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CUSTOMER SATISFACTION SURVEYS: A SIMPLIFIED METHOD TO CREATE A LEVERAGE INDEX USING QUALITATIVE DATA

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Abstract – When analyzing customer satisfaction data it is very often requested for the metrologist to provide a leverage index in order to identify which attribute of the product or service (predictor) needs to be improved to increase the satisfaction level (dependant variable).

This is usually done by the means of a questionnaire with many items each covering an attribute and performing a quantitative analysis using partial least square, Theil's index or neural networks.

In practice it is observed that long questionnaires give very few responses (5-10%). Shorter questionnaires are poor in information but increase drastically the response rate (20 to 40%) and more interestingly the customer comments are quite systematic (up to 90% of opened questions are documented).

Facing such behavior leads to the question of creating a leverage index out of qualitative data.

This paper will present a method to categorize the verbatim in such a way that a numeric contribution of product or service attributes can be measured.

Keywords: qualitative, survey, leverage index, customer satisfaction.

1. CUSTOMER SATISFACTION SURVEY AND SOFT METROLOGY

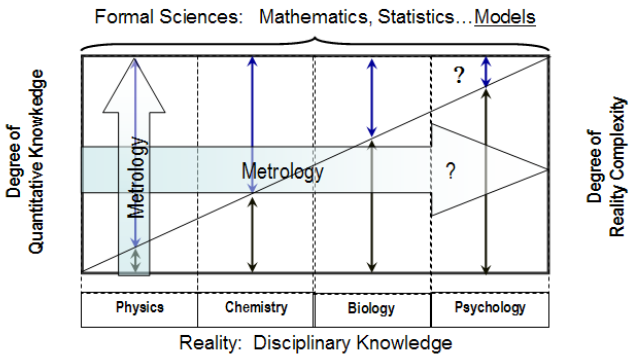

Figure 1. The span of measurement science.

To position the customer satisfaction metrology within measurement science it is possible to use the graph of figure 1 proposed by Salvador Echeverria-Villagomez [1]. This schematic is segmenting the measurement discipline into physics, chemistry, biology and psychology, associated with both degree of complexity and level of knowledge. We think that psychology can be expanded to human science in general.

The European initiative to fund research for this field of knowledge (NEST-New Emerging Sciences and Technologies) has provided a more precise definition of the mesurande: "measurement mediated by human perception". The author has recently provided an inventory of this research area which is well matching the NEST definition [2].

As the graph is showing, the degree of knowledge is decreasing as a function of complexity. If a standards laboratory, within industry, is able to perform a frequency measurement in the range of 10^{-12}, a biology laboratory can estimate the quantity of sugar in blood within the range of few percent.

For measurement related to human sciences we have very few examples of full uncertainty budgets associated with the result. Only human perception, which allows a comparison with physical sensors, is able to take into account all the contributors to the uncertainty budget [3].

For other domains, the current practice is to take into account the sampling uncertainty and to quantify the residuals associated with the analysis [4].

2. INTRODUCTION - THE MEASUREMENT OF CUSTOMER SATISFACTION – RESEARCH MODELS

In a volatile market place, the measurement of customer satisfaction and expectations is a key differentiator for modern companies.

This is enforced by quality standards such as ISO 9001-2008, as an auditable requirement of paragraph 7.6 (Control of monitoring and measurement devices) [5] as well as for ISO 17025-2005 4.7.2 (Service to the customer) [6]. This kind of measurement is now, de facto, an integral part of metrology, usually identified as dimensionless or "soft" metrology.

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While the measurement of satisfaction at work was mainly studied by psychologists as a discipline of human sciences [7], research on customer satisfaction was conducted by marketing and business schools. With the following sequence of models design

- SCSB - Sweden Customer satisfaction barometer – 1989
- ACSI – American Customer Satisfaction Index – 1994
- DK – Deutsche Kunder barometer – 1995
- KCSI – Korean Customer Satisfaction Index – 1998
- SWICS – Swiss Customer Satisfaction Index – 1998
- European Customer Satisfaction Index – 2000
- European Satisfaction Index System - 2004

This measurement is based on the response to a questionnaire.

Since 1993 the components of customer satisfaction were, defined, models were built and the questionnaire standardized.

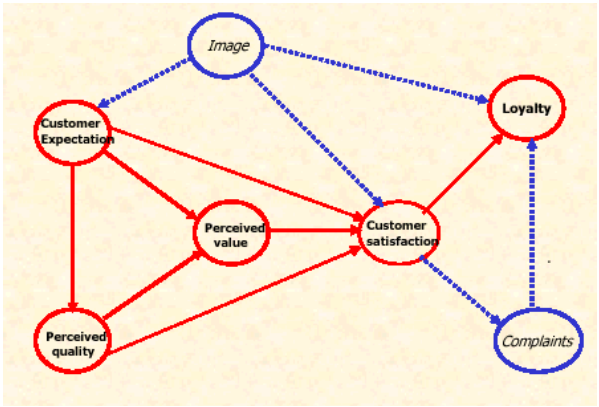

Fig. 2. The European Customer Satisfaction Index. The full model is in doted and solid lines, the reduced model in solid lines.

The center of the model is the customer satisfaction index influenced by 4 to 6 components (customer expectation, perceived quality, perceived value, customer complaints and customer loyalty). A split between product and service was added in the most recent European model. Each statistical cluster is evaluated using specific questions and the linkages between the branches of the model are calculated using a partial least square algorithm. This model has a specific pattern for each market.

This allows a company, mainly interested by customer loyalty, to identify what is influencing customer retention, what is the position of the company within a population of competitors (European customer satisfaction index system) [8].

Assuming the variation is linear it is also possible to use the R^2 to transform the PLS coefficients into percentage of contribution and to perform simulations.

3. A DIFFERENT MESUREMENT METHOD IS USED BY MOST COMPANIES

However the models given by research is replaced in most companies by a locally developed questionnaire. The advantage of this approach is to customize the questions according to the product and service specific attributes, to identify critical success factors and to correct weaknesses.

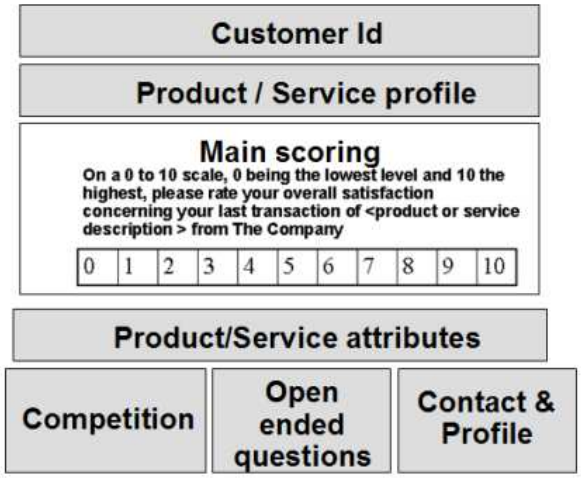

Fig. 3. The typical structure of a customized satisfaction survey as an alternative to the research model.

The example in figure 3 shows the structure of a survey allowing to gather the global level of satisfaction, the satisfaction related to each attribute of the product or service, completed by several open ended questions and some additional data allowing to stratify the results.

4. THE LEVERAGE INDEX AS APPLIED TO NUMERICAL DATA

The leverage index is a way to identify the contribution of a product/service attribute (predictor) to the overall customer satisfaction (dependant variable).

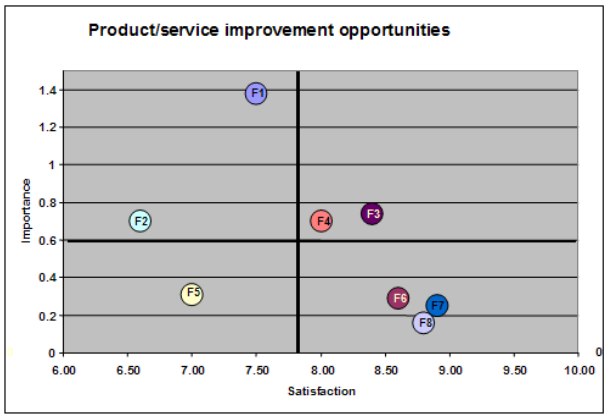

Fig. 4. The typical structure of a customized satisfaction survey as an alternative to the research model.

The abscissa is providing the satisfaction level for each attribute and the ordinate gives a value called the leverage index.

Items having a strong contribution and a low satisfaction score (F1-F2) are priorities for corrective actions and considers as “levers” to increase customer satisfaction.

This index is either represented by an absolute number or a percentage. It is calculated using 3 kinds of statistical techniques:

- Partial Least Square [9]
- Theil's index [10]
- Neural networks [11]

There is no technical limitation in the number of parameters these tools are able to handle. 10 to 20 attributes are sometime requested to identify all the processes and features participating to the customer perception.

However the real limitation is coming from the will of the customer to participate to the survey. With long questionnaires administrated by Internet the return ratio can be lower than 10%. Shorter questionnaires are increasing the participation (up to 40%) but decreasing the information.

It is also observed in this situation that open ended questions are quite always documented with short questionnaire.

Therefore, this raises the question to extract most of the information from the customer comments and to convert this corpus into a numeric representation able to work like a leverage index.

5. CONTENT ANALYSIS AND WORDING CONVERSION

The customer verbatim is usually coded using categories and sub categories associated with the steps of the product life cycle (from design to disposal). This approach does not capture very well all "transversal" categories such as price, delay, information errors etc.. It does not assign a clear ownership to a low score. This is the reason why we have selected the segmentation by processes for this project. Several decades of quality systems audits and improvement have made available very detailed process mapping, easy to associate to a customer comment.

Another important information is the "polarity" associated to the category. A comment can be positive, negative or expressed as a recommendation for improvement (it will be transformed into a negative comment if nothing improves over time). For example, a comment like "Your booking process is very efficient" will be coded [(+) Booking Process]; "Your booking process is confusing" will result into a [(-) Booking Process]; "I am satisfied with your service but your booking process should be more reactive" will generate a [(R) Booking Process].

The number of items integrated within the category "other" allows to evaluate the quality of the segmentation. Over 10% it requires a further breakdown.

Another important element is to identify how many categories can be associated to a customer verbatim. After several years of practices we found that 2 categories per corpus is a good compromise for our population of customers (mainly engineers). When two comments are provided we did not take into account the order of presentation and assumed the 2 categories have the same weight.

6. SCALING THE CATEGORIES TO IDENTIFY AND SIZE THE MAIN CONTRIBUTORS

After several approaches the decision was made to perform a relative analysis according to the customer objective which was 8.3 (over the European Business to Consumer average of 7.8).

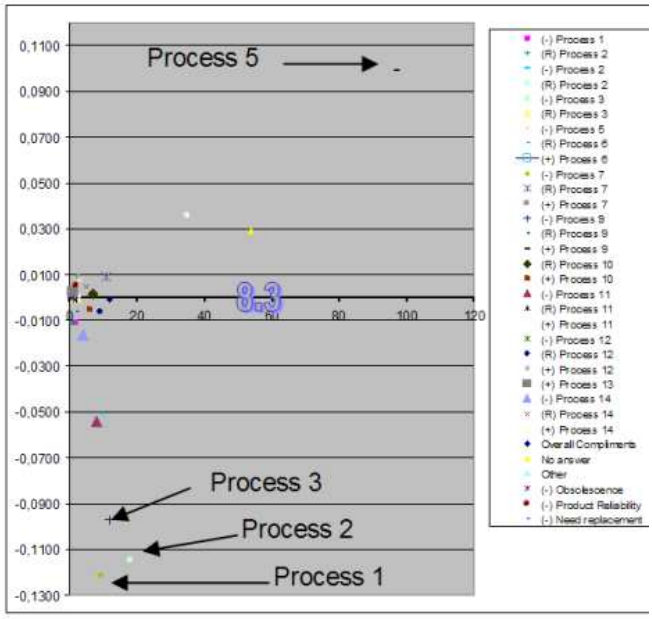

Fig. 5. A first mapping giving the distance to the objective for each wording category and the number of contribution.

A first data mapping uses the cumulated distance to the objective (8.3) for each sub process (ordinate). In this example we have reported the number of customers in abscissa.

Figure 5 is allowing to draw several conclusions:

- a majority of processes have no contribution to the increase or decrease of customer satisfaction.
- Processes 1, 2 and 3, even if rarely mentioned by customers have a strong negative impact on the overall results.
- Process 5 is a positive contributor to the satisfaction, however even if mentioned by 100 customers the gap equals only + 0.1.

In other words the graph gives a similar type of information for qualitative data than the leverage index for numerical data. The operational conclusion is that the company should fix processes 1, 2 and 3 and monitor process 5.

We have tested this method over several quarters and got consistent results.

Another interesting consideration is the setting of customer satisfaction objectives. The graph tells that the company objective can move from 8.3 to 8.4 but there is no margin for further improvement when processes 1, 2 and 3 are fixed. The customer comments are illustrating this situation when they tell that process 5 is optimum. Their needs are fulfilled and they are not ready to invest more for improvement in this area.

7. UNCERTAINTY CONTRIBUTORS

As told before, the overall measurement uncertainty is hard to calculate but we can give some possible contributors

- the sampling size is usually the main contributor and was defined by specific standards [12]; however the calculation relies on a normal distribution; in our case we are collecting surveys from all Europe; Nordic or German cultures are showing U shape distributions (satisfaction driven by the fulfilment of a written commitment).
- The reliability of categorization; the accuracy of categorization can be assessed using the Reuters collection (Reuters-21578); however this set of references does not apply to our technical work environment, so we can only rely on a general estimate of 80% match between different coders.
- The variation between culture for scoring of satisfaction; the question "what is a good satisfaction score" was asked to representatives of 16 different countries; the result is showing below the large span of evaluation..

Group	Country	"Good" score value	Delta versus global	Scoring system
1	1	9,4	+ 0,83	Much more generous
	2	9,1	+ 0,53	
	3	8,9	+ 0,33	
	4	8,7	+ 0,17	
2	5	8,7	+ 0,14	More generous
	6	8,7	+ 0,14	
	7	8,7	+ 0,10	
	8	8,7	+ 0,09	
3	9	8,6	- 0,01	Equivalent
	10	8,6	- 0,02	
	11	8,6	- 0,02	
	12	8,5	- 0,05	
4	13	8,4	- 0,22	Much less generous
	14	8,3	- 0,23	
	15	8,1	- 0,48	
	16	7,9	- 0,67	

Fig. 6. Scoring level according to culture.

To get an accurate uncertainty measurements a more narrow study has to be conducted with a more homogenous population.

8. CONCLUSION

This method allows extracting pertinent information out of customer satisfaction surveys in the very frequent case where customers are accepting to give their opinion only if the survey is very short. The lack of numerical data can be compensated by a more accurate exploitation of the qualitative information. It is also possible to discover contributor to the customer satisfaction never anticipated by the designer of the survey.

The reliability of the categorization and the possible automation of such extraction process are topic requesting further investigation.

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