Claes Cassel

# Measuring Customer Satisfaction, a methodological guidance

## 0. Background and objectives of the study

This report is a continuation of the "State-of-the Art Project " regarding planning and carrying out Customer/User Satisfaction Surveys in NSI:s. (LEG on Quality Recommendation No. 7). The object of this study is to develop some methodological guidelines for carrying out and analyzing customer satisfaction surveys. In this report we discuss questions related to customer/user identification and segmentation, response rates, questionnaire design and analysis of customer satisfaction data. Many of the questions discussed are common to other surveys as well and are not restricted to satisfaction surveys only. When discussing scales and questionnaire design we will confine ourselves to the case when the analysis is to be done using structural equation models.

## 1. Customer/user identification, segmentation and questions about response rates

In line with standard procedures in survey sampling the objects under study have to be defined as well as the target populations, the frames containing the targets and the domains of study.

### 1.1. Customer/user identification

To get an idea of how to define a customer let us consider the following scenario of the process of how a potential customer will get in contact with a statistical agency. Let us suppose that the potential customer seeks information about some question that he/she has. This would probably mean that he/she will try to find the information primarily on the agency's web site, that is, to look in databases that are accessible on the site provided that he/she can use the internet. If not or if he/she does not find the information he/she will try to get in contact by phone or by mail/email. This contact will mostly be directed to the information office of the agency where somebody will either provide the information or direct him/her to someone that will provide the information if it exists. If the information does not exist as such and if the potential customer is keen enough it will have to be created. In that case the potential customer will give the agency an assignment to create the information needed. If so there would probably be a meeting between the potential customer and some staff of the agency. Some times the agency could decide to provide this information for free because of a desire to create good will, but more often the potential customer will have to pay some amount of money for the work that the agency has to do to create the information. In this process we distinguish several ways of possible contacts:

The **first contact** will probably be through the web. This may include a lot of different kinds of potential customers for example the public, people who don't intend to carry out any investigation and have no intention of giving any assignment to the agency. But in the initial phase it may include potential paying customers like researchers, media, commissions, companies as well.

The **second contact** is likely to be through telephone and/or mail/email. People who find what they need in this step are not likely to proceed to the next step, at least not for this specific case (though it may generate assignments later). If the need for information is not satisfied in the first or second step the potential customer will proceed.

The **third step** is a meeting or discussion over the phone with the staff of the agency. This may or may not result in an assignment to the agency to find or create the information needed. If so the potential customer has become a customer. Usually the customer is supposed to pay for the information. This means that he/she has to have means for financing. Mostly this would not apply to persons in general but to companies, media, governmental institutions or researchers.

Generally speaking the reason for trying to get information from the agency could be

1. For sheer interest
2. For finding facts for articles
3. For finding data for research
4. For finding data for investigations
5. For finding data for planning purposes

Broadly speaking the corresponding target groups could be

1. The public
2. The media
3. Researchers
4. People working in institutions
5. People working in companies or institutions

In general terms the meaning of the word **customer** is associated with a client that pays for some service provided by the agency. Using this definition we find that mostly the customers of an agency are people working in media, research, official institutions including commissions and companies. These people have given an assignment to the agency and are willing to pay for the service. That means that it would be possible for the agency to maintain a register of the customers and include for example information about the frequency of the contacts, that is the number of times that the customer has bought services from the agency, information about the size of the company, information about whether it is deemed as an important customer or not.

On the other hand a **user** would be a person that uses information from the agency. It is a very broad concept that includes all persons that will contact the

agency either by phone or mail/email or uses the internet. Generally it will not be possible to keep a register of the all the users. For those that contact the agency through the agencies information center it would indeed be possible but since some users will contact people working in the agency directly and not through the information center the register would suffer from unknown under coverage, that is, the register would not be complete. For those who use the web to seek information it would be possible to register the address although it might be unethical or forbidden according to some national rules for protection of privacy.

The table below summarizes the connections between the different types of (potential) customers and the ways for contacts.

| **Contacts** | **Webb** | **Phone** | **Mail/Email** | **Visit** |
|---|---|---|---|---|
| **Target groups** | | | | |
| **Public** | yes | yes | yes | not likely |
| **Media** | yes | yes | yes | possibly |
| **Researchers** | yes | yes | yes | possibly |
| **Institutions** | yes | yes | yes | yes |
| **Companies** | yes | yes | yes | yes |

## 1.2. Segmentation and questions of nonresponse

We may distinguish between surveys that are used mainly for monitoring purposes, that is to follow up the opinions of clients and surveys that are done with the purpose to provide information for improving the satisfaction of the clients with the agency's services. In the second case one might be inclined to use a detailed questionnaire about different aspects of the services because the more detailed the information is the more useful it is likely to be for improving the service. Also, it will be more useful if the data can be disaggregated into a low organizational level to provide information for different working groups and not as a whole for the entire organization. On the other hand if the purpose is monitoring it could be enough to collect aggregated data for the organization as such. Of course, it is also possible to mix the modes, that is, to collect detailed information on a disaggregated level and aggregate it to the entire organization. However, cost considerations might point to the direction to use fairly simple and cheap questionnaires for continuously monitoring the overall quality of the output of the agency while the more detailed and expensive analysis could be carried out on a less frequent basis.

The types of surveys one might consider could be

- Surveys on the web
- Surveys as follow ups when delivering requested assignments
- Surveys from registers

**Surveys on the web** could typically consist of some questionnaire that pops up when someone has entered the agency's website. The questionnaire would not

likely be detailed but fairly simple and focus on questions dealing with the appearance of the site. This could be suitable for continuously monitoring the opinions of the visitors to the site. Some features of this type of survey are worth considering, for example

- The target population would be the visitors to the site. From the table above we see that this population consists of the public, the media, researchers, people from institutions and companies. Unless questions are asked about it there would be no way to distinguish between the contacts so presumably the responses will be taken as representative for the public. However there seems to be reason to believe that it is not entirely representative for the public since the other categories would probably be overrepresented.
- There will probably be several answers from the same individual. This means that if the person answers to the questionnaire every time he/she visits the site it will be automatically be weighted according the frequency of the visits. If he /she does not answer every time the frequency is unknown.
- The non response rate would typically be unknown.
- This type of survey is cheap, fast and can generate data continuously.

**Surveys as follow ups when delivering requested results of assignments** have some features in common with the web surveys i.e.

- It is fairly simple and cheap.
- It allows continuously monitoring of the quality.

Besides the above mentioned points it has some features different from web surveys,

- It allows a detailed questionnaire
- The non response can be calculated
- There would be no problem with connecting the respondent with a specific level of the organization since that would be known at the agency.
- There would be no problem with registers or definition of the user/customer because by definition the target population consists of all clients who receive the questionnaire. Of course, keeping track of the customers will occasionally create a register of customers. There would be no under coverage but some over coverage unless the register is updated regularly.
- This type of survey would be suitable for a census type of survey since typically all customers would receive a questionnaire. Of course it would be possible to select a systematic sample say each tenth of the customers. This could be done by the agency's information center provided that they could keep track of the results sent to the customers.

The third type of survey consists of selection **clients from a register** of clients. This is most in line with a traditional sampling survey. It requires a good and up-to-date register of the target population of users/customers. From this

register a probability sample of units can be selected, questionnaires distributed collected and analyzed in a traditional fashion. It has the following features:

- It allows a detailed questionnaire.
- The nonresponse can be calculated and to some extent controlled using follow ups.
- The target groups would typically be units that would be considered to be important for some reason. This includes the media, the researchers, the institutions and companies. There would be no reason to aim at full coverage of the target groups but only the part of the groups that are considered to be important. It could include paying customers and users that are not paying customers. There would only be minor coverage problems since by definition all units in the register would be important units.

Some drawbacks are listed below

- The major drawback is that it is rather expensive.
- The creation of a register might be troublesome for example if different departments in the agency are encouraged to list their most important customers/users it might be the case that a so defined customer is a customer of several departments. This could raise a problem to find out which department should be the target for the questionnaire.
- If the units are companies or institutions there could be a problem to decide which person should be addressed as the person that should be the respondent.

## 1.3. Some examples of existing customer surveys

**Sweden**
Statistics Sweden carries out three separate surveys,

1. To the public once a year. A sample of individuals is drawn from the register of total population. Questions about branding/image of Statistics Sweden are put. The nonresponse is about 50 %.
2. To paying customers in connection with the delivery of results. The questions deal with how the users perceive the quality of the results. The nonresponse is 55-60 %.
3. To the most important users once a year with questions about how they perceive the quality of the products. The non response is about 40 %.

**Italy**
Istat has a tradition in conducting surveys on its users, even if they are not implemented on a regular basis. The most recent one – in October 2004 – was comprehensive and focused on their latest experience in searching for statistical information (as opposed to “satisfaction” in general). The survey was submitted on the website (through a pop-up), by sending e-mails to users who had communicated their address and were willing to cooperate (this included registered users to the website or to specialised data warehouses) and by submission of the questionnaire to users contacting (in person, by email o by phone) our data shops and libraries. Valid responses were 4.500: about 30%

answering the web form, 56% answering our email (with a response rate of 7%) and the rest reacting to the direct contact.

With reference to a search (the current or the most recent one), 2/3 were motivated by work and 25% by study. As to typologies, 29% were looking for regionally detailed data, 20% for indexes, 17% for time series, 10% for thematic data bases. Close to 50% of users declared they were going to include the data in their own elaborations, rather than for consultation or documentation. In 45 cases out of 100, respondents declared to be “faithful” users, having requested and obtained data from Istat at least 6 times during the last 12 months.

As to their profile, users are mostly people in working age (85% of respondents), males (65%) and with tertiary education (61%). Students (14% of the respondents), however, are the main users of the libraries.

As to the evaluation of their experience in looking for data, 72% declare that their search was satisfied and 87% of them state that it was not hard to find what they were looking for. 10% of those who were not satisfied, admit they were searching for data Istat is not producing.

Other examples can be found in the previous report Annex 1.

# 2. Analysis of data

## 2.1. Analysis Using Structural Equation Modeling (SEM)

### 2.1.1. Introduction

Using structural equation modeling amounts to defining a structure where the overall satisfaction is seen as a function of the satisfaction with different components that are considered to be relevant for explaining the overall satisfaction. To fix the ideas consider the case where the customers overall satisfaction with the output from a statistical bureau depends on how the customer perceive the quality of different aspects like for example timeliness, competence of the staff, costs, service mindedness of the staff, quality of results, accessibility of data and so on. What components should be relevant for explaining the overall satisfaction are typically determined through interaction between representatives of the agency and some customers for example using focus groups. The components are then further divided into a number of areas each of which representing an aspect of the component. The aspects should be easy to recognize in reality. It should also be easy for the customer to give a rating of the perceived quality for that aspect. A probability sample of customers is requested to respond to a questionnaire. The questions relate to the aspects of the components The respondent is supposed to enter their rating of the satisfaction with the aspect under study. Typically a ten point scale is used. The rating ten denotes that the customer is completely satisfied and the rating one means that the customer is not at all satisfied . The responses are analyzed using structural equation modeling with latent variables where the latents are the components. From the analysis the components that have the largest impacts on the overall satisfaction can be found. Thus it is possible to find what components should have first priority for improvement. The analysis provides an efficient method for improvement of the customer satisfaction.

### 2.1.2. The concept of satisfaction

Satisfaction is a somewhat vague concept. A customer can be more or less satisfied with the quality of a service. Satisfaction should be seen as a continuous variable rating from not satisfied at all to completely satisfied. To measure satisfaction scales with fixed endpoints are often used. The lowest point on the scale represents the situation when a customer is not satisfied at all and the highest point the situation when a customer is completely satisfied. A value in between represents the degree of satisfaction perceived by the customer. Because of the fact that it can be difficult to obtain an exact agreement between the customers opinion and the numerical value stated using a limited scale it seems feasible to allow for a small approximation error. Thus the idea of latent variables seems to be appropriate in this context.

### 2.1.3. Measuring a diffuse concept, latent variables, manifest variables

In psychometrics, sociology, econometrics and other sciences one often tries to measure concepts that are not explicitly measurable. Some examples are concepts like “attitude”, ”motivation”, “satisfaction with services”, “satisfaction with processes” and so on. Concepts like “sex”, “age”, “weight” and so on can be measured directly. Concepts that are not directly measurable are called **latent variables** in statistical analysis whereas variables that can be directly measured are called **manifest variables**.

The common theory for measuring diffuse concepts (latent variables) means that in order to measure a latent variable there should exist a number of manifest variables that can be measured directly. Taken together the manifest variables will give meaning to the latent variable and build the contents of the latent variable. Each manifest variable will refer to one specific aspect of the latent. This means that the latent variables are indirectly observed through the manifest variables. Each manifest variable will contribute to the contents of the latent variable according to a weighting system that is calculated through the algorithm used for calculating. The theory for observing latent variables assumes that there exists a basic “true” value. This value can be estimated with the help of manifest variables. The estimate of the true value by a manifest variable is disturbed by a random error. The situation can be illustrated using an analogy: Suppose that a doctor is trying to decide whether a person suffers from psychological disease or not. Mostly it is very difficult to decide by direct observation if the patient suffers from the disease. The doctor has to ask about a number of symptoms. One symptom would usually not be enough to establish with absolute certainty that the patient is ill. If, on the other hand a number of symptoms point in the same direction the doctor will be convinced.

Measuring a latent variable using manifest variables works in a similar way. The more manifests that are used for defining a latent variable, the more accurate the measurement of the latent will be. The accuracy of the manifest variables can be assessed using the so called **reliability** measure**.** The reliability of the manifest variable tells about the precision of this manifest variable as a measure of the latent variable. The higher reliability the more precise the manifest variable is as an estimate of the latent variable, that is the more likely the manifest is to be close to the latent variable.

### 2.1.4. Scales

Satisfaction is best measured on a continuous scale. Customers can be more or less satisfied. But for obvious reasons we cannot use an unlimited scale. We have to compromise. The scale should be such that it allows the customer enough flexibility to express his opinion and yet be limited.

In studies using this methodology a ten point scale is often used with the endpoints fixed at 10 representing the case when the customer is completely satisfied and 0 the case when the customer is not at all satisfied. There is no

midpoint in this scale so the customer has to make a choice. Other scales can of course be used.

### 2.1.5. Questionnaire design

Experience shows that a relatively small questionnaire is enough. The number of questions is dependent on the number of components that are deemed to be relevant for explaining the overall satisfaction. Often around 10 components will be enough for this.

To each component at least 3 questions should be attached. The questions are the manifest variables. These should be formulated in such a way that they relate to aspects of the components that are easy to recognize in reality. Overall the questionnaire will contain some 30-40 questions about the customer's satisfaction with different aspects of the service. There should also be some background variables that will make it possible to do a more detailed analysis regarding segmentation. Below we show some examples of possible formulations of questions.

**Figure A. Example of manifest variables (questions) regarding the latent variables, (factor/component) *Treatment***

**TREATMENT**

| **How satisfied are you with…** | **Not satisfied at all** 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | **Completely satisfied** 10 | **Not applicable** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| - how courteous the staff at Stats XX is to you? | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| - how the staff is listening to you? | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| - how helpful the staff is to you? | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| - how the staff respects you as a customer? | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| *The treatment from Stats XX as a whole?* | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

### 2.1.6. Structures of latent variables

When measuring satisfaction it is often feasible to create structures of latent variables. This enables analysis that can answer questions like for example:

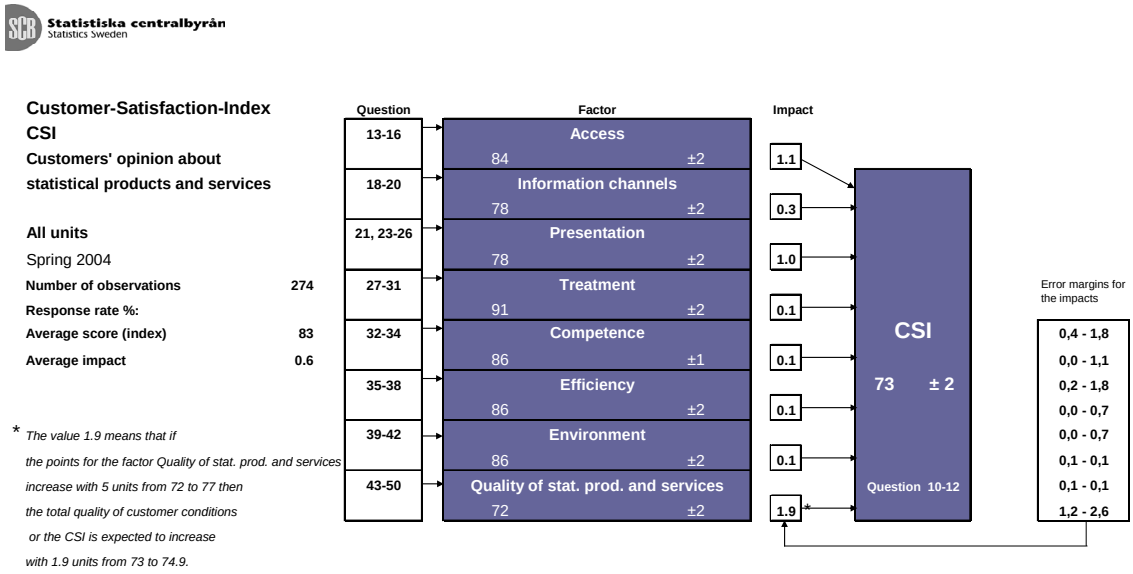
- How satisfied are the customers overall?
- How satisfied are the customers with different aspects like the treatment, the accessibility, the competence of the staff and so on?
- If the aim is to make changes in the organization for increasing the overall customer satisfaction what components should be prioritized in order to get the most out of the efforts?

The idea is to create a structure of components that can explain why the customers are satisfied or not. So for example if the customers think that the competence of the staff is very high and satisfying this will have an impact on the overall satisfaction and perhaps explain part of the customer perceived overall quality of the products. On the other hand if the customers would be

dissatisfied with the accessibility of databases in the bureau this could be an explanation of low customer satisfaction**. Thus it is important not only to create a structure that can be used for measuring overall customer satisfaction but also to use a method that makes it possible to calculate the impacts of the different components on the overall satisfaction.** Only then can efficient procedures for improving the organization be employed.

It is of course essential to know which components have a large impact on the customer satisfaction. Below is an example of a structure for explaining customer satisfaction is shown. It emanates from an actual study of customer satisfaction for a national statistical office.

**Figure B. Model: Customer–Satisfaction–Index: Customers' opinion about statistical products and services**




The overall satisfaction is abbreviated CSI (Customer Satisfaction Index). The structure used assumes that the overall satisfaction can be explained by the factors (components) Access, Information Channels, Presentation, Treatment, Competence, Efficiency, Environment, and Quality of statistical products and services. These concepts that are the latent variables, will become meaningful only when the contents are defined through the manifest variables that is the questions. The numbers to the left of the latent variables refer to the respective questions used for defining the latents. The questions are found in a questionnaire.

### 2.1.7. Solving the structure

By solving the structure we mean that we use mathematical/statistical methods to analyze the data that has been collected in order to estimate the relations between the latent variables and between the manifest variables and the latent variables. This means that the method will choose the relations that are optimal, that is uses the data in an optimal way. Thus the model estimated will fit the data according to some criteria e.g. it minimizes the deviations from the actually

observed data. Note that the weighting of the manifests into the latent variables is determined by the method itself and not by any personal opinion. It is then possible to calculate the reliabilities of the manifest variables, create the contents of the latent variables and calculate the relations between the latents. It is also possible to see whether the model we set out to estimate really fits the data to a satisfactory degree or not for example using the coefficient of determination's, $R^2$, measure of fit.

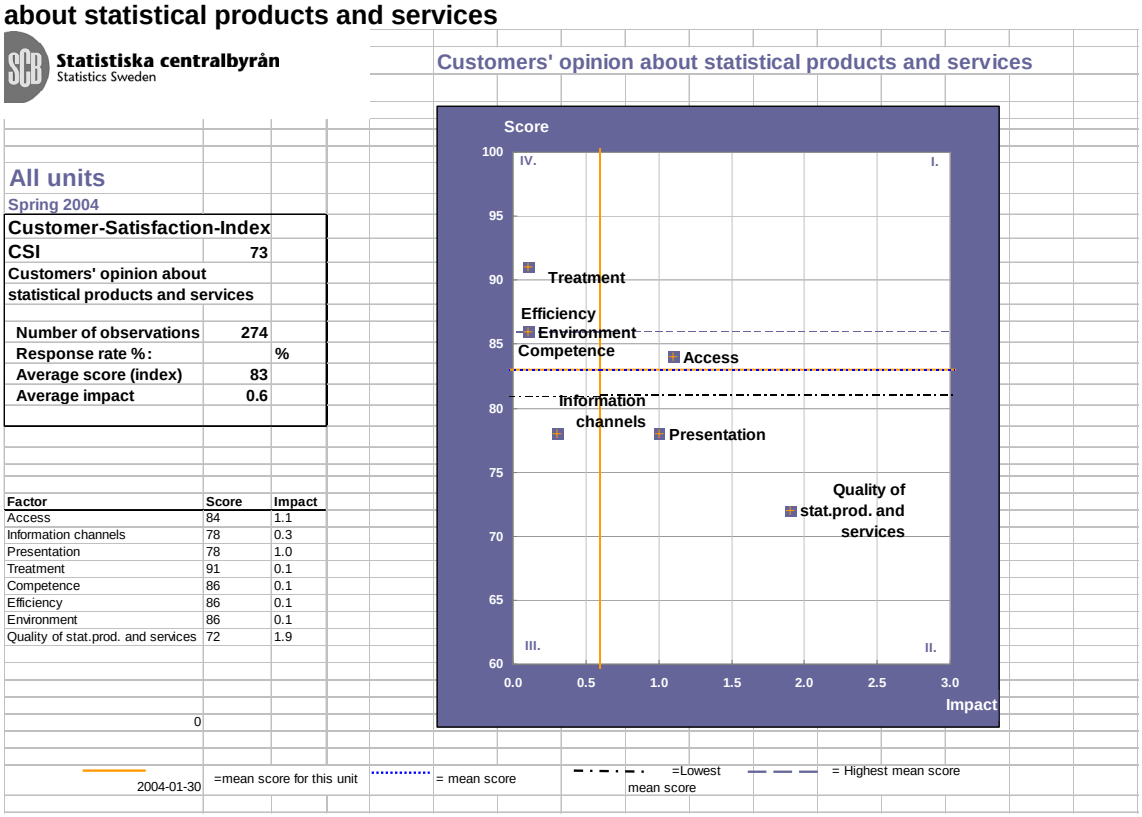
There are several methods for solving the structure. The method used by Statistics Sweden is PLS ( Partial Least Squares). It is used because it is robust and stable. PLS works with iterations. It is based on regression analysis and does not rely on assumptions about the distribution such as for example multivariate normality.

### 2.1.8. Interpretation of the solution, example

As a result of the solution we get measures of the respective levels of each latent variable in form of an index ranging from 0 to 100. The latents are measured for each customer. The larger the value is the more satisfied the customer is. In the example in Figure B the CSI is 73 which shows that the customers are fairly satisfied as a whole. Looking at the levels of the latent variables we find that the *Access* component has the value 84, *Information Channels* 78, *Presentations* 78, *Treatment* 91, *Competence* 86, *Efficiency* 86, *Environment* 86 and *Quality of stat products and services* 72. The error margins 95% confidence intervals are shown to the right of the indexes. For each latent variable the impact on the overall satisfaction is measured. These are shown as arrows leading to the CSI block. The *Quality of statistical products and services* has by far the largest impact 1.9 on CSI. **The impact of a component on the overall satisfaction is interpreted as the usual interpretation of a regression coefficient that is, the expected change in the overall satisfaction due to a change in value of the component.** As a consequence if the component also has a low average level among the customers this component is a prime candidate for changing and it should be prioritized. **Thus, the solution to the structure provides information about what components ought to be prioritized for increasing the overall customer satisfaction.**
Note that it does not say anything about how important the customers think that the component is. A component could be perceived as important by the customers without having an impact on the change of the overall satisfaction.

Shown below is an example of a diagram used for easy evaluation of the components

**Figure C. Impact matrix: Customer–Satisfaction–Index: Customers' opinion about statistical products and services**




The components are plotted according to the average values of satisfaction index and the impacts on the overall satisfaction. The index values are represented on the vertical axis and the impacts on the horizontal axis. The origo is placed in the point representing the mean value of the impacts and the index values for the components. Thus all components can be compared to the mean. Ideally, the components that have a large impact on the overall satisfaction should also be rated high. If on the other hand components that have large impact also are rated low in terms of satisfaction index then they are singled out as candidates for improvements because improvements in that component are expected to increase the value of the overall satisfaction exactly with the amount of the impact. In the example above the Quality of statistical products and services is the component to focus on for improvements of the CSI.

### 2.1.9. Error margins, weighted analysis.

Good statistical practice calls for calculating margins of errors when estimating parameters in models and in populations. When measuring customer satisfaction the situation is frequently that the customers are selected from a population of customers using probability sampling with sometimes a so called complex sampling design that is a design different from equal probability sampling. The model is then estimated based on the given sample but is supposed to be representative for the entire population of customers. Thus we have to deal with two types of randomness, one originating from the fact that the model cannot represent the choices of all the customers with full accuracy and one originating

from the selection of the customers from the population. The solution to this problem is to use the so called **superpopulation approach** (see the reference list). The calculation of margins of error and the estimation of average index values should use a so called weighted analysis, where the weights are the sampling weights. For minimizing the variances standard survey sampling methods could be applied such as for example using the GREG estimator (Generalised Regression Estimator) or the calibration estimator (see the reference list).

#### 2.1.10. Evaluations of the method.

The method of using structures of latent variables is supported by international quality organizations such as EFQM (European Foundation of Quality Management), EOQ (European Quality Organisation) and national quality organizations. In 1991 the National Economic Research Associates evaluated different method for measuring customer satisfaction with the aim to choose the best method for measuring customer satisfaction in USA. In 1998 the European Customer Satisfaction Index Steering Committee evaluated methods for measuring customer satisfaction in Europe. Both evaluations gave the same result. The method chosen was the method using structure equation analysis. It is now used in the American Customer Satisfaction Index, in the European Performance Satisfaction Index and by national organizations under the umbrella of the EPSI rating system.

### 2.2. Methods that do not use Latent Variables.

In the previous report “State of the art regarding planning and carrying out Customer/User Satisfaction Surveys in NSI s” it was stated that for the analysis of data collected for measuring customer satisfaction a number of different methods can be used and are used. For example there is always the possibility to analyze the data using graphs and cross tables. In some cases the analysis goes beyond the traditional tables. There are at least two types of methods used that fall in this category. One is to ask the customers about their expectations and experience of different services and to analyze the difference between these two concepts. Another one is to not only ask the customers of how satisfied they are but also how important they think the subject is. The analysis then proceeds to evaluate both aspects and when creating an action plan the most important topics will be prioritized. Below we give some critical comments about these methods.

To our knowledge the first method does not calculate an overall satisfaction measure. If it is deemed to be important that it should be possible to compare statistical agencies with respect to customer satisfaction an overall measure would be feasible. One reason for comparisons could for example be that it could be beneficial to study and learn from “good examples”. Also there is no evaluation of the impact of the differences on an overall measure. Of course one could argue that focus should be set on the areas where the gap between the expectations and experiences are largest.

The analysis following the second method is a little similar to the prioritizing diagram in the SEM but instead of using the calculated impacts the method uses the average stated importance for prioritizing. In our experience these average stated importance measures tend to be very similar to each other, that is people tend to think that most things are almost equally important. Furthermore, it does not necessarily follow that if a subject is deemed to be important it will have any impact on the change (increase) of the overall customer satisfaction. From our experience this method will usually give different result compared to the SEM approach which focuses on efficient change of the overall satisfaction.

## 3. Some references:


- **Structural equations with latent variables.**

**Bollen, K. A., (1989), Structural Equations with Latent Variables. Wiley, New York.**

- **Sampling designs.**

**Särndal, C.E., Swensson, B. and Wretman J. (1991), Modelassisted Survey Sampling. Springer Verlag.**

- **Calibration.**

**Deville, J.C. and Särndal, C.E. (1992). Calibration Estimators in Survey Sampling. Journal of the American Statistical Association 87, 376-382.**

**Deville, J.C. , Särndal, C.E. and Sautory, O. (1993). Generalized Raking Procedures in Survey Sampling. Journal of the American Statistical Association 88, 1013-1020.**

**Lundström, S. and Särndal, C.E. (2005). Estimation in Surveys with Nonresponse. John Wiley and Sons, Ltd.**

- **Superpopulation approach.**

**Cassel, C.M., Särndal, C.E. and Wretman J. (1977), Foundations of Inference in Survey Sampling. Wiley, New York.**

- **Customer Satisfaction Measurement.**

**ECSI Technical Committee (1998). European Customer Satisfaction Index. Foundation and Structure for Harmonized National Pilot Projects. European Commission (DGIII, Industry) and European Organisation for Quality (EOQ).**

**Nera (1991). Developing a National Quality Index: A Preliminary Study of Feasability. New York National Economic Research Associates. Inc.**

**Cassel, C., Eklöf, J., Hallissey, A., Letsios, A. and Selivanova I. (2002). The EPSI Rating Initiative. European Quality 9:2, 10-25.**

**Epsi Rating (2003). Pan European Report 2002: Customer Satisfaction in Europe. Stockholm Sweden: European CSI Editorial Board.**

- **Partial Least Squares in measuring Customer Satisfaction.**

**Cassel C.M., Hackl, P. and Westlund A.(1999), Robustness of partial least squares method for estimating latent variable quality structures. Journal of Applied Statistics, 24:4, 435-446.**

**Cassel C.M., Hackl, P. and Westlund A.(2000), On measurement of intangible assets: a study of robustness of partial least squares. Total quality management. 11:7, 897-907.**

**Cassel C.M.(2000), Measuring customer satisfaction on a national level using a superpopulation approach. Total quality management. 11:7, 909-915.**

**Cassel C.M. and Eklöf J.(2001), Modelling customer satisfaction and loyalty on aggregate levels: Experience from the ECSI pilot study. Total quality management. 12:7&8, 834-841.**

**Westlund A., Cassel C.M., Eklöf J. and Hackl, P. (2001), Structural analysis and measurement of customer perceptions, assuming measurement and specification errors. Total quality management. 12:7&8, 873-881**