarce level of quality. This means that in this case we were able to understand customer requirements.
- High output and low customer requirement: over matching. In this situation our customer expected a low quality product but we delivered a high quality product. This is a over matching because we used a lot of resources to produce something that customer didn't require.
- High output and high customer requirement: up thumb. This case is similar to the first one; customer required a high level of quality product and we were able to produce it. This means that we met our customer requirements.

3. Matrix of level of resources and Customer satisfaction

This matrix underlines the correlation between customer satisfaction and resources/input. Customer satisfaction is defined as the level of happiness that our customer have towards our product/service; while input or resources are the starting point of our process, without them a process is not able to begin.

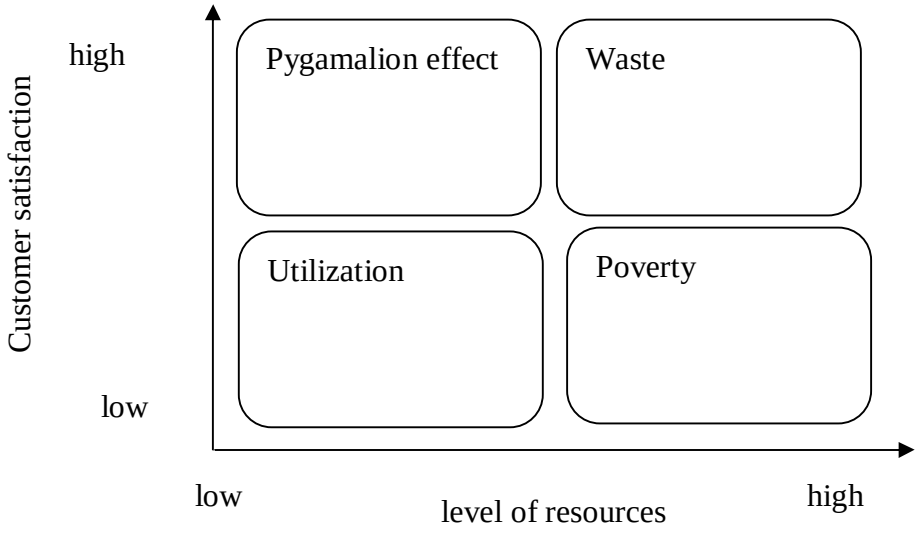


Figure 4.11 Matrix between level of resources and customer satisfaction

In this case we can have four different situations

- High customer satisfaction but low level of resources: utilization. In this case our customer is satisfied despite we didn't use very high quality input resources. This means that we were able to satisfy customer without using primary quality resources and without spending so much money in procurement.
- High customer satisfaction and high level of resources: Pygmalion effect. This means that we put a lot of resources in order to obtain a high customer satisfaction. It is like the character of Eliza Doolittle in the Pygmalion of Bernard Shaw; he put a great effort in order to transform Eliza who had a great potential in an educated woman. Here we have a great potential of resources and we were able to transform them into a valuable product that satisfied our customers.

- Low customer satisfaction and low level of resources: poverty. In this situation we have a product made with not high quality resources and for this reason the customer isn't satisfied. We are in a situation of poverty; poverty of resources and poverty of customer satisfaction: that is the reason of calling this situation poverty.
- Low customer satisfaction and high level of resources: waste. We spent a lot of resources for satisfying our customer but he/she didn't like our product. This means that we wasted a lot of primary resources to deliver a product that didn't meet customer expectations.

4. Matrix of output and Customer satisfaction

This is a very important matrix which reflects the customer satisfaction of the system on the output of the system. This can also be measured on 4 different situations:

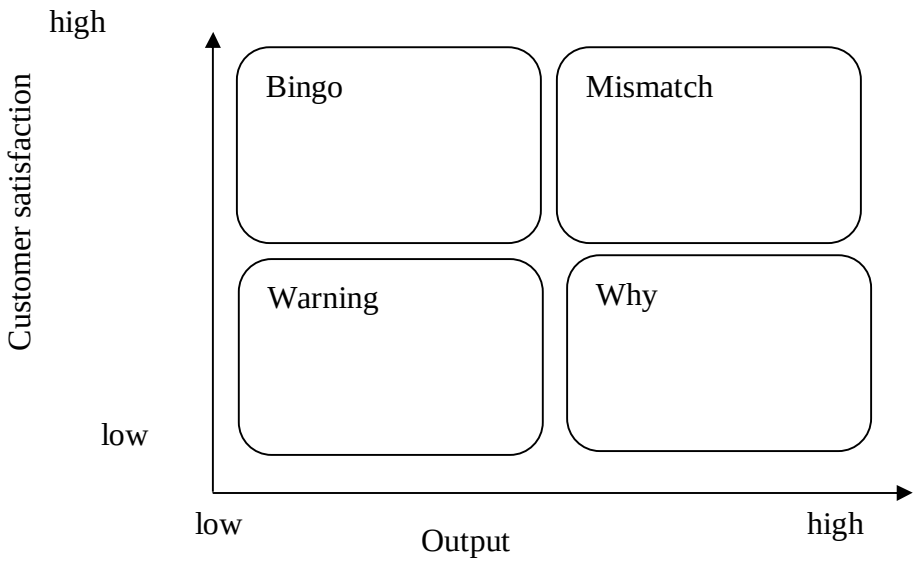


Figure 4.12 Matrix between output and customer satisfaction

- In the first case, where the output quality is low, then lead to the level of satisfaction is low. This is a warning to business of the firm; they need to find the main causes for low output quality.
- Opposite with above case, when the output of high, the customer is still not happy, so the firm need to figure out the reasons of low satisfaction, they also need to search for external factors.

- For the case whereby the output is low and customer feel satisfied with this output, this happens rarely in the reality, especially in some areas, without other suppliers or lack of these products and services.
- In the last case, the output is high and lead to high customer satisfaction, this case where the required quality and received quality, even perceived quality are met together. The customers feel satisfied with products and services. The whole system has produced good products and services according to customer requirements.

Chapter 5 Case study Six Sigma in healthcare a case study in Cremona Hospital

1. Introduction to Cremona Hospital

Cremona Hospital (CH) is a public hospital in Cremona Province, it is the biggest care center in Cremona province, and it has 302-bed facility, whose personnel about 2000 staffs and has been serving patients in for over 30 years.

The combined facilities offer acute and long-term care licensed beds serving as a regional referral center. It offers a full range of acute and tertiary services and generates approximately 350 million euro in revenue each year.

2. Why Better Quality in CH? – History of Quality Improvement

In 1990, the president of Cremona hospital attended the meeting about the quality problems of the current healthcare system; he spoke to the board of directors about the quality improvement through the implementation of new quality measure system.

His passion tried to initiate the idea of drive the system by different approaches to solve current issues; he would take advantages of total quality concepts and Six Sigma methodology which are implemented successfully in many enterprises. He believed that Six Sigma could change the delivery care and offered a competitive advantage apart from any other hospitals in Lombardia. This passion for the quality and pursuit the perfection placed Cremona hospital as a front-runner for achieving total organizational transformation.

With assistance from Regione Lombardia (ASL) Cremona hospital began a step by step implantation of the process throughout the organization. This year remarked as first time they spoke about “quality” and they started the journey of quality culture for all departments of the organization. This implementation gave a lot of experiences for them to step up achieving excellence performance as requirement for their vision to move beyond the present and into the future.

The senior leaders committed to increase and maintain employee motivation to excel in the delivery of care as well as transforming the organizational culture into one of the complete excellent, with the goal to virtually eliminate all the process errors. Cremona hospital leaders

have always been committed to quality and towards the end several quality programs for last over 10 years, till 2000. Each of the projects was devoted to quality improvement on many aspects of organization activities, Regione Lombardia also tried to help and promote the concept of better quality in the healthcare system through all the areas of Cremona province by help them to collect survey for patient satisfactions. At the same time many healthcare organizations in Lombardia Region also had begun to view quality improvement as a next step for substantial change with the main help from ASL.

In all projects deployed in Cremona hospital by using Six Sigma, they always kept the objectives as accordance with organization's mission and vision to provide high quality services with unyielding integrity in the caring, safe, service oriented and cost-efficient. They focus on three corporate metrics as strategic objectives: customer satisfaction measured by Scoring system provided by Regione Lombardia, quality of care and service measured by a centre of performance indicators for the core processes, cost efficiency measured by total investment on the return of the project.

Even more, they also started to achieve the ISO 9000 certification, in order to accomplish this project there was a significant help and sponsored by the Regional community (provided 50% on the total cost). They only established the *ISO* certification on some main critical activities which were: First Aid, Pediatry. This project was held a prominent place in the organization structure and was lead by the President and the CEO of Cremona hospital. For long term development, they set a vision was to obtain the ISO certification on all the operative units. During 2000-2005, due to the continuous change of the head of Regione Lombardia led to a non supporting budget for the project and therefore Cremona Hospital couldn't reach the defined target as certify all the operations for ISO standard. In order to get finance and other supports from regional community, Cremona hospital needed to comply with the minimum requirements of quality level according to standards defined by ISO such as the capacity of bedroom, special treatment room, technology, equipment and standardized processes.

By the year 2006, they joined the "joint commission international of healthcare organization. This program was also sponsored by Commune that provided budget implementation throughout 8 hospitals(both in public and private sectors) in Regione Lombardia, ", at that time

there were only 11 hospitals joined this program. This project was spanned almost three years; at the end of year 2009 Cremona Hospital was able to maintain the certification. The result was positive compared to the fact that four hospitals over eight were failure. Though this program, Cremona had deployed over 300 processes in all departments, and both sites (the main hospital in Cremona town, and other in Oglio Pò). Over expectation, they implemented successfully in Oglio Pò where they had only 500 staffs and the organizational structure was small and very well organized.

3. Overview of Quality Certification

What is JCI accreditation and what is the relationship between JCI and The Joint Commission?

JCI is the international arm of The Joint Commission (USA) JCI's mission is to improve the quality of health care in the international community. The Joint Commission (USA), including the organization that preceded it, is dedicated for over 75 years to improve quality and safety of health services. Today, The Joint Commission is the largest accrediting agency in the Health of the United States, where nearly 16,000 organizations and inspect health programs through a voluntary accreditation process. The Joint Commission and JCI are both non-governmental organizations and non-profit US-based.

What are the aims and objectives of JCI accreditation programs? Accreditation JCL contains a series of initiatives to meet growing demand worldwide as a methodology for the evaluation of health services based on quality standards. The aim is to offer the international community of objective processes, standards-based precisely on the assessment of health care organizations. The program's objective is to promote the demonstration of continuous improvement and sustainable health care organizations through the implementation of international standards shared international goals for Patient Safety and measurement indicators. In addition to standard acute care hospitals contained in this third edition, JCI has developed standards and accreditation programs for:

- Clinical Laboratory Services
- Continuity of care (home care, RSA, long-term care, hospice) Transport Organizations
- Health Care

- Ambulatory JCI also provides certification of defined benefit programs or pathology, such as programs for integrated management of stroke or heart disease.

The JCI accreditation programs are based on a framework of international standards adapted to local realities. The programs are characterized by the following points:

- Only the result of international consensus standards, developed and updated by an international Task Force infme and approved by an international Board, are the basis of the accreditation program • The basic philosophy of the standard based on the principles of quality management and continuous quality improvement
- The accreditation process is designed to incorporate the statutory bodies, religious and / or cultural features of a nation. Although the standards set high expectations of uniform safety and quality of patient care, the considerations specifIcità of every nation in relation to compliance with these expectations are part of the accreditation process
- The team of evaluators and the agenda of survey (accreditation visit) vary depending on the size of the organization and the type of services provided. For example, a large teaching hospital may require a four-day visit with a team of doctors, nurses and administrative, while a small local hospital may request a visit of two or three days. Similarly, a clinical laboratory will require one person for two days depending on the number of examinations and clinical tests given and executed;
- JCI accreditation is designed to be valid, reliable and objective. Based on the analysis of the findings of the survey, final decisions are taken by an accreditation committee for the international accreditation.

What accreditation?

Accreditation is a process in which an entity separate and independent from the organization requesting health, usually non-governmental, assesses the organization to determine their adherence to a set of requirements (standards) designed to improve Safety and quality of healthcare. Accreditation is usually requested on a voluntary basis. The standards for the accreditation requirements are considered optimal and achievable. The accreditation is tangible evidence of the positive engagement by an organization in improving healthcare safety and

quality of care delivered, ensuring a safe health environment and strive continuously to reduce the risks borne by patients and staff . Accreditation has gained the international spotlight as a tool for managing and quality assessment. What are the benefits of accreditation? The accreditation process is designed to create a culture of safety and quality within an organization strives to continuously improve the care processes and their outcomes. In doing so, an organization strengthens public confidence in relation to its commitment to patient safety and quality of care, offering safe and efficient working environment that contributes to the satisfaction of operators and is able to negotiate with sources funding based on data on quality of care; listen to patients and their families, respects the rights and involves them in the care process as partners and creates a culture that is open to learn from adverse events and early warning of problems security, installation of a collaborative leadership that sets priorities and continues the program of quality and patient safety at all levels.

How were initially developed standards for hospitals and how they were improved for the third edition? A task force composed of 16 experts including doctors, nurses, administrators and public policy experts guide the process of developing and revising standards for 3CL Accreditation International. The components of the task force from six geographic areas: Latin America and the Caribbean, Asia and Pacific, Middle East, Central and Eastern Europe, Western Europe and Africa. The task force is improved based on an international field review and input of experts and competent in individual subjects. An international committee carries out the task force and makes recommendations on updates and changes necessary to ensure that standards always reflect current practice. How are the standards? The standards are organized around important functions common to all health care organizations. The organizational function of the standard is today the most widely used worldwide and has been validated by scientific studies, testing and application. The standards are grouped by functions related to patient care and safety related functions, efficiency and good management of the organization. These functions are applied throughout the organization in its entirety, as individual departments, units or departments within the organization. The evaluation process in place to collect information on compliance standards across the organization and the accreditation decision is based on the overall level of adhesion found throughout the organization. Why are there no standards in bold

in this third edition? In previous editions, some standards were bold as they were considered standard core, "that is essential for the protection of fundamental rights of patients and their families, to guarantee the safety of the structure health and reduction of risk in the care process. Experience has shown that all standards are alike and equally related to the reduction of risk in healthcare organizations and so now all the standards are considered of equal importance to the fulfillment of the rules for the accreditation decision.

The standards are available to the international community? Yes, these standards are available to the public for use by individual healthcare organizations and government agencies to improve the quality of care. It 'can download a list of standards from the website of JCI to assess their adaptability to the needs of individual countries. The translation of the manual and use the standards as published by 3CL require authorization 3CL. What happens when there is national or local laws related to one standard? Where a law or regulation indent arguments also regulated by a standard is deemed applicable between law and standards, that between the two that sets out the requirements more stringent. How you use this manual? The handbook of international standards can be used to:

- Guide the effective and efficient management of health organization;
- Guide the organization and provision of health services and initiatives to improve quality and efficiency of these services;
- Review the important functions of health organization,
- learn about the standards that all organizations must meet to be accredited by JCI;
- Review expectations of compliance standards and additional requirements that are in the declarations of intent;
- Understand the policies and accreditation procedures and the accreditation process;
- Become familiar with the terminology used in the manual. What are "measurable elements" of a standard? Measurable elements of a standard are those requirements of the standard and its intent to be evaluated and which will be scored during the process of site visit (survey). The measurable elements do no more than listing what is required for full compliance to the standard. Each item is described in the standard itself or in its intent. The list of lenient measures is aimed at providing greater clarity to the standards

and to assist organizations in staff training and standards in preparation for the accreditation visit. How often will the updated standard? The information and experiences relating to the standards will collect on a continuous basis. If a standard does not reflect the most modern clinical practice, commonly available technologies, practices, quality management and so on, will be subject to review or purge. At present it is expected that standards will be updated and reissued at least every three years. What's new in this third edition of the manual? For a complete list of all the changes from the second edition of the Manual of standards for hospitals, see the reader to the summary table. Among the most significant changes include:

- A new chapter on international targets for Patient Safety;
- Standards relating to medication management have been updated and moved to a separate chapter entitled "Management and Use of Drugs "(MMU)
- Standards relating to surgery and anesthesia have been updated and moved to a separate chapter entitled" Assistance Anesthesiology and Surgery (ASC)
- Standards regarding communication processes have been extrapolated together the various chapters and standards for managing information in a single chapter revised and retiled "The Information and Communication Management (ICM)
- Processes for initial and periodic review of credentials and skills of doctors, nurses and other health professionals are made explicit in the round with heightened expectations regarding the processes put in place to guarantee safe and quality within the organization;
- Standards for infection control (prevention and Infection Control ") have been updated and now also include the standard isolation procedures,
- Has introduced a new standard for the supervision of professional training in health within the organization
- A new standard was introduced on the establishment of a program of protection and prevention for professionals,
- Expectations have been clarified on the evaluation of sentinel events and adverse events were introduced

4. "As Is" Situation of current system

4.1 PROBEM RECOGNITION

Through development of projects to improve the quality of care such as the reduction of medical error, timeliness of service, that is providing more quickly and the delivery of care at lower cost through increasing of productivity. At Cremona hospital, the CEO and TOP managers try to utilize and focus on the strategic objective and increase the efficiency through organizational dashboard; they recognize three main problems as describe as followings

- Lack of communication at every level of organization, crossing departments, and within one department.
- Poor investment on quality
- "Doctors are not managers".

During the operation the doctors always have the mind of saving patient's life and they don't care about the efficiency factors or cost reduction, they also expose the lack knowledge about management even the quality is not explicit in their activities. They just view as "we are doctors, we should work only what we assigned", and they don't have a clear focus on quality perspective.

Beside of this, there many problematic issues on the flow of communication between the department of the hospital, even inside one department. The communication is blocked in somehow and this causes a strong disappointment for the staff. The managers and the supervisor are not recognized their role and responsibility to accomplish the target. The lack of communication also lead to serious problems of understanding patient requirements so the hospital could not deliver the good quality, the customer dissatisfaction is accumulated day by day.

While the quality department recognizes the problem, but they could not handle the situation due to but with the limitation of human resources (2 staffs with one supervisor). Even more, to deploy the certification of ISO 9000:2000 and Joint commission Program requires a huge amount of money, time, resources and collaboration between the involved stakeholders. The

main budget come from the hospital, the other remain flow from a support of the Regional community. Due to fluctuation of the head department and political issue the budget are not always provide on time.

4.2 PLAN FOR IMPROVING QUALITY AND PATIENT SAFETY

Since 1990, Cremona has developed a plan to improve quality and patient safety as the translation on the operational level of quality improvement, which is the formal instrument of planning decisions, in formulating and drafting enables management to define in detail the objectives, strategies and operational tools by which the Hospital intends to interact with their stakeholders. The Plan proposes a comprehensive approach to quality improvement and patient safety: improving quality overall provides a continuous reduction of the risks to patients, and visitors. The proposed approach includes: the assumption of responsibility for care by individual practitioners against the patient, the optimal design of new clinical and managerial processes, monitoring processes through data collection; data analysis, implementation and support changes that generate an improvement.

The methodology adopted is to: define and build an integrated system involving all stakeholders in the process of patient care and to coordinate and share the collection data within an organization; critically review their actions, make improvements based on the analysis and comparison of data, contributing to increased awareness on choice of routes for improvement in the provision of care, increased support for developing leadership for a program involving the entire organizational units. A “must be” condition of the plan to improve quality and patient safety is to put everyone in a situation of empowerment to become the engine of the whole approach.

4.3 DEFINE THE VALUES AND RESPONSIBILITY AS GUIDELINE

Cremona hospital also has a clear definition how value provides to patient by practitioners in Quality improvement, following by the principles of effectiveness, quality, efficient and economical in diagnosis, treatment and rehabilitation. The organization and operation of the hospital must then apply the Following Principles:

Responsibility of care by individual practitioner:

- Consider patients as center of organization, create patient satisfaction.
- Quality performance and service delivery.

- Attention to the development and monitoring of business processes, the continuous performance improvement in term of effectiveness, appropriateness, quality and efficiency.
- Improvement of skills to assess, engage, empower and reward all the human capital on business objectives by facilitating communication over the organizational structures, teamwork, integration of Professionalism and a sense of Belonging, Including through training.

Organizational Flexibility, defined according to the requirements of health and welfare. The Hospital therefore creates an organizational system based on the following values: respect for the patient orientation and internal and external collaboration of actors at all levels. By understanding the needs and respects to the rights of all patient's kinds, developing listening and monitoring systems satisfaction. Promote a climate marked by the integration of organizational skills, facilitation, teamwork, development of networks of collaboration with entities outside the hospital to offer integrated services with those of other health and social provincial participation by ASL.

- Orientate to quality as capacity of the Hospital to promote and develop overall quality, and oriented to patients and the benefits provided, the internal relations, structure and technology.
- Encourage 'scientific innovation in all areas of their competence seen as promoting all forms of coordination and integration with the world of research and clinical care.
- Evaluation on the results intended as feedback of the activities of the hospital in both the organizational and individual level.
- Build the professional development of all employees, ie the capacity of the Hospital to provide all players an opportunity to deepen their knowledge and develop their full potential.
- Translate into results the specific regional and local planning understood as stable and constructive co-operation and the exchange of information with the Regional community and ASL.

- Always looks for a constant integration of services designed to provide a benefit to the employees who have the positive contribution and coordinated in time and space of all articulation of the hospital.
- Understand the transparency of the identification for each decision of the benchmarks and expected results. To carry out the organizational system of the organization shall devise an organizational structure and management systems geared to enhancing the flexibility competencies at all levels of responsibility, defining expected results and contributing in any way to generate a positive business climate.

4.4 HOW CREMONA SET "STRATEGIC ORIENTATION ON QUALITY IMPROVEMENT"

In Cremona system, the "people" must be the focal point of all processes, particularly patient as also present as "center care", through many forms of participation and support. The Hospital must be able to provide benefits whose guiding principle is quality and this happens through a proper understanding of the needs and the consequent organizational compliance operational. The orientation on patient becomes a cultural shift that promotes strategic direction, starting from its own history, values of ethics, fairness and transparency, redesigning and restructuring services to be paid according to the changing types of requests and the changing complexity of the needs of people.

Through the motivation of staffs will ensure improved efficiency, reducing waste though the continuous process of development. The performance review and quality assessment are integral to the institution. Each department therefore promotes strategic development and management of the quality system as a necessary element to achieving business goals.

The policies and management strategies are aimed at developing a management model aims to give the patient a high quality of services provided in terms of effectiveness, ethics, fairness and safety and continuous improvement of themselves by direct involvement of people. It is pursued consistently with the searching for maximum operating efficiency, an indispensable condition for consolidating the results and to develop new initiatives to add value to the services provided by ensuring the placement of the hospital.

4.5 ORGANIZATIONAL STRUCTURE OF QUALITY MANAGEMENT SYSTEM

The quality system of Cremona hospital is structured in vertical way as describe in the following chart

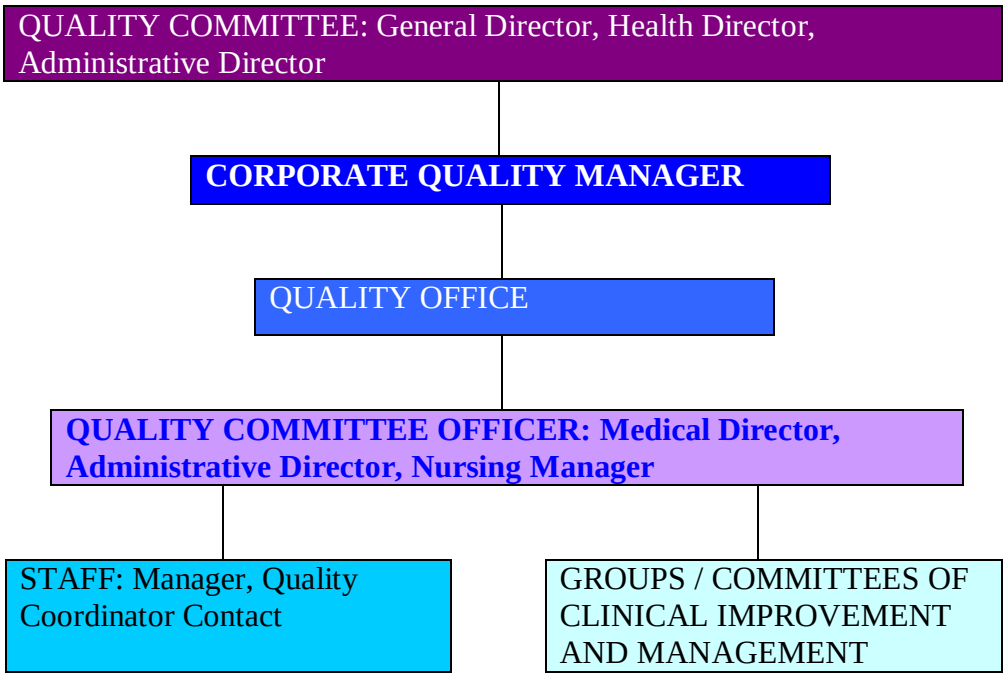


Figure 5.1: organizational structure of quality system at Cremona hospital

The owners of hospital, the Quality Office, all employees are the body responsible for conducting the Quality Management System with the following tasks:

- Set, develop and manage organization's The Quality Management System
- Support of Strategic Management and the corporate structure in order to reference the themes, systems, procedures of quality, efficiency and effectiveness of monitoring activities, monitoring and compliance with internal rules.
- Promote and coordinate activities relating to the management and continuous improvement of quality of business services.
- Care and organizes training and updating in the field of Quality;
- Supports strategic direction in policy of quality and preparation of the Quality Plan of the Company; Provides methodological support for the introduction of corporate structures, management and maintenance of Quality systems;
- Set, develops and manages the Document;

- Promotes and coordinates " Corporate Network Quality;
- Detect and analyze indicators and monitoring aimed at the evaluation of farm assurance schemes;
- Proposes actions for improvement;
- Spread the culture of quality within the company.

For the coordination of corporate quality and support the implementation of planned improvements, the Organization uses the Quality Management System. The Quality Management System is designed to achieve the following goals:

- Ensure the patients soundness, safety and professionalism of the Hospital as recognized of "Hospital Institutes of Cremona".
- Assist the delivery of health services to all patients.
- Maintain certification according to UNI EN ISO 9001:2008.
- Maintain the Joint Commission International Accreditation for the Hospital Oglio Po
- Implement the standards required by the Lombardy Region in the evaluation program of health agencies and organization accredited to public health.
- Gain market share, consistent with the proper control parameters of economical management and risk in the provision of health services.

4.6 QUALITY MANAGEMENT SYSTEM

The Quality Management System to support the plan to improve quality and patient safety uses the following tools:

1. ORGANIZATIONAL STRUCTURE. The provision of excellent health care services requires effective leadership to manage the hospital. This leadership come from sources of official recognition who are holding up the position of top managers and have very important responsibility and trust by each employee. In addition, all operators must work well together to coordinate and integrate all organizational activities, particularly those designed to improve health care and clinical performance. Therefore essential tool for the Quality System is the identification of roles, understanding the different responsibilities within the Organization and how it intersects with the work collectively and individually.

2. DOCUMENTATION The adoption of a Quality System by a structure through the acceptance of relevant documents to be kept under control (system files) that is used to describe and manage the entire quality system. It is important that documentation is developed “Fit for business ", taking into account the size, specialty clinics, the history of property and persons involved in it. The documents describe the organizational policies, regulate activities relating to the safeguarding and development of quality management system, specify and describe the methods, materials and the sequence of steps to be taken to the execution of a “specific activity”.

3. REVIEW AND QUALITY IMPROVEMENT PLAN In the review system in each Department, there shall be a periodically review of its own quality management system to verify the adequacy and effectiveness in achieving their goals by using all information and data available to identify areas of strengths and priority. Each area must establish and demonstrate continuous improvement on the result of specific and appropriate processes planned, implemented, monitored and reviewed business concludes with the preparation quality improvement projects resulting from the analyzed data. The process of developing and Management Plan can be represented in a methodology known as PDCA (Plan, Do, Check, Act).

Plan quality improvement and patient safety has the following features:

- Is guided by the direction according to the main objective of the organization.
- Affect change in organizational culture.
- Use a proactive approach and reduce the risk and variables using data's identification of priorities;
- Seek to demonstrate sustainable improvements.

4. INDICATORS / MONITORING QUALITY AND DATA ANALYSIS Many indicators are quantifiable and therefore measurable variables to describe complex phenomena, evaluating the time course, and making decisions for changes. They are used to assess the functioning of the processes, to measure the operational status and capabilities of the processes under consideration, to improve process efficiency, to ensure better use of available resources and reduce risk. They are tools used to monitor the success of performance and to highlight any issues. They explore in order to influence the "results" of clinical, therapeutic, managerial,

economic, educational aspects which aimed at the satisfaction of the patient. In the logic of improvement, indicators allow to verify whether and to what extent the changes have produced improvements.

5. IMPROVEMENT GROUPS / COMMITTEES The improvement teams and committees are part of the Quality Management System as a means of promoting improvement activities in organizational processes.

Groups / active standing committees are:

- Ethics Committee Commission to proper use of blood for avoiding infections.
- Therapeutic Committee Commission
- Education Group
- Medical monitoring for health risk management
- Group quality assessment

6. INTERNAL AUDIT Within the quality system, performance evaluation is done through the verification of activities as one of the instruments used to address the need to monitor and analyze the activities of both managerial and clinical perspective. The methodology allows the internal audit to review critically the various phases of the business ensuring that it meets the criteria previous establishment. One of the objectives of the test is the ability to overcome the logic of being or put under review, developing instead a fruitful collaboration between those who conduct the testing organization under analysis, with a shared vision of continuous improvement.

7. NON-COMPLIANCE AND CRITICISM / corrective and preventive actions ensure non-compliance on products purchased, services provided, the equipment used for the provision of services or procedures for carrying out the same activity required to detect and give evidence in order to protect their customers, operators and the organization. The corrective and preventive actions are essential tools for improving the system and consequently the quality of service. Actions are implemented to remove the causes of non-compliance of products / services and the Quality System and to pursue the overall improvement of the Company.

8. QUALITY TRAINING Training is a major organizational tool available for continuous improvement of the quality and appropriateness of services. Training should therefore be used

either on the individual for the growth of skills, both on the side of organizational improvement focusing attention on developing managerial skills. The objective of training is to involve as many actors and methodological support to the establishment of organizational analysis, plans, policies, procedures, protocols, operating instructions, forms, improvement projects etc.. Quality training included in the training plan involves:

- Construction of the quality management system based on qualitative indicators
- The system checks the development of laboratory quality
- The quality for the review and design of the improvement
- AOIOC path quality: ISO 9000 - J CI - Regional Assessment Program
- JCI accreditation and regional assessment

9. METHODOLOGY (PDCA)

The PDCA process of drafting and management plan can be represented in a key move as PDCA (Plan, Do, Check, Act). This path consists of a planning phase where you define goals and establish the document (Plan), a phase of implementation (C) at which the decisions are being experienced, a phase control (check) parallel to the C phase occurs in which the progress of the plan and eventually provide for any remedies; and a phase of actual implementation of the Plan (Act). The PDCA is the main method of universal validity, which is directed towards the improvement of the quality and allows us to treat any rigorous and systematic problem. The methodology focuses on the scientific method, where "science" is a problem whose evidence is based on data and facts rather than opinions or feelings.

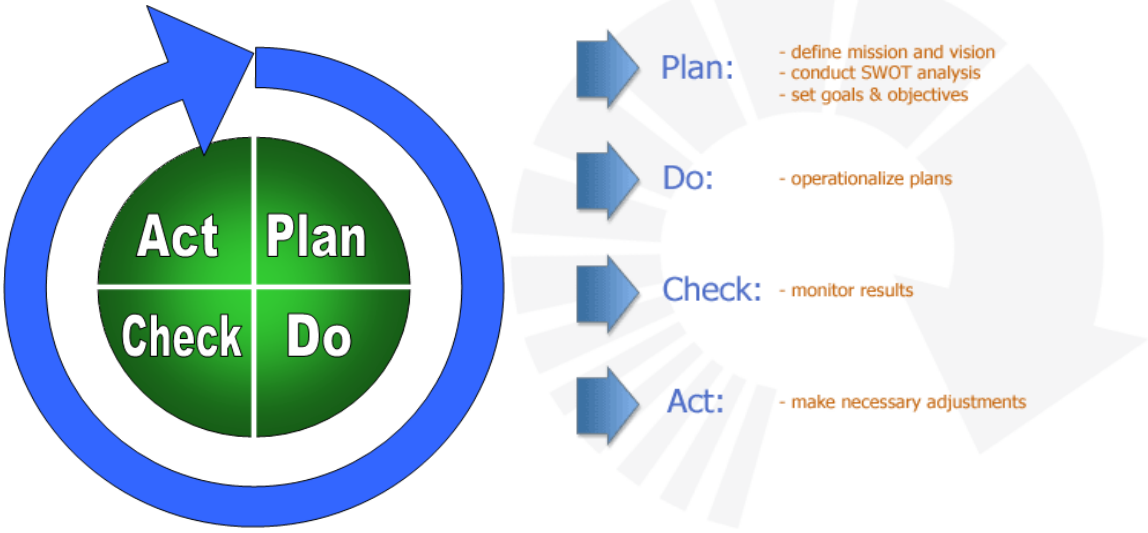


Figure 5.2: PDCA as the main method for management in Cremona hospital

5. Implementation of Six Sigma

5.1 Six sigma structure at Cremona hospital

The project was lead by Cremona president and CEO and report to him by three executive vice-presidents who each direct the effort of the corporate matrix they support. Vice presidents provide project sponsorship to project leaders and ensure they are informed to any event that may impact on project.

Brown Belts, who are selected by senior leader, devote approximately 20% of their time actively leading Six sigma projects. Trained green belts function as a layer of support, providing assistance to Brown Belt who led projects. Green belt is given specific task throughout the project in which their help is needed to achieve necessary improvement. In this structure, Green belts may pursue the position of brown belts by submitting a letter of recommendation from their respective vice president, with approval from their executive vice president.

Finally, there are three Master Black Belts who serve as teachers and mentors to the organization, and lead more difficult and complex projects. Additionally, a senior vice president manages project selection, removes barriers to change, communicates project successes, and oversees the entire initiative. Together with change agents who are trained facilitators, the Green Belts, Brown Belts, Master Black Belts, and senior vice president as champion, make up the Six Sigma team. It is the Six Sigma team's charge to maintain the momentum of results that

Six Sigma has provided and to make use of resources even more efficiently. Senior leaders made a commitment to learning at Cremona Hospital. All employees receive a primer to Six Sigma during new employee orientation. Additionally, every employee receives at least 1 full day of training devoted to Six Sigma, while many may receive more. One critical factor is that all senior managers, including the CEO, have been Green Belt trained and shadowed a project. Belt training is quite rigorous and consists of 13 intense days extending over a 6- month period. Training materials for classes were all developed by Master Black Belts and have been customized to healthcare. They continually update the material and include many project examples from Belt projects at Cremona Hospital.

5.2 Six Sigma methodology

Each phase of the DMAIC (Define–Measure–Analyze–Improve–Control) methodology includes an assortment of tools that provide further understanding of a process. One of the many strengths of Six Sigma is that every project is approached as the same, utilizing each of the five phases; there are no short- cuts to process improvement in the world of Six Sigma. All analysis is based on actual data, rather than opinion or perception. At Cremona Hospital, Six Sigma refers to more than the pure statistical methodology. It is a strategic initiative that includes transforming culture. In addition to teaching data collection and analysis tools, change acceleration process (CAP) helps employees to create a shared need, shape a vision, mobilize commitment, make changes last, and then monitor progress. Both CAP and Six Sigma projects are supported by Workout (town meetings), which is an operational tool to help cut through bureaucracy in decision-making. It also brings together those most closely involved in a process to drive improvements. Both CAP and Workout training was provided by professional consultants equipped the organization to face the challenge of change with a proven method.

5.3 Benefit of Six Sigma

The benefits of Six Sigma projects are experienced throughout the organization. During the initial implementation, the first 'Belt' class focused on processes in radiology. As a result of these projects, costs per procedure were significantly reduced. Additionally, examination results are distributed to ordering physicians faster, patients receive treatments quicker, and the physical workspace was re-designed to increase employees' efficiency. Other classes have

focused on different areas of the organization: maternal care, specific pulmonary diagnosis related groups (DRGs), admissions, the billing process, and the documentation process. Using the skill set learned in Six Sigma, CAP and Workout, and other organizational resources allows managers to tackle issues such as patient satisfaction in the emergency department and medical/surgical areas, patient throughput, employment processes, surgery scheduling, and revenue cycle. Due to the rigorous statistical training of Six Sigma, managers ask for data before making decisions and utilize the tools to assist in performance improvement in their areas.

Six Sigma is a data-driven methodology that is well understood by medical practitioners, making it easier to create buy-in. Physicians utilize the concept of DMAIC in their practices daily, defining a patient's problem, obtaining a baseline measure, analyzing the factors that could cause the illness, prescribing a remedy to improve the patient, and then maintaining control of the patient's health. This is the same method used in studying process problems using Six Sigma methodology. Physicians and other practitioners are more apt to accept change in processes when the decision is based on data. Many times, projects may require a physician champion to implement appropriate solutions successfully. This helps to foster an environment of playing on the same team, which benefits the organization, physicians, and most of all the patients. Essentially, Six Sigma targets the root cause responsible for process problems and provides the necessary tools to resolve them. The difference in this approach and others is its built-in skill set and monitoring capabilities, proving to be the most effective system-wide quality improvement method focusing on results. Each project represents a significant opportunity to improve some aspect of the services provided by Cremona Hospital, and Belts realize the extent to which they can positively impact the way Cremona Hospital does business.

5.4. Critical success factors of Six Sigma

Most healthcare organizations would not dispute that there is a need to improve, and the effectiveness of Six Sigma has been proven in the manufacturing environment at well-known companies such as Motorola and GE. CH's leaders have considered its applicability to healthcare from the perspective of quality of processes, or the ability to deliver care prescribed by practitioners. Together with the quality of practice, or practitioners' judgment, these components drive the effective and efficient delivery of service. Senior leaders at CH

determined that Six Sigma was not the approach to determine the appropriate method of treatment; rather it is ideally suited to designing processes that deliver care in a timely and efficient manner. Commitment is critical. Applying Six Sigma in a service industry is not easy, and if senior leaders are not on board, it is almost certainly a formula for failure.

Selecting the right people on the Six Sigma team is crucial as is the selection of projects, which must be tied to the organization's strategic imperatives. Project ideas are obtained from a variety of sources including feedback from our customer service tools, benchmarking data and analysis, financial results, Workout, and brainstorming sessions. All Six Sigma projects must support one of the metrics and the 'project R0' or charter must be approved by the executive vice president sponsoring that metric. The appropriate project leader, 'Belt,' is assigned based on the scope of the project. One of the Master Black Belts mentors the Belt to ensure whether the methodology is strictly adhered.

In addition to selecting the right project, project success is directly related to buy-in and ownership of processes. The selected project must be important not only to senior leadership but also to the project leaders. If projects have been tied to the areas of strategic focus, there is buy-in from senior leadership. They will in turn ensure the department managers are held accountable to pro- duce the established targets. The management team and the whole organization, not just the project leaders, must own the targets. Financial results and their validation continue to be a challenge in health- care. In a manufacturing environment, it is straightforward to measure the cost of production. However, it is very difficult to place a euro value on a faster test result that may yield a shorter length of stay or the value of a more satisfied customer. In healthcare, there are many projects that are truly worthwhile and impact the quality of care that are not financially driven. Therefore, the organizational focus of projects must be determined early on to ensure the method of project selection is well planned and considerations made for all potential aspects. It is important to offer an incentive for project leaders as they take on more organizational responsibilities. CH offers a financial incentive to help motivate Brown Belts. Each project leader is eligible to receive as much as 2500 euro for a successful project. Payment is tied to three criteria:

1. Timely completion (completion times are agreed upon by the sponsor, Master Black Belt, and project leader at the project's onset).

2. The project must pass each review stage or tollgate (Master Black Belts must sign off on the project methodology).

3. Finally, the project must result in a 70% reduction in the number of defective parts per million (DPPM). At the project's completion, 2000 euro is paid and then another 500 euro if the project reaches Six Sigma and improvements have sustained at the next 6-month measure.

CH has embraced a culture change throughout the organization that has impacted every employee. Resistance is a natural part of change and with change of this magnitude it is imperative to offer a means to overcome resistance and create buy-in from all employees. Barriers to effective communication have been eliminated, the 'silo' mentality between departments has been broken, and employees tackle problems with a more data-driven approach.

Clinical project example using DMAIC One critical element of any successful project is the ability to effectively exe- cute it. Tricia Just is the Infection Control Team Leader at The Medical Center in Bowling Green. She has been with CH for over 10 years. She completed a DMAIC project that focused on surgical site infections. The Infection Control Department monitors selected surgical cases each year. These cases are chosen due to high volume, high risk, and/or are problem prone. Ms. Just found that increased instances of wound integrity problems up to and including deep intra-abdominal infections were being identified in small and large bowel surgical cases. As the Infection Control Group had been unable to identify any particular area for improvement, the Six Sigma project was undertaken to determine the cause and ultimately reduce the infection rate.

5.5 Conclusion for application of Six Sigma

Six Sigma's future in healthcare is far from bleak. As consumers become better informed, healthcare providers must commit to achieve excellence in every aspect of the care delivered. The success stories are rapidly growing, all touting the impact of this rigorous approach to problem solving. The advantage Six Sigma brings with proven strategies allows other healthcare organizations to build on prior successes, sharing information and knowledge to ensure all patients' safety and delivering a healthcare experience defined by excellence. Since CH was the

first healthcare organization to adopt Six Sigma as an organization-wide approach to quality improvement in Lombadia, the organization serves as a pioneer who led the way for many others to follow. CH continues to move forward to constantly improve the way work is accomplished. In the words of author Ben Sweetland, 'Success is a journey, not a destination.' CH continues on this journey to perfect processes and services utilizing the most valuable asset, its people.

6. CURRENT SYSTEM TO MONITOR & IMPROVE CUSTOMER SATISFACTION

6.1. HOW CREMONA HOSPITAL MANAGE CUSTOMER SATISFACTION

In the healthcare structure the listening and recognition of patient's satisfaction are key instruments for understand the needs of the patient and identify critical areas to improve the quality of services provided.

Beginning from 2000, the hospital of Cremona started a new system "Observatory" which mainly functions in monitoring and controlling the patient satisfaction. The main method was "Questionnaires", in which they collected data and information through filling form from anonymous patients in order to obtain a sincere and objective evaluation.

Total of people who filled out the questionnaire were 7263, while there are 3639 respectively those who have benefited from outpatient and 3624 who had the experience of hospitalization and day surgery. Assessment rating, which takes place on a scale between 1 to 7 (5, 6, 7 which correspond to a "satisfied and excellent service"), was collected with questionnaires that assess patients' satisfaction in their experience on services, treatment, or examination. The aspects evaluated in order to gain insight and truthful evaluation the hospital setting during their stay are: care, medical care and nursing, respect for privacy, the relationship with operators, the information received on health status, organization structure and issues hotel. While those who visit clinics assess the care, assistance from doctors and nurses, communication, information, information, privacy, structure and organization in general, to return to the main question "Would you recommend our hospital to other patients?" which indicates appreciation of the service and patient trust in the physicians as well as the reuse of infrastructure. The evaluation recorded positively with percentages of 93.7% for the experience of hospitalization and 92.7%

for examination and treatment. For some patients who had an experience of few days of hospitalization, important operation, important routine inspections, they left with good memories.

The winning aspects were relating to care, health care and nursing, information received on the care, respect and personal privacy. The lower ratings were over the aspects of hotel and the complex organization of the hospital. Overall, the most critical one was the “supplied food”. The patient had very high rating for the clinic activities, they were satisfied with the care and assistance of doctors and nurses, the received information very seriously, respect and personal privacy. In opposite, lowest score recorded aspects of structure and organization, such as waiting time for the visit, the booking service and schedules. Survey results are considered complex high particularly the proceedings related to acting professionals that provide direct assistance, holding attention on issues that need improvement interventions. This data will be subject to bargaining between the strategic direction and referents of each business unit / service. The advantage is that in this way, detection can thus assumes strategic importance, and will be the subject of study and discussion in order to pursue really about the goal of customer satisfaction as the main factor for continuous improvement.

In the following tables, there are some data of “Ambulatorio” and “Degenza” services.

Table 5.1 Customer satisfaction of Ambulatorio Service

Ambulatorio		
Monitoring satisfaction over each single element of the service		
care and assitance area	attention given to the medical personnel	87,60%
	attention given to nursery personnel	88,80%
	respect of the privacy	91%
organization and structure	Accessibility comfort and cleanliness	82,30%
	acceptance and paying tickets	73,50%
	booking service	78,40%
	waiting time	66,70%
	respect of the schedule	70,70%
relational area and information	clarity and completeness of information	78,30%

Table 5.2: Customer satisfaction of Degenza service

Degenza		
Satisfaction over each single element of the service		
care and assistance area	assistance by medical personnel	95,5%
	care given to the patient	95,9%
	assistance by nursing personnel	95,6%
	post-hospitalization information	94%
stucture and organization	overall organization of the hospital	91,6%
	reception and information over each department	87,1%
	structural and hotel aspects	88,5%
relational area and information	clarity and completeness of the info	96,3%
	information received over care and treatment given	93,9%

6.2. WHAT ARE THE PERFORMANCE INDICATIOR AND DASHBOARDS USED IN CURRENT SYSTEM

1. A comprehensive approach to improve quality and patient safety requires the continuous reductions of risks to the patients and operators, and implementation and support the changes the produce an improvement through:

- The function monitoring process by collecting data and indicators
- Data analysis.

The purpose of these indicators are to guide the leadership of Units / Services Office of Hospital as the key indicators identified for monitoring of structures, processes and outcomes (outcome) of clinical and managerial organization. In order to drive:

- Giving decision
- Definition
- Management
- Registration

Of the key indicator found to monitor the structures, processes, and clinical outcome of the organization. The objective helps:

- Encourage the use of existing indicators and proven validity for monitoring clinical activities and relevant processes.
- Support the definition of new indicators where there are not already available and where they needed.

Plan to improve quality and patient safety provides the prioritization process to monitor and of the improvement activities and patient safety to be implemented (high risk activities, generating many problems, critical activities).

In the following sections, Cremona hospital defines some terms and definitions in their system:

Indicator: variable high informative content to allow a summary assessment of complex phenomena and provides information needed to guide decisions as crucial information and selected to measure the changes.

Monitoring: action time constant and continuous observation a process, a situation, a phenomenon in their place to gather information to allow corrections and / or improvements.

Structure: relatively stable attribute of human resources and material of the organization of health care (which is given)

Process: means any action undertaken by healthcare professionals of health system (what you do.)

Outcome: result in terms of health status and degree of satisfaction (perceived quality) following a specific intervention or user experience related to the care process (what you get).

The indicators are quantifiable and therefore measurable variables to describe complex phenomena, evaluating the time course, and making decisions for changes. Used to assess the functioning of the process, to measure the operational status and capabilities of the process under consideration, to improve process efficiency, better use of available resources and reduce risk. They are tools used to monitor the success of the performances and to highlight any problems to be explored in order to influence the "outcome" whether clinical, therapeutic, managerial, economic, educational, aimed at the satisfaction of the patient-users. In the logic of

improvement indicators allow to verify whether and to what extent the changes have produced improvements' Leadership in complete sharing with its employees is responsible for the selection of key measures (indicators) to be included in monitoring activities. The indicators are identified to monitor the structures, processes, results (outcomes-outcomes) and clinical management of the Company. The monitoring process should focus on:

- High risk for the patient,
- Characterized by large volumes of business and weaknesses inherent in their nature;
- Relevant and significant organizational unit concerned.

The measurement should disclose, in outcomes, situations can be defined and controlled by the Company. The decisive moment is the identification of structure, process, outcome to be measured which are immediately followed by the choice of the indicator, its encoding and its designation to facilitate the immediate detection of the indicator by users, as forces to identify the main significance of information and promotes knowledge and sharing. Monitoring of processes is essential to an organization of monitoring activities with planning the frequency of data collection and how integration of data collection with the daily work processes. Data collection must support the assessment of the effectiveness of improvements deepening of the areas under study and improvement. Measures when selecting a new current measurement does not provide more useful data to assess performance. The indicators represent one of the tools of the quality system of the Hospital of Cremona chosen to ensure proper management of clinical activities performed inside the main 'organization. Currently the scientific literature are available indicators for monitoring of most of the major clinical situations, therefore the Company is not designed primarily to produce new indicators as to promote the use of indicators of proven validity. Should not be available in literature indicators for the management of specific clinical and organizational processes, they are defined and processed at the company level, following the methodology proposed by this procedure.

A "good" indicator must be: significant (addresses important issues), valid (accurate and precise), detectable (data availability without excessive costs of collection), and then easily "buildable", sensitive (must register improvements and deteriorations) and then "Reliable, understandable (to operators), not contaminated by any ambiguity, accepted by professionals

whose work is submitted for assessment. should be clearly defined: the target value, the mode of data collection, the methods of calculation. Normally, the measurement of indicator expresses: a "report" in which case it requires an operational description of the numerator and denominator, the identification of data sources of the numerator and denominator, the frequency of data collection, the population of reference, and, possibly, exclusion, the person responsible for data collection.

Definition of indicators

Defining indicators is the responsibility of the Head of the Reference and Quality. Each OU / S / U must provide for the monitoring of at least two critical processes through the identification of specific indicators. Please note that general criteria used to identify critical processes are:

• Clinical impact in terms of frequency,

• Economic and organizational impact. The choice of indicators used in relation to the process that you want to monitor, will be sought, and those in privileged literature, defined by the criteria of EBM, only in the absence of valid indicators, relevant and adaptable to local context will be built ad hoc indicators. To build an appropriate indicator will follow these guidelines:

a) Define the process / activity to be observed.

b) Establish the rationale / purpose for which they will measure the indicator.

c) Define the indicator.

d) Define the target value: reference value that reveals the quality and expected) Determine the type indicator (ratio, proportion, rate, average, sentinel event, the absolute number).

f) Describe in detail: numerator, denominator, which are derived from source data, methods of data retrieval to provide traceability information.

g) Define the target population and, possibly, the population of exclusion

h) Establish a frequency detection (time interval between a detection and later).

i) Assigning responsibility to make the calculation of: always be identified within the EU / S / U shapes which are responsible for collecting the data , computation and communication of deviations from the target value to the Head.

The identification of indicators is recorded on a "master computer" in a file in Excel (reference to QMS "Matrix Indicators) and presents the top following fields: Object Code Indicator Description of Indicator Measurement (structure, process, outcome) Goal Value Unit Organizational Previous surveys via a hyperlink leads to the explanatory note where they are defined:

- Identification Code
- Scenario
- 3 measurements. Rationale / objectives
- Type Indicator
- Operational description of the number
- Operational description of the denominator
- Source of numerator data
- Data source of denominator
- Methods of information retrieval
- Reference population
- Responsible for data collection
- Frequency of collection

Indicators are set annually as a result of the Quality Review and Improvement Plan Quality and Patient Safety, which manages the development of indicators in use and identify any areas that need evaluation and monitoring through the use of additional indicators. The identification of indicators should be recorded on Matrix Indicators signed for approval by the Head Referee and Quality and Quality submitted to the Office for verification of the definition of indicators, according to Plan Quality Improvement and Patient Safety Company el ' approval by the RAQ has to update or replace existing indicators and to report or assign indicators / monitoring in specific cases of particular need for clinical and epidemiological nature, medico - legal or based on the mandates of the Directorate.

Detection of Indicator: Data collection for detection of the indicator is essential to formalize a systematic data collection. The manager, identified indicators, before approving them, must determine criteria for the collection and give clear guidance to staff about the arrangements

and recording media in mind the prerequisite of traceability. The existence and significance of the indicator must be "proved" with reports, databases, and forms, always available, updated and with a schedule of no less than 10-12 months. If the indicator requires data not available through information systems running the OU R / S / U in cooperation with the Contact Quality, shall identify the appropriate method of detection, possibly through the identification of detectors to devote to this task, and verifying the accuracy of data collected. The responsibility is to supervise the implementation of monitoring and the detection of the indicator and the data area.

The registration of the Head of detection of the indicator at the specified frequency necessary to register on the form, "Matrix indicators Excel spreadsheet" the bottom dedicated to the recognition that the value refers to the period specified and to compare the time course with the target value. The calculation of runs as determined and specified in the "matrix indicators." According to the timing review, the Office manager sends the report on quality monitoring.

Analysis of indicators / monitoring: The Quality Manager is the contact area, following the periodic survey, analyze the state of the indicators and communicate progress to all staff. With a performance indicator monitored repeatedly not positive, the manager must be activated to ensure that a systematic approach to identifying the causes of non-compliance for further development of appropriate corrective actions. The analysis is listed in the following tables:

Table 5.3 How to describe an indicator in Quality System of Cremona hospital

Items	***Description***
1.identification code	
2. scenario	
3. rationale/objectives	
4. type of indicator	
5. operational description of the number	
6. operational description of the denominator	
7. source of numerator data	
8. data source of denominator	

9. methods of information retrieval	
10. reference population	
11. responsible for data collection	
12. frequency of collection	

Table 5.4 Examples of indicators

STD	Code of Indicator	Descirption of indicator	Purpose of the measurement	Objective 2009	Organizational Unit	FIRST SEMESTER 2008	FIRST SEMESTER 2008	Gennaio	Febbraio	Marzo	Aprile	Maggio	Giugno	Luglio	Agosto	Settembre
3,4		Percentage of hysterectomies performed by laparoscopy or vaginal			GINECOLOGIA/OS	Anno 2007	Anno 2008									
3,16	D411_I_01		processo	>=70%	TETRICIA	40,00%	66,00%						65,22%			
3,4	D411_I_02	Percentage of caesarean sections performed the total number of shares	processo	<=35%	GINECOLOGIA/OS TETRICIA	33%	30%	37%	32%	38%	35%	34%	39%	50,77%	33,33%	
3,4	D411_I_03	Rate revisions post-isterosuzioni	processo	<=1%	GINECOLOGIA/OS TETRICIA	1,50%	1,83%	0%	0%	0%	8,00%	9,09%	0%	0,00%	0,00%	
3,4	D411_I_04	Percentage of surgical reinterventions	outcome	<=2%	GINECOLOGIA/OS TETRICIA	0,23%							0,00%			

Table 5.5: description of indicators

Items	***Description***
1. Codice identificativo	**D202_I_01**
2. Scenario della misurazione	Pazienti con diagnosi di IMA
3. Razionale/Finalità	In ottemperanza alle linee guida nazionali e internazionali la dimissione del paziente con IMA va accompagnata (dove non ci siano controindicazioni) dalla indicazione alla terapia con ASA e betabloccanti anche se dal 2007 l'introduzione di un nuovo farmaco (*Ivabradina*) ha lievemente ridotto l'uso del beta-bloccante sopratutto in quei pazienti in cui l'uso di tali farmaci poteva risultare "forzato" per la presenza di particolari condizioni.
4. Tipo di indicatore	Percentuale di pazienti con diagnosi di IMA dimessi con ASA + beta-bloccanti rispetto al numero totale di pazienti dimessi con diagnosi di IMA
5. Descrizione operativa del numeratore	Numero di pazienti con diagnosi di IMA dimessi con ASA + beta-bloccanti
6. Descrizione operativa del denominatore	Numero totale di pazienti dimessi con diagnosi di IMA

7 Fonte dei dati del numeratore	Software di reparto - Quore-
8. Fonte dei dati del denominatore	Software di reparto - Quore-
9. Modalità di recupero dell'informazione	Dal software di reparto vengono desunti i dati relativi ai pazienti con IMA e che sono stati dimessi con ASA + beta-bloccanti.
10. Popolazione riferimento	Pazienti dimessi con diagnosi di IMA
11. Responsabile della raccolta	Dr.ssa Simonetta Vinci
12. Periodicità della raccolta	Semestrale
Requisiti	***Descrizione***
1. Codice identificativo	**D202_I_02**
2. Scenario della misurazione	Pazienti con diagnosi di scompenso cardiaco
3. Razionale/Finalità	Essendo stato istituito un ambulatorio dedicato al follow-up dei pazienti con scompenso cardiaco, la frequentazione di tale ambulatorio permette di seguire in maniera più continuativa e costante il paziente permettendo in tal modo un minore numero di ricoveri legato a tale patologia. **Letteratura di riferimento**: *Focused Update: ACCF/AHA Guidelines for the Diagnosis and Management of Heart Failure in Adults (2009) *A Report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines Developed in Collaboration With the International Society for Heart and Lung Transplantation Mariell Jessup, Am Coll Cardiol, 2009; 53:1343-1382, doi:10.1016/j.jacc.2008.11.009
4. Tipo di indicatore	Riduzione percentuale del numero di pazienti ricoverati per scompenso cardiaco nel primo semestre 2009 rispetto al primo semestre 2008.
5. Descrizione operativa del numeratore	Numero di pazienti con scompenso cardiaco ricoverati nel primo semestre 2009 - Numero di pazienti con scompenso cardiaco ricoverati nel primo semestre 2008

6. Descrizione operativa del denominatore	Numero di pazienti con scompenso cardiaco ricoverati nel primo semestre 2008
7 Fonte dei dati del numeratore	Software di gestione reparto - Quore-
8. Fonte dei dati del denominatore	Software di gestione reparto - Quore-
9. Modalità di recupero dell'informazione	Dal software di reparto vengono desunti i dati relativi ai pazienti con scompenso cardiaco che vengono seguiti presso l'ambulatorio dedicato e successivamente ricoverati.
10. Popolazione riferimento	Pazienti con diagnosi di scompenso cardiaco
11. Responsabile della raccolta	Dr.ssa
12. Periodicità della raccolta	Semestrale
Requisiti	***Descrizione***
1. Codice identificativo	**D202_I_03**
2. Scenario della misurazione	Pazienti con recidiva precoce di fibrillazione atriale (FA) dopo cardioversione
3. Razionale/Finalità	Attraverso una maggiore selezione e ottimizzazione della terapia si vuole ridurre il numero di recidive precoci di fibrillazione atriale nei pazienti sottoposti a cardioversione elettrica (CVEL) in elezione.
4. Tipo di indicatore	Percentuale di pazienti con recidiva precoce di FA dopo cardioversione
5. Descrizione operativa del numeratore	Numero di pazienti con recidiva precoce di FA
6. Descrizione operativa del denominatore	Numero di pazienti che hanno eseguito una CVEL
7 Fonte dei dati del numeratore	Software di gestione reparto - Quore-
8. Fonte dei dati del denominatore	Software di gestione reparto - Quore-
9. Modalità di recupero dell'informazione	Dal software di reparto vengono desunti i dati relativi ai pazienti con fibrillazione atriale che vengono sottoposti a cardioversione in

	elezione.
10. Popolazione riferimento	Pazienti con fibrillazione atriale che hanno eseguito una cardioversione
11. Responsabile della raccolta	Dr.ssa
12. Periodicità della raccolta	Semestrale

Based on the research and data provided by Cremona hospital, it can be concluded that the study of customer satisfaction is very important. Thus, though customer satisfaction does not guarantee repurchase on the part of the customers but still it plays a very important part in ensuring customer loyalty and retention. Customer satisfaction is a direct determining factor in customer loyalty, which, in turn, is a central determinant of customer retention. Therefore, organizations should always strive to ensure that their customers are very satisfied.

Chapter 6 Evaluation of Origami Model

1. Origami and its strength

Through discovery of the Origami model in chapter 4, we describe the following points as the main focuses when we build up this model. Those features are the bases to design the whole model.

1. Structure
2. Organization
3. Flexibility
4. Completeness
5. Strategic
6. Decision making
7. Reporting
8. Responsiveness
9. Easy to use
10. Quick access to all level of organization
11. Traceability
12. Effectiveness
13. Efficiency

The integration is across through all relationships of all components of the model. The model also focuses optimizing the overall activities of the organization working together to create bundles better quality of products and service. It also point out the managing and coordinating the whole chain from all related activities to satisfy the end customers though the developing highly competitive organization and positive outcomes for the firm.

In the following table (table 6.1), those above strengths are considered with the case of each application and each strength helps organization recognizing the opportunity to improve their performance.

Table 6.1 Application of Origami model and its strength

Main features	Strength	How this strength is used	Application on Case study
Link every part of the organization links, every part of the organization not only the quality point of view and quality department.	Completeness	The strength of the model will help the organization to implement a new structure or improve existing system.	-Missing Organization -Missing Model -Missing structure -Better case -Quick analyze the current system - Discover the flaws(bugs) of the low performance - Can use to solve problem
Provide accuracy of the performance measurement	Accuracy and quick evaluation of performance	Accuracy , Quick evaluation	Provide the Dashboard Provide the Report on performance measurement
Combine all the different perspective of business environment	Completeness Quick access to Strategic decision	Provide a better services to its competitors for its own strategy	Improve customer satisfaction
Separate the physical organization into two logical entities: processes and organization	Centered Focus on Detail	Better understanding of detail of processes and entities inside the system.	Organization can focus on the processes , while they can boot up the
Consider processes is central of system which face directly to customers	Process as central component	Improve process efficiency and effectiveness	Identify bottlenecks, and understand how to improve it, they can distinguish and classify priority of processes such as critical processes and support processes
Consider the requirements and customer satisfaction on different perspective (perceived quality different from actual quality)	Different perspective of quality	Analyze in deeper details of how the customer satisfaction regarding to the quality	Measure the customer satisfaction in the correct way and in the efficient way
Provide all the aspects for measuring the total quality	Total quality measurement	Monitoring quality system	The organization can evaluate how the 'total system" is following a Quality Dimensions.

Give quickly access for organization to define strategic decision to increase the customer satisfaction and reduction of the cost optimization.	Accessibility	Decision based on the analysis of the matrixes	Strategic-decision making could be used and considered in all the levels of the organization based on the result of analysis.
Be easy for organization to integrate the six sigma methodology, easy combination and enhance existing tools of Six Sigma	Short time of deployment, Easiness		The organization can integrate or convert from existing system to a new system, much better in term of performance. With the combination of Six Sigma, will increase profit and reduce the cost. The deployment time is short and takes fewer resources.
Be able to quickly define the main factors to effect on customer satisfactions	responsiveness	understand customer needs so as to deliver a qualitative service that fit the requirements	The organization will quick find the solutions for understanding the customer‘s satisfaction. The will give the quick decision to response to customer needs.

2. What benefit and Value Added of the Origami Model?

ORIGAMI is a model for knowledge management and therefore also a tool for those who develop policies and other decision-makers. As ORIGAMI is designed and explained thoroughly in perspective of quality improvement. It comprises all aspects and elements of a complete system. Its purposes provide significant contribution on both areas:

Academic Research: provide a complete framework to quick access to understanding the organization.

Practical implementation: This model includes a systematic review of research on effectiveness and cost reduction. The system can be integrated with other knowledge including theories (Quality Perspective, strategy perspective).

The Origami performance excellence framework is results focused and presented in a systems theory approach that highlights such crucial issues as the:

- Importance of leadership.
- Need to consider all elements of an organization.
- Strategic importance of scanning and analyzing the business environment
- Value of creating focus on customers and employees.
- Need to use measures, indicators and organizational knowledge to identify and monitor key performance indicators
- Methods for approach and deployment of improvement action plans.

This perspective provides the basis for conducting a companywide self-assessment, establishing current and target performance measures, coordinating and implementing continual improvement and aiding benchmarking.

The Origami stresses on the core values for the quality are:

- Visionary leadership.
- Patient focused excellence.
- Organizational and personal learning.
- Valuing staff and partners.
- Agility.
- Focus on the future for long term development.
- Managing for innovation.
- Management by fact.
- Focus on results and value creation.
- Systems perspective.

In each of the above criteria, the organization can give very quick evaluation of their own performance against the criteria. On a larger scale, if organizations are reviewing entire categories for self assessment, the Origami model can also be used to document relative strengths and opportunities for improvement. Value Added Benefits Completing a self-assessment has obvious benefit, but there are also other advantages. The team based interactive process drives home the key pillars of award models and criteria such as:

- Understanding the holistic systems approach to organizations.
- Developing the ability to introduce and conduct self-assessments.
- Recognizing the importance of strategy and leadership to successful management.
- Focusing on internal and external customers.
- Identifying areas for improvement.
- Gathering key information and using it to direct the strategy.
- Creating consistent approaches and effective deployment strategies for specific impacts.
- Knowing the value and means of conducting ongoing and focused monitoring and measurement.
- Knowing the coordination of all organizational efforts.
- Recognizing the necessity of sharing information.

The analysis used in conjunction with the matrixes; help to establish a fit improvement strategy for the criteria to be addressed. The organization need to avoid duplication on linked criteria and maximize learning. Timelines, resources and milestones need to be identified. The resulting improvements or best practices can then be shared across the organization. By using these methods, the organization can sustain momentum beyond the initial self-assessment and ensure the targets are addressed and results incorporated into their strategy.

3. Origami and implementation impacts on an organization

ORIGAMI is a tool for critically evaluating, synthesizing and presenting knowledge. Origami presents a model that has the impact on the health system when an organization wants to

implement it on their system. It can contribute a significant impact through six levels as showing in the figure 6.1 when it deploys in an organization

1. Awareness: the corresponding stakeholder must know that the model is a prerequisite for influencing a decision-making in the organization; the model gives to the top managers a comprehensive understanding about Quality perspectives related to functional components of organization.
2. Acceptance. : In this level, the managers will use the model as the main framework to implement in their system useful in terms of validity, relevance and applicability and its findings acceptable.
3. Policy process: The model is applied into the system; they will impact on the main decision making on process of the system, which utilize the use of the model's strengths. The model philosophy gives will be the guideline development for the system.
4. Policy decision: the actual policy decision should be clearly influenced by the model's conclusions or recommendation.
5. Practice: the policy decision has to be implemented in practice, through clear and measurable changes in clinical practice.
6. Outcome: practice must change before it is possible to begin to measure the true impact of a model, for example in terms of quality or economic outcomes.

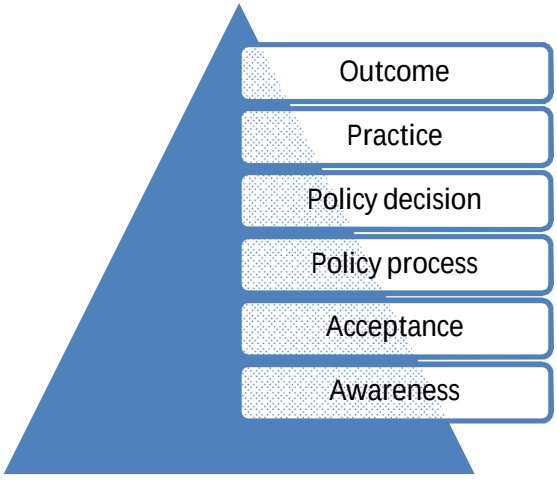


Figure 6.1 The impact of implementation Origami model for an organization

Levels 1 and 2 are very much related to the strategies based on understanding the model. The model will give a very quick overview on how related quality perspective will be affected by the resources, and also, the model relate to how it is used in policy-making.

In the levels 3 and 4, the top managers will make the decision and set up policies based on characteristics and strength of the model, so they will utilize the use of the model to get the higher performance of the organization.

Levels 5 and 6 address how the policy decisions and processes lead to better decisions and practices and whether this improves quality of outcomes. In this level we build on the knowledge value chain model and the impact assessment framework to address the following questions.

- Does the model deliver what it promises?
- What kind of decisions are, and should be, based on the model?
- How does the model deliver a better quality for organization?

4. The experience with combination between Origami with Six Sigma – A case study of Cremona hospital.

We understand that case study methodology is best when the objective is to build theory in preliminary phases of a research study or to add new perspectives to previous research. Part of this research can be considered as preliminary, because there is still little evidence on how the Six Sigma and Origami act jointly in management. The objective of the case study is not the statistical generalization, but the analytical one. This methodology tries to generalize from case to theory; it does not attempt to extrapolate facts from sample to population. However, a case study increases reliability and external validity of our model. Due to limitation of time, Cremona hospital is selected as main case, this hospital has adopted the implementation of Quality system for over 20 years and it also apply ISO standard for over 6 years. Through interviews lasted between 2 and 3.5 hours with the Quality Manager, we were tape recorded to assure that information was not later biased.

Firstly, we classified topics according to the degree of implementation of their quality system with criteria of the model. We identified how we can archive the best fit in high level of theory of the experience in implementing of Six Sigma. This classification was based on information about model dimensions such as customer orientation, work teams for continual improvement, consciousness about quality, quality planning, and so on. Quality manager of the hospital was asked about the perceived performance improvements as a result of combination between Origami and Six Sigma implementation. We also take interview with other three managers agreed that this combination will benefit the hospital in many ways. Then the authors asked them to position the improvements in a set of performance measurements, explaining why the Origami system had improved every measure. Measurements were obtained from a literature review that relates quality management and performance. The richness of the case study is that the manager is able to explain at the moment of completing the questionnaire the "why" of each rate and to add evidence to the question. They provided related information to identify the fitness between their current model and a new combination model.

According to these managers' perceptions, Origami will influence product quality, customer service, fast response, competitiveness, customer satisfaction, employee satisfaction and motivation, rate of defects for clinical operation. Regarding the patient claims, it is important to note that quality manager indicated that this point had not improved because customers today are more demanding than before. So, there is a room for improvement here, customer focus and improve quality as the strength of the Origami model. . Finance and innovations were not tested because of the particular characteristics of the companies interviewed. Financial measures were difficult to mark. Managers agreed that they would need more information to position themselves through implementation of Origami model, although they perceived that the market in general values the fact that the hospital has implemented a Six Sigma system and consequently, the Quality was improved.

After completing the questionnaire, we asked to indicate the elements of critical success for implementation of our model for company improvements. Following are their responses:

- "The most important aspect is that everybody in the company, including the cleaning service, the doorman, and the accountant, is conscious and worried about quality. Before, the only people interested in quality were the quality department staff.
- "Personnel motivation and participation. If you get this, then the complete system works."
- "First, the general belief of the importance of quality. Second, the decision to be real leaders. Managers and staff move together towards the same aim."
- "The doctors are not managers"
- " You need to spread out the concept of Quality to everyone"

According to these responses, the main dimensions of a "perfect system" for getting better results are employees' participation, motivation, and leadership which are "easy access" through components of Origami Mode. Finally, it is interesting to note that in the case of Quality Manager, "if the Origami model was implemented in the hospital, the effect to external customers(patients) will be very significant, due to very deep analysis of relationship among components for better customer satisfactions of the model".

The effect on both customer satisfaction and competitiveness was medium with the current model. It is worth explaining that when the quality manager also considered that certification could improve these variables, he always explained that "customer satisfaction" was derived from the accomplishment of a previous requirement from him: to attain certification (as explained in previous chapter). Some other managers pointed out that this satisfaction could be due to improvement in claims management. When ISO 9000 was first created, Cremona was a first certified hospital in Regione Lombardia which was a competitive advantage for them. Today this advantage has disappeared and it has become a requirement to compete in the market. The effect on customer service was also medium. In this sense, ISO 9000 certification has been useful to organize the claims management system. Each claim must be registered and evaluated. There must exist a procedure to solve claims.

Regarding the employees, they believe that combination of Origami and Six Sigma will bring a radically improvement on their productivity and their interest in quality problems. Improvement

in productivity is again explained by better procedures and work instructions. However, many managers have confessed that employee satisfaction worsened because of the bureaucracy of the system. The documentation needed to sustain the system increased their workload. The remaining variables are not considered to have any impact on results. Note that the financial measures were not influenced by the implementation of the standard.

When managers were asked about the main advantages and disadvantages of Origami model, they agreed that this model is helpful to organize the overall system through procedures and work instructions. The paperwork generated was identified as the most negative consequence. After asking if Origami was profitable and benefit to organization, the majority answered that "it had to be," pointing out that nowadays it needs such model for archive high performance system, better customer satisfaction. "If we have it, we could be better" they affirmed.

Again, it seems that the only positive aspect of the norm is the process management focus; but there are these results worthwhile enough to decide if the company should implement the Origami model with Six Sigma? Managers agree that there is still a long journey for conversion of current system to Six Sigma and back by Origami model. Everybody must be motivated and all departments integrated into the system, not only the production process. However, the most important revelation regarding this aspect was what was stated about the joint implementation of ISO and Origami. Managers declared that they implemented the registration mainly because it was compulsory in order to be in the market. Registration for them means only that a person goes into the plant and disturbs everybody. Their quality system is strong enough to ensure customers' product quality. They deliberately keep the ISO voluntary requirements to a minimum. Despite the fact that they have a more developed quality system, their ISO 9000 quality manuals are very "basic," they claimed to have "two parallel systems" in order to avoid the auditor from in Regione Lombardia authority exploring the normal running of their quality system and slowing down the whole system. One manager affirmed that auditors are not really prepared to understand how their quality system works; he said: "The auditor has had many problems trying to understand that we do not need any intermediate control."

Finally, as an interesting note, the quality manager would expect a new implementation of new version of the standard ISO with Origami model in near future. As explained before, managers try to establish minimal requirements in the quality manual to avoid what they believe as disturbances in their normal work. In his opinion, with strength coming from Origami model, they will try to apply Origami model in higher level of a quality system, is more demanding, and tries to incorporate some points more in line with their system. It would mean that, and the model would have to allow him or her to optimize many aspects of the clinical process. It could mean that the organization worked less and create better performance than before.

Chapter 7 Conclusions and Recommendations

This last chapter summarizes this research effort and offers several implementation models based on the research. We will begin with the summary of healthcare systems in EU countries, and then we will give the evaluation of the implementation of Six Sigma model on hospital systems based on the data and analysis presented in this research. . We also summarize the main characteristics of the new model created by the authors. We then continue with a discussion of factors that limit this research and recommendations for future research efforts.

Healthcare systems in EU countries

Through two first chapters, we study of healthcare systems in EU countries typically of three main types of system. Indeed, the differences from country to country are so great that the terms “national health care” or “universal coverage” can be misleading as if one collective model shows how other countries deal with health care and health insurance. Each country’s system is the product of its unique conditions, history, politics, and national character. Those systems range from the managed competition approach of the Netherlands and Switzerland to the more rigid single-payer systems of Great Britain, Italy and France, with many variations in between. In those countries implemented single-payer system, policies define prohibiting private insurance and even restricting the ability of patients of spending on healthcare. Some countries have eemployment- based systems which are required significant portion of costs through either high deductibles or high copayments from employees.

Even so, we also pointed out some experiences of countries tried to come over extremely long waiting lists for treatment. Dissatisfaction with current system seems to be universal and growing in most countries which needs to either require incremental change or completely rebuilt. We also see the growing trend in countries with national health care systems is to move away from centralized government control and introduce more market-oriented features.

Yet, those systems do have serious problems. In most cases, national health care systems have successfully expanded insurance coverage to the vast majority, if not quite all of the population. But they have not solved the universal and seemingly intractable problem of rising health care

costs. In many cases attempts to control costs through governmental fiat have led to problems with access to care, either delays in receiving care or out of right rationing.

Six Sigma in Healthcare field

Through next chapters, we started with many investigative questions in order to answer the research question: "How and why is healthcare implementation of Lean Six Sigma successful or unsuccessful?" and "How has Lean Six Sigma been deployed and implemented in specific healthcare organization?" This question looked at several issues relating to the implementation of Six Sigma. The first was the historical use of quality management methods and tools. The second issue was the impact that leadership has on implementation. It was determined that strong buy-in and engagement was a significant, if not the most important, factor leading to implementation success. The leader's role in fusing the business and strategy together into a single organization-wide strategy was also identified as important to success. The third issue was found that the use of competent and experienced consultants significantly contributes to an organization's success. The fourth issue was the organizational structure changes made as a result of implementing Six Sigma. It was found that new leadership positions were created along with a new organization focused on continuous improvement. The fifth issue was the description of the use of an implementation strategy to execute continuous improvement. It was found that most implementations were modeling driven and followed a timeline that used training milestones to determine their implementation progress.

We also found the answer to the investigative question: "What are barriers to Lean Six Sigma deployment and how are they overcome?" The deployment barriers identified by this research were:

- Resistance to change
- Lack of cohesive business strategy
- Fractured organizational culture
- Budget & time constraints
- Getting the "right" people
- Picking the "right" projects

These barriers were addressed by implementing the following barrier removal strategies:

- Demonstration of success
- CEO sponsorship of a cohesive business strategy
- Good selection criteria
- Continuing education
- Coaching and workshops for management

The fourth and final investigative question was: "How is Six Sigma implementation success defined in Cremona hospital?" The purpose of this investigative question was to determine how implementation success was measured in the private sector. It was found that the majority factors measured their Lean Six Sigma success by improvements in performance measurement systems or other business benefits usually financial in nature. This research also determined that certain unexpected results come as result of Six Sigma implementation. Those identified were cross- organizational exposure of personnel participating in projects. Also identified was an unexpected depth in the level of culture change throughout the organization. This effect was also defined by some as transformation.

The advantage Six Sigma brings with proven strategies allows Cremona hospital to build on prior successes, sharing information and knowledge to ensure all patients' safety and delivering a healthcare experience defined by excellence through following critical points:

- Top management should drive the implementation of six sigma to obtain greater performances
- Six sigma and balance score card could implement the performance of healthcare processes
- Innovation process is fast only if top management is committed to the project
- A good knowledge and know-how is necessary to understand the changes
- Reach a good level of quality doesn't mean introduce radical changes; it can be achieved also with improving the existing process and machineries
- Improving performance through better customer satisfaction

Since case study was the first healthcare organization in Lombrdia Regionale to adopt Six Sigma as an organization-wide approach to quality improvement, the organization serves as a pioneer who led the way for many others to follow. This case study also shows of continuing to move

forward to constantly improve the way work is accomplished. In the words of author Ben Sweetland, 'Success is a journey, not a destination.' continuing on this journey to perfect processes and services utilizing the most valuable asset, its people.

Implementation a new Model

The ORIGAMI Model would be an implementation strategy that centralizes the continuous improvement effort within each component. This model resembles the organization-wide implementation strategy that is a combination of components and brings an enhancement for fill the missing gaps of existing models in the view of Quality. This model help organization to define the strategy would integrate the continuous improvement program within on unit operation or among units.

The selection of this strategy would signify a serious commitment by the organizations Leadership and should help eliminate several of the barriers identified by this research.

This model specifically addresses the strategy development selection through the use of matrixes matching between the components of the model. This model would expose many processes and unique relationships of the functional areas. This exposure and the continuous improvement activities would contribute greatly to the individual's knowledge and understanding of complex issues. The model also identified that most used their continuous improve program as a vehicle for quality development.

Limitations

Although many limitations are inherent in case study research, three may have had some appreciable impact on this research. First was a lack of control over who within the hospital provided the answers to the interview guide. Although contact was made with the organization's quality leader, the researchers could not control how the data was gathered to answer the interview guide. It was indicated that most respondents consolidated responses from many internal sources; this fact cannot be verified. Second was the open-ended format of the interview guide. This open-ended provides the opportunity to solicit the widest range of responses but also allows for a greater chance of misinterpretation. Although this generally didn't have a great impact on the data, the risk was minimized by offering clarification if required by the respondent. If additional clarification was not requested none was provided.

Third was the level of implementation of Six Sigma and Quality Improvement program. The amount of time that the organization had been involved with implementing projects ranged from 6 months to two years.

So, during the time of implementation, there were some changes on administration or transfer positions, therefore, the final results of projects may perceive and evaluate in different ways.

An additional limitation of this research is that the researchers only focused on the identification of the implementation strategy, the deployment and implementation barriers and challenges, and how success was defined. Other issues or confounding variables maybe involved which the research was unable to identify through this research method.

Recommendations for Future Research

During the process of completing this research, we have identified many opportunities for further research that applies to continuous improvement and change management. A timely research effort could advance this research by identifying current continuous improvement within the new model developed by us and conducting analysis of their method, structure, and application, among other factors or the models. This research could employ the case study method and benchmarking to determine the value of the various programs. This research would result in a greater understanding of what continuous improvement efforts are currently in use and provide the foundation for the integration of Six Sigma with a new model.

Conduct additional case studies using anyone of the companies from this research to gain a further the understanding of their structure, change management issues, culture change issues, and management philosophies among other issues. This research could be conducted using a longitudinal-case study approach to explore deeper into the company to identify and develop key issues to a greater degree than this research did.

A study about implementation of Six Sigma improvement project in Cremona hospital could be conducted and documented to provide a descriptive account of the issues involved in executing a continuous improvement project. This research could further identify and explain the issues involved with deployment and implementation of a continuous improvement program for a new model with combined Six Sigma methodology. This research could also provide the foundation for further use and communication of the applicability of our model within all departments of

this hospital. An analysis of corporate cultures across the organization could be an interesting work in order to determine the most appropriate methods for implementing a centralized continuous improvement program across the entire activities of this hospital. This research could provide the foundation of future change management decision making and could contribute to Cremona's strategy concerning culture change.

Finally, for future work of population health challenges, we have remained as many questions as we have not answered yet. Yet, there exists an impressive body of knowledge that has or could be readily translated into effective interventions in the reality, and an urgency that demands greater action. We expect to have more study of health improvements which enable and empower a greater number of populations to be healthy, independent, and productive.

Bibliography

1. Jonathan Cohn, Sick: The Untold Story of America's Health Care Crisis—And the People Who Pay the Price (New York: HarperCollins, 2007), p. 226.

2. Mattke et al., "Health Care Quality Indicators Project."

3. Martine Bellanger, Veneta Cherilova, and Valerie Paris, "The Health Benefit Package in France," European Journal of Health Economics 6, suppl. 1 (2005): 24–29.

4. Simone Sandier et al., "France," in Health Care Systems in Transition, eds. Sarah Thomson and Elias Mossialos (Brussels: The European Observatory on Health Care Systems, 2004).

5. "French Health Care Is Badly Run," BBC News, August 8, 2006.

6. Manière et al., "Perspectives on the European Health Care Systems."

7. Mattke et al., "Health Care Quality Indicators Project."

8. Andrea Donatini et al., Health Care Systems in Transition: Italy (Copenhagen: European Observa- tory on Health Systems and Policies, 2001).

9. Franco Reviglio, "Health Care and Its Financing in Italy: Issues and Reform Options," IMF Working Paper 00-166, October 2000.

10. Depending on regions and election cycles. Copay- ments for prescription drugs are frequently intro- duced only to be repealed shortly before elections.

11. Callahan and Wasunna, Medicine and the Market: Equity v. Choice, p. 93.

12. Callahan and Wasunna, Medicine and the Market: Equity v. Choice, p. 97.

13. Donatini et al., Health Care Systems in Transition: Italy.

14. Reviglio, "Health Care and Its Financing in Italy".

15. Donatini et al., "Health Care Systems in Transition: Italy."

16. Mattke et al., "Health Care Quality Indicators Project."

17. David Greene and Benedict Irvine, "Health Care in France and Germany: Lessons for the UK" (London: Civitas, The Institute for the Study of Civil Society, 2001).

18. Ulla Schmidt, "Health Policy and Health Economics in Germany," Speech given at the con- ference, The American Model and Europe: Past- Present-Future, Washington, January 27, 2006.

19. Christian Gericke, Matthias Wismar, and Reinhard Busse, “Cost-Sharing in the German Health Care System,” Berlin University of Tech nology, 2004, http://www.ww.tu-berlin.de/diskusionspapiere/2004/dp04-2004.pdf.

20. Boris Augurzky, Thomas Bauer, and Sandra Schaffner, “Copayments in the German Health Care System: Does It Work?” Institute for the Study of Labor (IZA) Discussion Paper no. 2290 September 2006.

21. Civitas, “The Swiss Healthcare System,” (Lon- don: The Institute for the Study of Civil Society, 2002), http://www.civitas.org.uk/pdf/Switzerland. pdf.

22. Kyle James, “German Health Care Reform: Mission Impossible?” Deutsche Welle, March 8, 2006.

23.World Health Organization, “Highlights on Health, Germany, 2004, www.euro.who.int/eprise/ main/WHO/Progs?CHHDEU/system/200050311-1.

24. OECD, “OECD Health Data 2007: Statistics and Indicators for 30 Countries.”

25. For more on the concept of managed com- petition, see Enthoven, “The History and Principles of Managed Competition.”

26. Association of Swiss Health Insurance Com- panies and CIA World Factbook (Washington: Central Intelligence Agency).

27. Andreas Minder, Hans Schoenholzer, and Marianne Amiet, Health Care Systems in Transi tion: Switzerland (Copenhagen: European Obser vatory on Health Care Systems, 2000).

28. Uwe E. Reinhardt, “The Swiss Health System: Regulated Competition without Managed Care,” Journal of the American Medical Association 292, no. 10 (2004): 1227–31.

29. Hertzlinger and Parsa-Parsi, “Consumer- Driven Health Care: Lessons from Switzerland.”

30. Regina Hertzlinger and Ramin Parsa-Parsi, “Consumer-Driven Health Care: Lessons from Switzerland.” Journal of American Medical Associa- tion 292, no. 10 (2004).

31. See Reinhardt, Hussey, and Anderson, “U.S Health Care Spending in an International Context.”

32. “Swiss Voters Reject Health Insurance Changes,” Agence France Presse, March 11, 2007.

33. OECD, “Health at a Glance: OECD Indicators, 2005.”

34. Civitas, “The Swiss Healthcare System,” (Lon- don: The Institute for the Study of Civil Society, 2002), http://www.civitas.org.uk/pdf/Switzerland

35. Al-Assaf AF (1993). Outcome management and total quality. In Al-Assaf AF, Schmele J, eds. The textbook of total quality in healthcare. Delray Beach, Florida, St Lucie Press.

36. Nicholas, DD, Heiby JR, Theresa HA (1991). The quality assurance project: introducing quality improvement to primary health care in less developed countries. Quality assurance in health care.

37. Mara Migliazza. Six Sigma Improves Workflow in N-Medicine Department.

38. Bradley Schultz. Merging Six Sigma And The Balanced Scorecard

39.Powell, T. C. 1995. Total quality management as competitive advantage: A review and empirical study. Strategic Management Journal 16: 15-37.

40. Quazi, H. A., and S. R. Padibjo. 1998. A journey toward total quality management through ISO 9000 certification: A study on small and medium-sized enterprises in Singapore. International Journal of Quality and Reliability Management 15, no. 5: 489-508

41. . Quazi, H. A., C. Wing Hong, and C. Tuck Meng. 2002. Impact of ISO 9000 certification on quality management practices: A comparative study. Total Quality Management 13, no. 1: 53-67.

42. Rahman, S. 2001. A comparative study of TQM practice and organizational performance of SMEs with and without ISO 9000 certification. International Journal of Quality and Reliability Management 18, no. 1: 35-49.

43. Rao, S. S., T. S. Raghu-Natham, and L. E. Solis. 1997. Does ISO 9000 have an effect on quality management practices? An international empirical study. Total Quality Management 8, no. 6: 335-346.

44. Romano, P. 2000. ISO 9000: What is its impact on performance? Quality Management Journal 7, no. 3: 38-56.

45. Samson, D., and M. Terziovski. 1999. The relationship between total quality management practices and operational performance. Journal of Operations Management 17: 393-409.

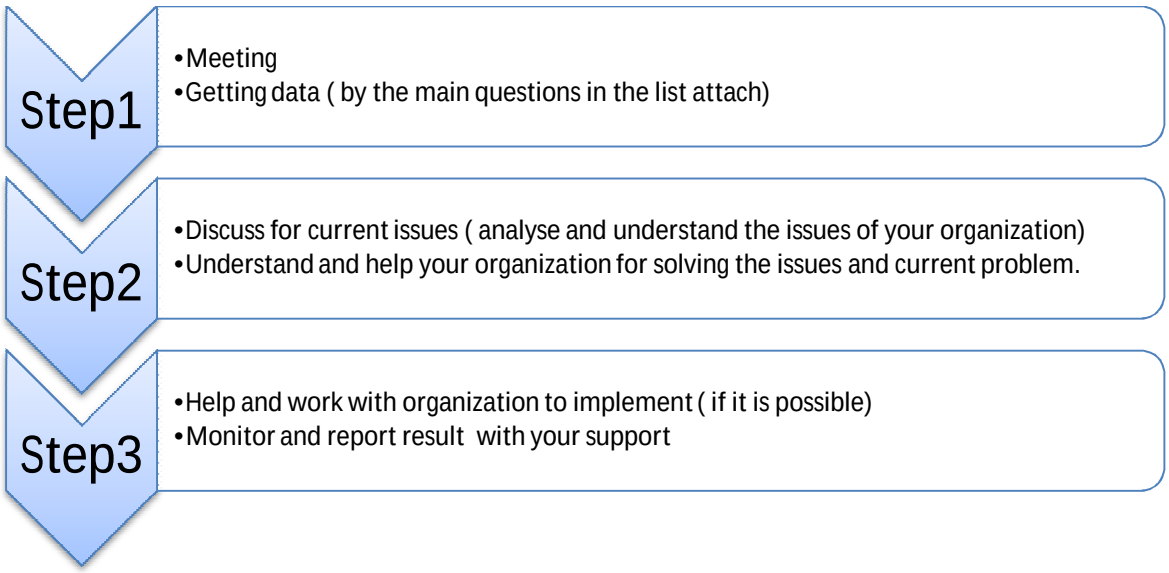
List of annexes

Annex 1 : Access to Healthcare Questionnaire

Introduzione

L'obiettivo di questa indagine è quello di esplorare quanto facile o difficile sia per l'accesso ai servizi sanitari in modo che possiamo lavorare con voi e gli operatori sanitari per migliorare i servizi. L'indagine contiene una serie di domande riguardanti il tuo tipo di assicurazione, il vostro livello di soddisfazione, l'accesso ai trattamenti e la lunghezza delle liste d'attesa.

For the purpose of study, we want to apply our knowledge in reality problem. We want to know some detail information about your current systems, how it work, how can we help your organization to improve the quality of the system. After the study, we will try to find solution for your improvement. The process can be like this way:



The following questions are prepared in order to give you an overview of content of meeting.

Domande

1. How do you control and monitor the quality system of hospital system? In the following list, there are many aspects of quality for hospital system. We would like to know, how would you manage these quality aspects?

- Safe: Care should be as safe for patients in healthcare facilities as in their homes.
- Effective: The science and evidence behind healthcare should be applied and serve as the standard in the delivery of care.
- Efficient: Care and service should be cost effective, and waste should be removed from the system.
- Timely: Patients should experience no waits or delays in receiving care and service.
- Patient centered: The system of care should revolve around the patient, respect patient preferences, and put the patient in control.
- Equitable: Unequal treatment should be a fact of the past; disparities in care should be eradicated.

2. How do you evaluate patient satisfaction?

   Through customer satisfaction, we want to know, how your organization to get and evaluate the feedback from patient satisfaction.
3. Which techniques are used for evaluation of customer satisfaction? (like chart, graph ,collecting data, process data…)
4. Which are main problems that you face daily?

We try to find out the issues of your organization, then based on these issues , we can give some suggestions and solution to solve issues, increase your quality level of your organization.

5. Which are the main problems for long term development?

For long term development, what do you think about issues in operation for increasing the patient satisfaction? Please, let us know

6. Which level of commitment of top management?
7. How the teams are organized for effective work?
8. How are flows of communication from Top to bottom and cross departments?
9. What are the main processes of the organization?
10. How do you manage and control those main processes?
11. How is general overview of your system? (we want to know the detail the current system, then we can find the solution to improve it)

12. What your opinion for our model?

13. How the model matches with current situation?

14. Have you applied Six sigma before?

We want to know your experience with implementation of Six sigma methodology in your organization or from your own experience. We provide comprehensive knowledge and work for this topic, so we want to know Six sigma in your knowledge. So, we can study and focus on your work with Six Sigma for better improvement.

15. How was opinion (Cons and pros) of Six sigma ?

(through your knowledge and experience about Six Sigma for improvement)

16. How long does it take to implement Six sigma? (if you implemented Six Sigma)