Using Failure Mode Effect Analysis (FMEA) to Improve Service Quality

Service Operations Management

Abstract

Service companies must be able to face the challenge to offer error-free services to their customers.
According to Service definition, the customer is always present during the processes and delivery of the service . If something goes wrong it will happen in the presence of the customer .
This article shows the use of FMEA as a prevention tool in the services offered by a Medical Clinic restaurant. A group of employees was trained in prevention tools, they designed the process map, identified the critical points and applied the FMEA method in order do prevent any failure during the services operation. The first results indicated that all the actions implemented were really effective in preventing errors.

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Introduction

Three features of the service delivery activity are critical to the quality perceived by the customer. (Parasuraman,1990)

- The intangibility: The service is usually subjectively perceived and the result is always related to the customer feelings
- The customer participation in the process: The customer presence in the service process introduces an element that is not controlled by the provider and still adds up the need for the customer satisfaction regarding the way the service is delivered.
- Production and consumption are a simultaneous process: There is no way to control the quality before the service is delivered.

Considering these features, the service company should try to develop an error-free process. Since a previous inspection of the service can not be performed and the corrective actions can only be taken after the error is detected and the customer is dissatisfied, the service company should use prevention tools in order to detect the critical points likely to give rise to failures in the process and proceed to the necessary changes in order to eliminate them. The motor vehicle industry has long been successfully using the FAILURE MODE EFFECT ANALYSIS (FMEA) to prevent the occurrence of defects in their processes and projects. QS9000 requires the use of FMEA as a mandatory step in the approval process of a new part.
This article shows the use of FMEA as a prevention tool in the services offered by a Medical Clinic restaurant.

Service Blueprinting

NORMANN (1993) states that the quality perceived by the customer is based on what he called “Moments of Truth”, that are the moments in which the customer gets in contact with any aspect of the service company. The evaluation of the service quality by the customer will be the total quality perceived in all moments of truth experienced all over the service delivery process.

The sequence of the moments of truth was called "Service Process Flow" (SPF) by SHOSTACK (1984, 1987) and was proposed as an engineering tool for the development of service systems.

See Figure 1

The elaboration of the SPF begins with the mapping of the Moments of Truth experienced by the customer. Then, the interactions between the customer and the contact personnel are identified, being recognized the activities of the latter. Successively, the activities of support, production and management staff are described.

After establishing which moments of truth are critical for the customers quality perception, it can be identified which activities within the company – or which activity sequence – play an essential role in the customer perception regarding the company performance.

Our proposal is to use the SPF to identify the key-points of the process and evaluate the failures that are likely to occur during its execution. These points will serve as the basis for the application of FMEA technique.

FMEA: A Prevention Tool

- Concept**:** Identify how the Service can fail in achieving the Intended Function (JURAM 1988)

    1. Identify the possible error causes and eliminate them
    2. Detect the failure impacts and reduce their effects

- It is a Method Designed to:

    1. Identify how a Process can fail in meeting the customer critical needs
    2. Estimate the risk of specific causes that lead to these failures
    3. Evaluate the current control plan for the PREVENTION of these failures
    4. Implement the procedures required to obtain an error-free process

In order to apply this technique to Services, we firstly defined the critical points involved, as described in the previous chapter.

The first objective of the technique is to assign, to each point analyzed, an RPN (Risk Priority Number), which prioritizes the necessary preventive action. The final objective is implementation of prioritized actions.

The RPN is calculated based on the existing information on the potential failure mode, the severity of the failure and the system capacity to detect the failures before the customer perceive them. For this, we evaluate each point, in terms of: (S) Severity, (O) Occurrence, (D) Detection and (R) Recuperation values and calculate the RPN as (S) x (O) x (D) x (R). These indices are scored in a "1 to 5 range", where 1 is the lowest value and 5 the highest.

(S) – Severity (of the effect) – Importance of the effect on the customer requirements – could also be associated to safety or other risks, in case the failure occurs.
Range: **1-** not severe, e.g., the customer either does not perceive the failure or becomes slightly irritated

5- very severe, e.g., customer in trouble or extremely irritated due to the adverse effect derived from the service.

(O) – Occurrence (cause) – frequency at which a certain cause occurs and generates a failure mode.
Range: **1**- Unlikely to occur
5 – Evident failure based on existing data

(D) – Detection: System capacity to detect the causes before the failure occurs, or capacity to detect the failure before the customer.
Range: **1** – Confidence to either find or prevent the failure before the customer perceives it
5 – The current controls will certainly not detect the failure.

(R) - Recuperation: Process capacity to correct the service before the customer perceives the failure, or as soon as the customer perceives it, in such a way that he/she agrees with the corrective action.
Range: **1** – There is a corrective process in place that was implemented before the customer perceives the failure.
5 –There is no service corrective process

There is no item (R) in the original FMEA process, but we decided to add it since it is possible that, when delivering the service, the own process corrects the failure as it occurs in the presence of the customer, minimizing its effect. There are cases in which the prompt corrective action pleases the customer and makes him/her more confident in relation to the service delivered.

Case Study

The study was conducted in a Slimming and Convalescence Medical Clinic (SPA) located near the city of São Paulo.

The clinic restaurants were selected for the study since in this type of treatment, the meals, and the way they are served are extremely critical for the success of the treatment and the customer satisfaction.

The clinic has three different areas to serve the meals and the patients are referred to a specific area according to his/her treatment.

In order to cover the meal service, as a whole, we organized three groups of FMEA, one for each area, with 8 participants.

Each group was trained in flowchart and FMEA techniques. Since leadership problems were detected among the groups at the beginning of the study, it was decided also to include a training in group dynamics.

Therefore, each group worked independently, being the final results analyzed to compare the diagnoses and the actions taken.

The Service Process Flow

The first part of the study performed by the groups was the elaboration of the SPF in the restaurants, based on the moments of truth experienced by the customer.

Two lines were identified: the Front Office, where the customer experiences the service, getting in contact either with the utensils, furniture and the meal itself, or with the restaurant staff, and

The Backroom, where the support activities for the Front Office were carried out.
Each group designed its own SPF, but after a joint analysis of it was decided to use the SPF described in Figure 2.

See Figure 2

FMEA Application

The groups investigated the potential failures for each moment of truth, identifying 15 possible errors. For this phase, besides the brainstorm technique, a suggestion reports filled by the customers were checked. Afterwards, the groups analyzed the scores S, O, D and R and calculated the RPN value, for each point, as shown in Table 4. Please note that for this study, we only used the six points that scored the highest RPN. (Table 3).

See Table 3

See Table 4

According to Table 4, it can be observed that the groups assigned different scores to the same failure. After analyzing and discussing this fact, we concluded that the difference in the scores can be attributed to two main reasons: First, one restaurant was far better than the other, and second, the participants of each group had different interpretations regarding the level of the customer perception. This point was exhaustively discussed since, when FMEA is used in products, the failure mode and effect are well defined. On the other hand, in the case of services, there is also the subjectivity in the form the attendants perceive what they are doing and how the customers are reacting.

Therefore, we used the mean and the range of the scores for each group, in order to detect a significant discrepancy among the groups. Table 5 shows the final result. It can be observed in the most subjective items, such as badly-set table or impolite employee, that there was a higher discrepancy in the scores for the different groups. The items “delay” and “cleaning” shows a more homogenous result.

See Table 5

Preventive Actions

Each group analyzed the potential failures and proposed preventive actions in the current process to either eliminate or minimize the possibility of failure occurrence.

A new RPN value is calculated assuming that the action is successfully taken.

We show some of the preventives actions proposed:

Failure 1 – BADLY-SET TABLES
Preventive actions: Establish a standard for a well-set table. Train the operators in the new standard. Implement a continuous control made by the manager, who should assign a final score for the item Well-set Table at the end of his/her turn.
RPN1 = 36

Failure 2 – IMPOLITE EMPLOYEE
Preventive actions: Train the employees regarding the relationship with the customers.
Maintain monthly interviews between the employees and the managers to evaluate the relationship with the customers and discuss the employee personal problems.
Develop a reward program.
RPN1 = 36

Failure 3 – TABLEWARE MISSING
Preventive actions: In the procedures on how to set a table, include the item tableware. Arrange for baskets with tableware in the restaurant so that the customers can take them, if necessary.
RPN1 = 12

Failure 4 – COLD MEAL
Preventive actions: Redefine the cooking times in the kitchen procedures.
Monitor the temperature meters in the waiting bowls, where the food is placed before being served. Reorganize the meal shift in order to avoid crowded places or long lines.
RPN-1 = 27

Failure 5 – CLEANING AND FOOD HYGIENE
Preventive actions: Take the Good Manufacturing Practices (GMP) criteria, as defined by the Ministry of Health, as a basis to implement the Quality System.
RPN1 - 36

Failure 6 – DELAY IN SERVING THE CUSTOMER
Preventive actions: Monitor the customers entrance flow to avoid lines in the restaurants.
Train the staff in order to guarantee a rapid, polite and efficient service.
RPN1-30

Results

During the group work, improvements in the services could be observed, since the employees were discussing their problems and were feeling distinguished for taking part in the program. The definition and alignment of the objectives, as well as the indices used had a rapid effect on the employees performance.

After the implementation of the preventive actions, the groups met in order to calculate the new indices and the RPN. The results indicated that all the actions implemented were really effective in prevents errors. The suggestion questionnaires that were filled in weekly by all customers were also analyzed.

Based on these data, the FMEA was revised and new actions were established in order to obtain the defect-free goal and that the customers are satisfied with service they have..

Bibliography

GRÖNROOS, C. Marketing, Gerenciamento e Serviços – A Competição por Serviços na Hora da Verdade, Rio de Janeiro, Ed. Campos, 1995.

JURAM, J. M. Juran's Quality Control Handbook, 4th ed. New York, MacGraw Hill, 1988.

ZEITHAML, V.A.; PARASURAMAN, A.; BERRY, L.L. Delivering Quality Service, New York, The Free Press, 1990.

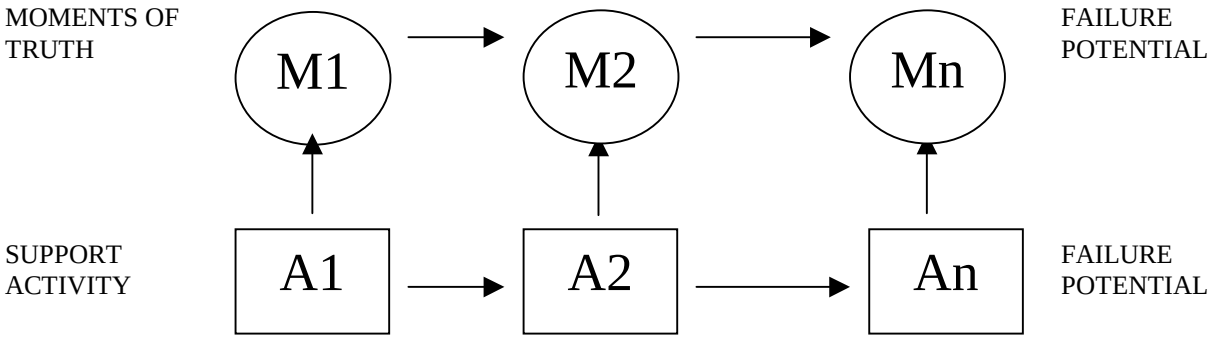

Figure 1 Service Blueprinting

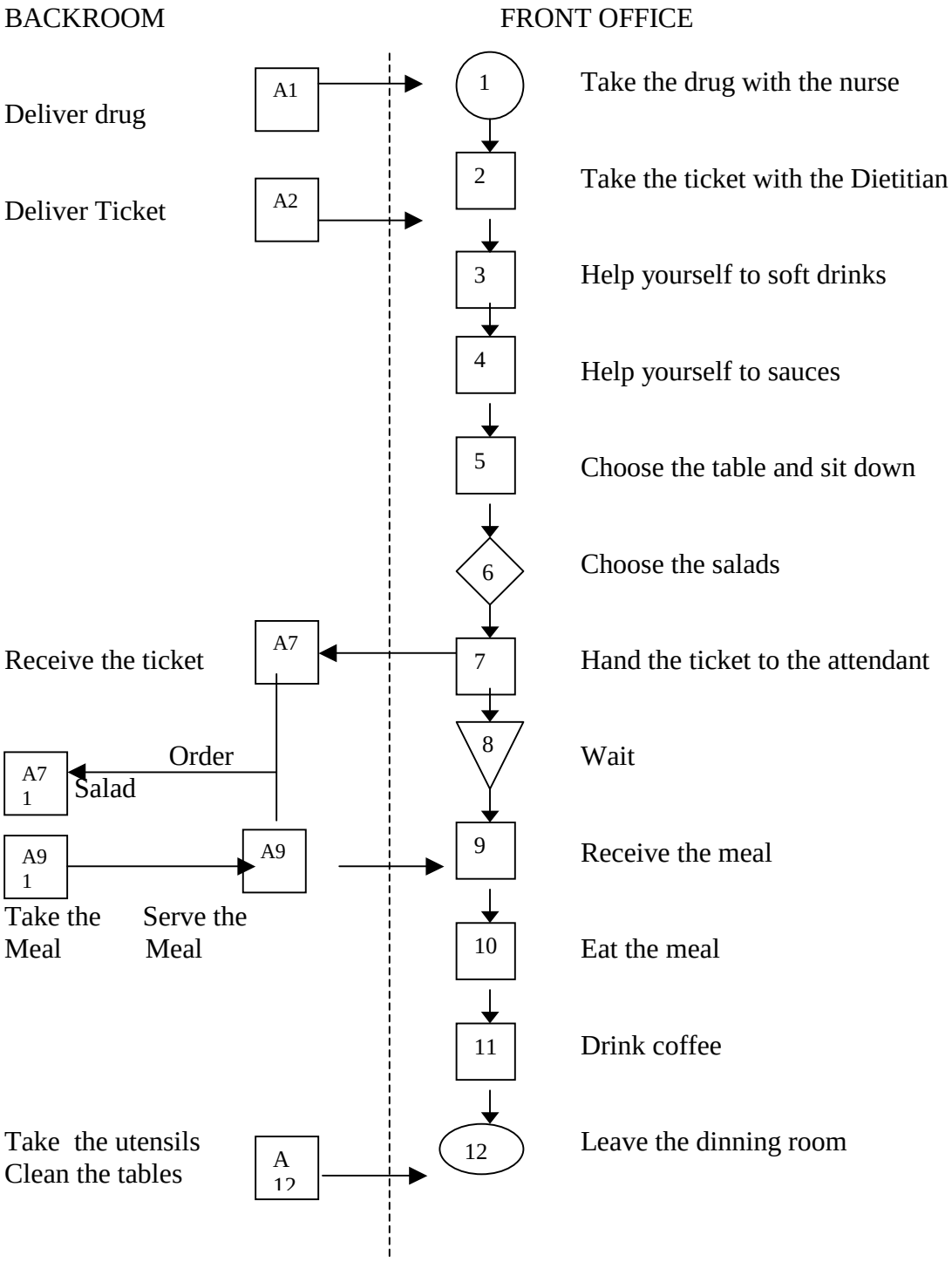

Figure 2 The Service Process Flow

		MOMENTS OF TRUTH
1	BADLY-SET TABLES	5
2	IMPOLITE EMPLOYEE	1 - 2 - 9
3	TABLEWARE MISSING	5
4	COLD MEAL	9 – 10
5	CLEANING AND FOOD HYGIENE	9 – 10
6	DELAY	8

Table 3 Potential Failures

	Group 1					**Group 2**					**Group 3**				
	O	S	D	R	RPN	O	S	D	R	RPN	O	S	D	R	RPN
1	5	3	2	5	150	1	3	1	2	6	2	3	2	3	36
2	5	3	3	5	225	2	3	2	4	48	1	2	3	2	12
3	3	2	3	4	72	4	3	2	3	72	3	3	2	3	54
4	5	3	1	3	54	1	2	1	3	6	3	3	2	5	90
5	3	5	1	4	60	2	5	2	2	40	2	4	2	3	48
6	4	4	2	3	96	5	2	2	3	60	4	3	2	3	72

Table 4 Reference values for the three groups

		RPNm	Range
1	BADLY-SET TABLES	64	144
2	IMPOLITE EMPLOYEE	95	213
3	TABLEWARE MISSING	66	18
4	COLD MEAL	50	84
5	CLEANING AND FOOD HYGIENE	49	24
6	DELAY	76	36

Table 5 Indices - Average and Range