



An Approach for Customer Satisfaction: Evaluation and Validation

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ABSTRACT

The main objective of this work is to develop a practical approach to improve customer satisfaction, which is generally regarded as the pillar of customer loyalty to the company. Today, customer satisfaction is a major challenge. In fact, listening to the customer, anticipating and properly managing his claims are stone keys and fundamental values for the enterprise. From a perspective of the quality of the product, skills, and mostly, the service provided to the customer, it is essential for organizations to differentiate themselves, especially in a more competitive world, in order to ensure a higher level of customer satisfaction. Ignoring or not taking into account customer satisfaction can have harmful consequences on both the economic performances and the organization's image. For that, it is crucial to develop new methods and have new approaches to THE PROBLEMATIC customer dissatisfaction, by improving the services quality provided to the customer. This work describes a simple and practical approach for modeling customer satisfaction for organizations in order to reduce the level of dissatisfaction; this approach respects the constraints of the organization and eliminates any action that can lead to loss of customers and degradation of the image of the organization. Finally the approach presented in this document is tested and evaluated.

Keywords: Approach, Evaluation, Quality, Satisfaction, Test of homogeneity, Validation.

1. INTRODUCTION

“Does the company have the most meaningful information at the right time to make the best possible business decisions?” is the question most companies want to answer. “*The purpose of a company is to create and keep a customer* (Levitt, 1960)”: through this declaration, the important phases of the life cycle of the customer management, which are acquiring customers and ensuring their loyalty are clearly identified. Companies are moving towards “customer oriented” management and focus on the life cycle of their customers. According to “Moisand 2002”, the life cycle of the customer is defined as the time interval between the moments for a customer to change its status from being a “new customer” to the status of a “lost/former customer”.



In a context of globalized and very competitive market, where the departments moved from a more classic level of management (cost centered) to a value centered approach, the mission of the decision-makers has evolved from proposing services and strategic partnerships to value creation. To achieve this goal it's necessary to have all the data to enlighten the past, to clarify the present in order to predict the future by avoiding to be confronted with gray areas (caused by lack of information). Business intelligence includes all IT solutions (methods, facilities and tools) used to pilot the company and help to make decisions.

This approach can be modeled by the three systems below:

1. Decision System: think, decide and control;
2. Effective System: transform and produce;
3. Information System: links the “Decision System” with the “Effective System”. Its main purposes are:
 - Generating information
 - Memorizing information
 - Broadcasting information
 - Processing information.

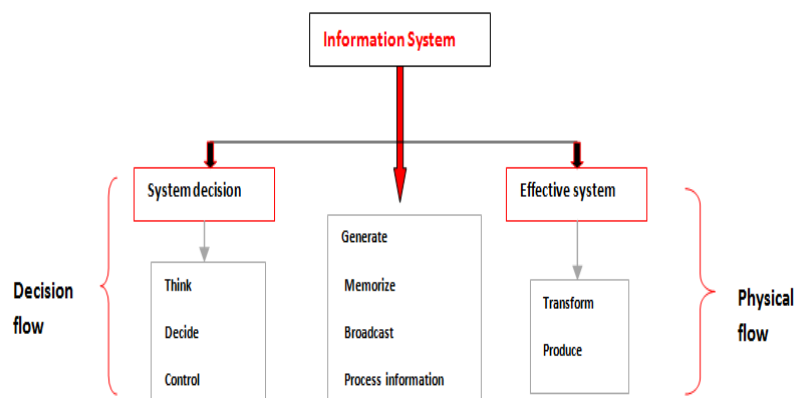


Figure 1. The information system

The information system is a subsystem of the organization that is responsible for collecting, storing, processing and Broadcasting informations in effective system and decision system. In effective system, the information is a current view of business data (invoice, purchase orders ...), in decision system, the information is more synthetic because it should allow decision making (The list of 3 products less sold in January 2014). So the information system links these two subsystems and must bring to all organizational actors of the company, the information they need to act and



decide. So IS is a representation of reality, it leads to coordinate the activities of the company.

This work is situated in this spirit, it consist to give a contribution to maximize customer satisfaction of the company, meaning to propose an approach that eliminates any form of loss of customer inside an organization, then, to evaluate and validate the approach. Finally, to test the homogeneity of the problem in order to measure customer satisfaction to conduct corrective actions based on two dimensions of quality:

- **The "made" quality Q_r :** the product, process or service are conform to what are defined as expected? It is composed of the different evaluation to judge the achievement of target processes, to measure the effects and check if the desired results were achieved.
- **The "perceived" quality Q_p :** what level of satisfaction generated from the customer? It is defined by excellence of the product (Zeithaml, 1988).

The ultimate goal is to have $Q_r = Q_p$

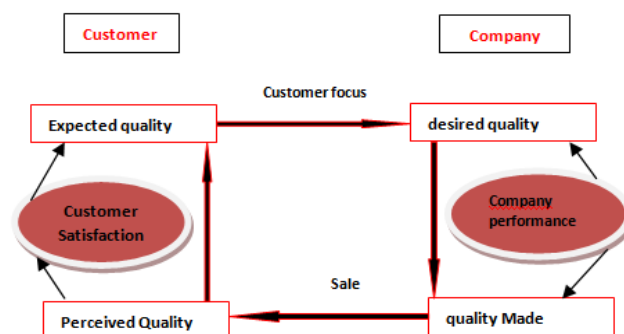


Figure 2. Company's qualities

The introduction has defined the conceptual framework of the work. It presented the issue addressed and contributions in the domain of company's governance. The following is composed of 3 sections:

In the 2nd paragraph, we expose the approach and then the latter is statistically evaluated from concrete examples. In the 3rd paragraph, we test the homogeneity of the problem. The conclusion shows the outline of this study and our contribution. It also shows the various extensions and possible future works.



2. PROPOSED APPROACH

Standish Group (Valery, 2001) did a study which was conducted internationally and evaluated the success and failure of IT projects. Accumulated data over the past ten years are based on a sample of 50,000 projects. This study has identified three levels of evaluation of a project:

- **The success of project** : it is characterized by a system delivered in hours and on time, for a cost within budget and fully compliant to the specifications;
- **The failure of project** : it is characterized by the cessation of the project ;
- Finally, **the partial success or partial failure of a project**: it is characterized by the late delivery of a system partially responsive, especially in terms of business scope, the specifications and a cost of up to 200% of the original budget.

Only 29% of projects were successful, 53% partial success or half failure and 18% failed. The proportion of abandoned projects outside the budget or out of time reaches 71%.

2.1 Statement

This study shows that the customer satisfaction is not always reached, perceived quality tend towards a desired quality presents a real challenge. Within the company, quality is increasingly focused on customer satisfaction. To win contracts, business leaders rely more on quality than price advantages. Staff involvement, with listening to the customer, is a key element for the success of a quality approach. The latter is the implementation of all the resources available to an establishment to provide a service that meets the needs and expectations of customers. From the customer perspective, a warm welcome and quality service is "normal", it is lack of quality which is penalizing to him.

To attract the customer, we must establish standards within the company by identifying the market need. There are international standards that ensure safe products and services, reliable and with high quality. These standards are called ISO Standards. For companies, there are strategic tools for lowering costs, increasing productivity and reducing waste and errors. For companies, getting a certification is the preferred way of knowing the quality of their organization to their customers and their suppliers.

2.2 Steps of the approach

Below the 7 best practices for customer satisfaction:



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- a) **To develop team's skills:** do additional training on IT tools to mount the team's skills.
- b) **To make customer satisfaction a challenge for all the company:** the company can use the dissatisfaction of their customers to improve our products and services. Bill Gates, Microsoft CEO, said that "the unhappy customers are the best sources of information." Because customers who express dissatisfaction enable companies to identify and resolve defects services faster.

Dissatisfied customers are very expensive for companies, the cost of recruiting a new customer is usually five times higher than the cost of acquired customer retention. It is far better to work to keep its customers than to recruit new ones to replace those who leave. So, according to Jacques-Antoine Granjon, founder of Vente-privee.com, the treatment of customer dissatisfaction should not only be considered as a cost but as an investment.

- c) **To motivate teams:** to mark clearly the importance of customer satisfaction, some companies have introduced a variable part in pay for some employees, calculated on the basis of indicators related to customer satisfaction.
- d) **To facilitate contacts customers:** there are 5 types of communications channels:
 - ➔ Telephone: Availability (24/24 7/7), Saving time ;
 - ➔ Face to face : Immediate Response, Human Contact ;
 - ➔ E-mail : Traceability (written proof) ;
 - ➔ Website: simplicity ;
 - ➔ Postal mail.
- e) **To anticipate the dissatisfaction :** Whatever the quality of claims processing, it may be better to move this claim and make a gesture to customers who had a bad experience product - or where this risk exists - without waiting for them to occur.
- f) **To measure customer satisfaction** (evaluate to improve): today it is essential to regularly assess the level of achievement of the final goal of customer satisfaction. For example by sending to all customers who have experienced dissatisfaction after the close of the case, a satisfaction survey designed by the customer service and measuring the accessibility of the service, reception, understanding and treatment of dissatisfaction,



- g) **To reach out to customers on the Internet** : The benefit may also be provided on the Internet by another customer, a social network (Twitter, Facebook ...), Make social media a true extension of customer service, with employees able to participate in discussions and respond directly to customer requests on these media.

3. EVALUATION AND VALIDATION OF THE APPROACH

Consider the case of a service company that manages the work of many potential customers as "France Gas". the latter signed a contract with the host company specifying the clauses that must be respected and among the latter is the rate of customer satisfaction which should reach 92% and this percentage is established post-agreement between two parties, and if that percentage is not met, a penalty will be done due to customer dissatisfaction. A development team of the host company supports the realization of applications for "France Gas". This team should produce 22 applications monthly with the dissatisfaction rate should not exceed 8% (2 applications per month). The cause of client dissatisfaction is due to the following:

- ➔ Application does not answer the need or generate unexpected errors after delivery
- ➔ Timeout

To avoid these situations, companies have an interest in implementing continuous improvement process which ultimate goal is the elimination of all forms of waste, such as customer dissatisfaction. The problem to be solved is, for P_n period, to maximize the number of satisfied customers. To evaluate the approach we will need to test it in a sample for evaluation and validation.

We start by making our Statistical hypothesis (H_0 and H_1).

- ➔ The first - the null hypothesis or H_0 . note: $H_0 : "Q_r=Q_p"$.
 Q_r : the proportion of customer satisfaction desired
 Q_p : the real percentages of satisfaction.
- ➔ The second, the alternative hypothesis $H_1 : "Q_p < Q_r"$

3.1 Before the approach



3.1.1 Example1: April 2013

The team was unable to process only 10 simple applications. The customer sent feedback to present his degree of satisfaction. There are 3 kind of response: NS (Not Satisfied, S: Satisfied, N: Neutral)

Table 1. Customer's feedback of April 2013

	APPLICATIONS	CUSTOMER SATISFACTION (S, NS, N)	REASONS OF DISSATISFACTION
1	PipRep 2.0 FR	NS	timeout
2	Contextor 2.8 FR	NS	timeout
3	Contextor 2,2,3	S	-----
4	Hermes Horizon	S	-----
5	Agent SSR 2011	Ns	Application does not work correctly
6	Plugin SSR 2011	Ns	Application does not work correctly
7	Agent Altiris 2011	S	
8	GECO 1.17.3 FR	Ns	timeout
9	Nexthink collector	S	-----
10	Cosmocom 4 FR 1.0	S	-----

Once the feedback is received, we proceed to calculate the percentage of the monthly satisfaction as shown in the following table:

Table 2. Satisfaction rates of April 2013

Satisfaction type	Customer Satisfaction	Satisfaction rates
S (satisfied)	5	50%
NS (unsatisfied)	4	40%
N (neutral)	1	10%

This table above can be modeled by the following figure:



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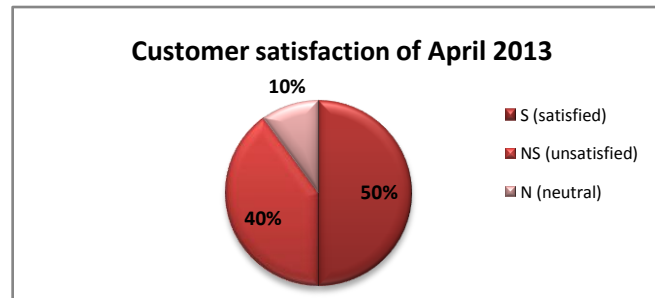


Figure3. Customer satisfaction of April 2013

$$P_s(t_0) = P(X_{t_0} = S) = 0.5$$

$$P_{NS}(t_0) = P(X_{t_0} = NS) = 0.4$$

$$P_N(t_0) = P(X_{t_0} = N) = 0.1$$

As $Q_r = 92\%$ and the hypothesis $H_0 = "Q_r = Q_p"$ and $H_1 = "Q_r < Q_p"$. We use here one-tailed left test.

If $\frac{Q_p - Q_r}{\sqrt{\frac{Q_r(1-Q_r)}{n}}} > -t'$ so we accept the hypothesis H_0 and we reject H_1 with error risk $\alpha = 5\%$

“t” is calculated using the table of the normal distribution:

$P(-t_\alpha \leq T \leq t_\alpha) = 1 - \alpha = 0.95 \Rightarrow t_\alpha = 1.645$ using the table of normal distribution and $t_\alpha = 1.833$ using the table of Student distribution.

We have $Q_r = 92\%$ and from the example $f = 50\%$

$$\frac{f - Q_r}{\sqrt{\frac{Q_r(1-Q_r)}{n}}} = \frac{0.5 - 0.92}{\sqrt{\frac{0.92(1-0.92)}{10}}} = \frac{-0.42}{0.0857} = -4.9 < -1.645$$

So we accept the hypothesis $H_1 = "Q_p < Q_r"$ and we reject $H_0 = "Q_r = Q_p"$ with error risk $\alpha = 5\%$. And the observed difference is significant.

3.2 After the approach

3.2.1 Example2: December2013

The team treated 22 applications as shown the following figure:

**Table 3. Customer's feedback of December 2013**

	APPLICATIONS	SATISFACTION (S, NS, N)	REASONS OF DISSATISFACTION
1	MSC_CASP69	NS	timeout
2	MSC_MDX	NS	timeout
3	Woodmac	S	-----
4	Whoswho	s	-----
5	Adobe Air Installer	s	-----
6	WinZip	s	-----
7	MSC_SetupDemdet	s	-----
8	Jabber	s	-----
9	TrendMicro_Office	s	-----
10	ORG+	s	-----
11	QlikView	s	-----
12	Q4- Engica	N	
13	TMS	N	
14	MSCLink_Core	s	-----
15	MIPS	s	-----
16	Rscientprint	NS	Application does not work correctly
17	TextPad	s	-----
18	MSC_DMx	s	-----
19	MSC_MSCOMCT2	NS	timeout
20	Add-in Excel	S	-----
21	Pre-req Excel	S	-----
22	Ios	S	-----

We proceed to calculate the percentage of the monthly satisfaction as shown in the following table:

Table 4. Satisfaction rates of December 2013

Satisfaction type	Customer Satisfaction	Satisfaction rates
S (satisfied)	16	72.72%



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NS (unsatisfied)	4	18.18%
N (neutral)	2	9.09%

This table above can be modeled by the following figure:

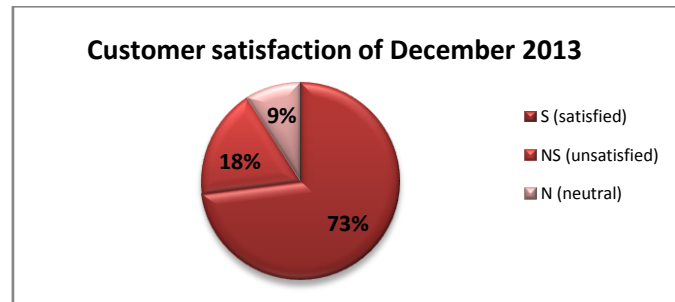


Figure4. Customer satisfaction of December 2013

$$P_s(t_0) = P(X_{t_0} = S) = 0.727$$

$$P_{NS}(t_0) = P(X_{t_0} = NS) = 0.181$$

$$P_N(t_0) = P(X_{t_0} = N) = 0.091$$

We have $Q_r = 92\%$ and from the example $f = 72\%$

$$\frac{f - P_0}{\sqrt{\frac{P_0(1-P_0)}{n}}} = \frac{0.72 - 0.92}{\sqrt{\frac{0.92(1-0.92)}{22}}} = \frac{-0.2}{0.182} = -1.09 > -1.645$$

And with Student law we have $t_\alpha = 1.721$, so this is also verified.

So we accept the hypothesis $H_0 = "Q_r = Q_p"$ and we reject $H_1 = "Q_p < Q_r"$ with error risk $\alpha = 5\%$. The difference between P and P_0 observed is due to sampling fluctuations.

3.2.2 Example 3: January 2014

The team treated 21 applications as shown the following table:

Table 5. Customer's feedback of January 2014

	Applications	Satisfaction (S, NS, N)	REASONS OF DISSATISFACTION
1	Windows6.1-KB2574819	S	-----
2	MigrationAssistantTool	NS	The installation must be silent



3	See Electrical Viewer 4	S	-----
4	Adobe_Flash_Player	s	-----
5	MSC_DEPOT	s	-----
6	Colibri 2.0	s	-----
7	Navision	s	-----
8	OFFICE 2013	s	-----
9	Windows6.1-KB2592687	s	-----
10	CheckPoint VPN	s	-----
11	Interlink_MSCLink	s	-----
12	CrystalReportsRuntime	N	
13	InterlinkComponentOne	s	-----
14	MSXML	s	-----
15	VisualC++Redistributable	s	-----
16	ReportViewer_2010	NS	Application does not work correctly
17	.Net_Framework	s	-----
18	MSCLink_Core	s	-----
19	MSCLink_Configuration	NS	timeout
20	LDOC	S	-----
21	MigrationAssistantTool	S	-----

We proceed to calculate the percentage of the monthly satisfaction as shown in the following table:

Table 6. Satisfaction rates of January 2014

Satisfaction type	Customer Satisfaction	Satisfaction rates
S (satisfied)	17	80.95%
NS (unsatisfied)	3	14.28%
N (neutral)	1	4.76%

The table above can be modeled by the following figure:



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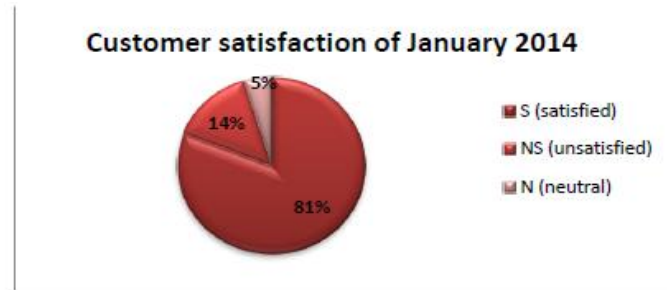


Figure 5. Customer satisfaction of January 2014

$$P_s(t_0) = P(X_{t_0} = S) = 0.81$$

$$P_{NS}(t_0) = P(X_{t_0} = NS) = 0.14$$

$$P_N(t_0) = P(X_{t_0} = N) = 0.05$$

We have $Q_r = 92\%$ and from the example $f = 80\%$

$$\frac{f - P_0}{\sqrt{\frac{P_0(1-P_0)}{n}}} = \frac{0.8 - 0.92}{\sqrt{\frac{0.92(1-0.92)}{21}}} = \frac{-0.12}{0.187} = -0.64 > -1.645$$

And with Student law we have $t_\alpha = 1.721$, so this is also verified.

So we accept the hypothesis $H_0 = "Q_r = Q_p"$ and we reject $H_1 = "Q_p < Q_r"$ with error risk $\alpha = 5\%$. The difference between P and P_0 observed is due to sampling fluctuations.

4. TEST OF HOMOGENEITY

We are faced with two samples which are most often not known whether they are from the same source population. It is sought to test whether these samples have the same characteristic ℓ . Two values is observed ℓ_1 and ℓ_2 , the difference between these two values may be due either to sampling fluctuations or the difference of the characteristics of the two original populations. That is to say, from the examination of two samples of size n_1 and n_2 , are respectively extracts of populations $P_1 (M_1; \alpha_1)$ and $P_2 (M_2; \alpha_2)$, these tests are used to decide between:

$H_0 = \langle \ell_1 = \ell_2 \rangle$: (we conclude the homogeneity)

$H_1 = \langle \ell_1 \neq \ell_2 \rangle$: (we conclude the heterogeneity).

In our case we test the homogeneity of 2 proportions:

f_1 = proportion of units having the calculated character X in sample 1;

f_2 = proportion of units having the calculated character X in sample 2;

p_1 = proportion of units having the character X in the population ;



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p_2 = proportion of units having the character X in the population .

$H_0 = \langle P_1 = P_2 = P \rangle$ and $H_1 = \langle P_1 \neq P_2 \rangle$

P is replaced by the estimator $f = \frac{n_1 f_1 + n_2 f_2}{n_1 + n_2} = \frac{22 \cdot 0.72 + 21 \cdot 0.81}{22 + 21} = 0.764$

$$\Rightarrow x = \frac{0.81 - 0.72}{\sqrt{0.764 \cdot 0.24 \left(\frac{1}{22} + \frac{1}{21} \right)}} = 0.02 > -1.645$$

So we conclude the homogeneity of the proposed solution. The proposed population is homogeneous and the difference observed is more significant and is due to sampling fluctuations.

4. CONCLUSIONS

The work done is to develop a practical and pragmatic approach to maximize customer satisfaction in an organization for a given period. Therefore, an approach has been proposed, evaluation and validation of the latter are described above. This work opens the way to our sense towards diverse perspectives of research which are situated on two plans: a plan of deepening of the realized research and a plan of extension of the domain of research. In terms of deepening of the proposed work, it would be interesting at first to use the Markov chain to model statistically the proposed model and to propose or develop practical tools for implementation of the proposed approach. As for extension of the domain of the research, it would be interesting to connect this approach to governance of information systems and to drive decision-making system which consist to investigate the options and compare them to choose an action that help in making decision.

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