

*A White Paper on*

# Integrated Models and Customer Satisfaction Surveys

Ron S. Kenett  
[ron@kpa-group.com](mailto:ron@kpa-group.com)

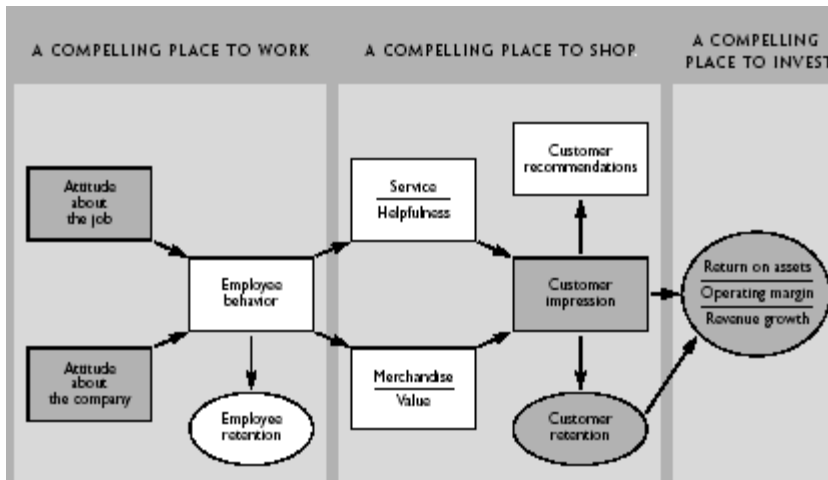
## Introduction

Competitive forces are driving organizations to seek remedies and solutions in different directions in their journey for achieving business sustainability and market presence. A generic goal of any organization is to develop and offer the right product and service, to the right market, at the right time and price.

In order to achieve such results three main sources of information need to be considered. We call them: 1) Voice of the Customer, 2) Voice of the Process and 3) Voice of the Workforce. In this paper we introduce the Integrated Model developed by **KPA** in order to account for information derived from these three sources, and it's relationship to Customer Satisfaction Surveys. Such surveys are a key technique to make the Voice of the Customer clearly heard by the organization in order to initiate improvements and monitor progress.

## The Integrated Model

A first example of an integrated model was implemented by Sears Roebuck and Co. into what they call the *employee-customer-profit model* (Rucci, 1998). The cause and effect chain links three strategic initiatives of Sears that are to be: 1) a compelling place to work, 2) a compelling place to shop and 3) a compelling place to invest. In order to push forward these initiatives Sears' management looked for answers to three basic questions: 1) how employees felt about working at Sears, 2) how employee behavior affected customers' shopping experience and 3) how customers' shopping experience affected profits. The model presented below is reflecting detailed answers to these questions and identifies the drivers to employee retention, customer retention, customer recommendation and profits.

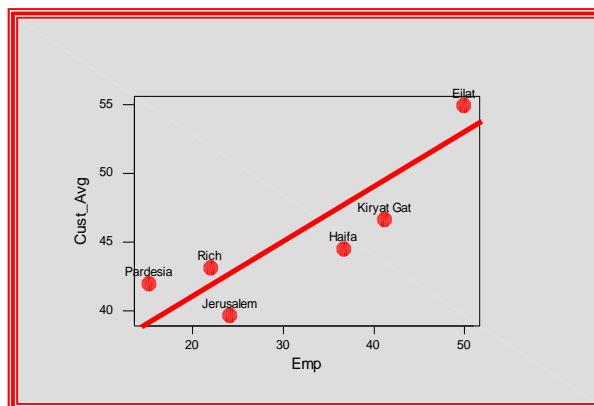


Sears has been able to map out these variables and determine that, for them, a 0.5 increase in employee attitude causes a 1.3 unit increase in customer satisfaction that creates a 0.5% increase in revenue growth.

At **KPA** we have designed and implemented integrated models for companies in a variety of industries for over a decade. The basic building blocks of the model are inputs representing 1) Voice of the Customer, 2) Voice of the Process and 3) Voice of the Workforce. (See Kenett, Hacohen et al. 1997, Kenett and Fainstein 2001, 2003, Kenett and Salini, 2011).

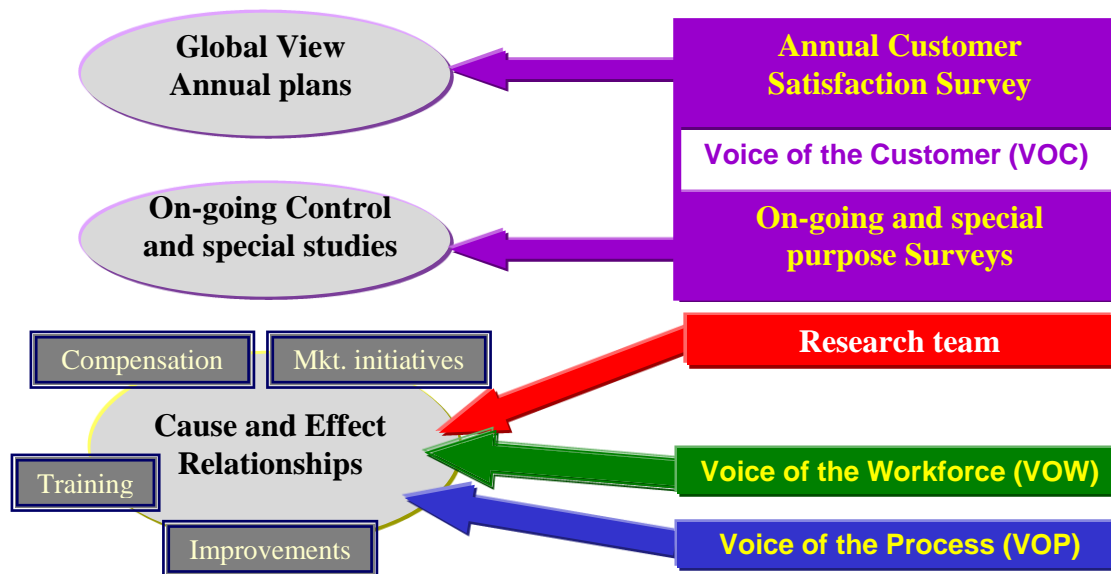
For example, in a company specializing in HOD (Home Office Delivery) of water bottles we were able to establish that increase in employee satisfaction from their immediate supervisor, by branch, is directly related to customer satisfaction from that branch (see scatter plot below). In the six branches investigated higher employee satisfaction correlates well with higher customer satisfaction. We can almost exactly predict customer satisfaction on the basis of employee satisfaction level.

**Voice of the Customer**



**Voice of the Workforce**

The approach taken by **KPA** in order to implement an integrated model, consists of analyzing internal operational data, customer and employee surveys, using an interdisciplinary research teams. A brief sketch of the approach is presented below:



We next expand on planning and analysis aspects of customer satisfaction surveys.

## Customer Satisfaction Surveys

Statistical analysis is a quantitative science that relies on a translation of reality into dimensions that lend themselves to such an analysis. Customer Satisfaction Surveys rely on questionnaires to map out reality. This mapping determines a population frame that can be statistically analyzed. In drawing a sample, several sampling schemes can be applied. They range from probability samples such as cluster, stratified, systematic or simple random sampling, to non-probably samples such as quota, convenience, judgment or snowball sampling.

The customer satisfaction survey process consists of four main stages: 1) Planning, 2) Collecting, 3) Analyzing and 4) Presenting. Today's customer satisfaction surveys are conducted in a wide variety of techniques including phone interviews, self report paper questionnaires, email questionnaires, internet based surveys, SMS based surveys, face to face interviews, videoconferencing etc.. In this paper we focus on the planning and analysis phase of a customer satisfaction survey and begin with the discussion of various aspects of questionnaire design.

Self-reports are the primary source of data in customer satisfaction surveys. Market researchers rely on the answers that customers provide to learn about individuals' satisfaction levels, loyalty and attitudes towards products, services and organizations.

Survey questionnaires typically combine closed form and open questions. When respondents are asked in an open-response format, "What have you done today?" to give a meaningful answer, respondents have to determine which activities may be of interest to the researcher. In an attempt to be informative, respondents are likely to omit activities that the researcher is obviously aware of (e.g., "I gave a survey interview") or may take for granted anyway (e.g., "I had breakfast"). If respondents are given a list of activities that included giving an interview and having breakfast, most respondents would endorse them. At the same time, however, such a list would reduce the likelihood that respondents would report activities that are not represented on the list. Response alternatives can clarify the intended meaning of a question, in the present example by specifying the activities the researcher is interested in. In addition, response alternatives may remind respondents of material that they may otherwise not consider.

Regarding rating scales, we found at KPA that a 1-5 scale with anchoring from "very low" to "very high" is most effective in capturing customer satisfaction levels. In written surveys we also typically include a direct evaluation of importance. An example of a questionnaire from a survey we recently conducted in Poland is presented below.



**POMIAR ZADOWOLENIA KLIENTÓW 2003**

Szanowni Państwo,

Celem tej ankiety jest zbadanie poziomu Państwa zadowolenia z produktów i usług Eden Springs. Przy każdym pytaniu prosimy o wyrażenie opinii w dwóch kwadratach: jak ważna jest dla Państwa dana sprawa oraz jaki jest poziom Państwa zadowolenia.

• Proszę przy każdym pytaniu zaznaczyć kółkiem cyfrę która, Państwa zdaniem, najlepiej wyraża wagę, jaką przykładają Państwo do danej sprawy w skali od 3 do 1

- 3 – ta sprawa jest dla mnie bardzo ważna
- 2 – sprawa jest ważna
- 1 – to dla mnie sprawa drugorzędna

• Proszę zaznaczyć kółkiem cyfrę która, najlepiej oddaje stopień Państwa zadowolenia jeśli chodzi o daną sprawę w skali od 5 do 1

- 5 – jestem bardzo zadowolony/bardzo zadowolona
- 4 – jestem zadowolony/zadowolona
- 3 – nie mam większych zastrzeżeń
- 2 – jestem lekko rozczarowany/rozczerowana
- 1 – jestem bardzo rozczarowany/rozczerowana

**Przykład**  
Kultura osobista dostawcy

	Waga			Poziom zadowolenia					Brak opinii
	+	-		+	-				
Kultura osobista dostawcy	1	2	3	1	2	3	4	5	0

Tak zakreślone odpowiedzi oznaczają, że kultura osobista dostawcy jest dla Państwa bardzo ważna. Są Państwo zachwyceni i uprzejmością i wysoką kulturą osobistą Państwa dostawcy wody.

**A. DOSTAWCA I DOSTAWY WODY**

1. Jak często w ciągu ostatnich 6 miesięcy mieli Państwo jakikolwiek kontakt ze Sprzedawcą-Kierowcą (w skrócie SK)


- Przy większości dostaw
- Często
- Nierzbyt często
- Najczęściej nie
- W ogóle nie miałem/am kontaktu

2. Jakiemu typu był to kontakt ?

- Osobisty
- Pisemny (list, notatka)
- Telefoniczny
- Nie pamiętam

**Dostawca**

Uprzejmie prosimy o wypełnienie punktów 3-8 tylko, jeśli mieli Państwo kontakt z dostawcą. W przeciwnym przypadku prosimy bezpośrednio przejść do punktu 9.

	Waga			Poziom zadowolenia					Brak opinii
	-	+		-	+				
3. Kultura osobista SK	1	2	3	1	2	3	4	5	0
4. Wygląd SK (ochludny/czysty)	1	2	3	1	2	3	4	5	0
5. Jak SK reaguje na życzenia zmiany dnia dostawy albo częstotliwości dostaw (specjalne przypadki)	1	2	3	1	2	3	4	5	0
6. Jak SK reaguje na życzenia dostarczenia innych produktów (sokienki, kanarki, kubeczki, herbata itp.)	1	2	3	1	2	3	4	5	0
7. Jak SK reaguje na niekryte życzenia jedzłowa w innym czasie, zgodę na inne miejsce dostarczenia butli)	1	2	3	1	2	3	4	5	0
8. Opóźnienie w rozpatrywaniu niekrytych życzeń	1	2	3	1	2	3	4	5	0
9. Ogólno ocenę Państwa SK									

The most important lessons that emerge from survey design research are rather general in nature. Researchers tend to view questionnaires as "measurement devices" that elicit information from

respondents. What is frequently overlooked is that questionnaires are also a source of information that respondents draw on in order to determine their task and to arrive at a useful and informative answer. Respondents do their best to be cooperative communicators. Consistent with the assumptions that underlie the conduct of conversation in daily life, they assume that all contributions of the researcher are relevant to the goals of the ongoing exchange, and they take these contributions into account in arriving at an answer. Researchers need to be fully aware of the information that questionnaires provide, and the extent to which the questions asked determine the answers received.

The primary goals of a questionnaire appraisal are to document problems in question design and identify possible revisions. Most surveys assume that question comprehension is an early step, followed by information retrieval, judgment and response selection. Assumptions about information retrieval emphasize the role that respondents play as managers of information. In customer satisfaction surveys of businesses or large organizations, where the respondent is asked to fill up a questionnaire reflecting an organizational perspective, retrieval involves:

- Identifying appropriate sources of information — these may include the respondents' own memory, organizational record systems, and other people within the organization.
- Selecting strategies for retrieving information from identified sources.
- Assessing the match between information retrieved and information needed to select a response.

Respondents may repeat some or all of these retrieval processes until the match seems sufficient.

In the judgment step, the respondent's task is to synthesize or integrate information coming from a variety of sources. Depending on the sources consulted, respondents may need to synthesize information from different individuals within the organization, or they may need to synthesize information from memory with information from administrative records.

Following the design of the questionnaire a pilot run is usually carried out with typical respondents in order to validate the clarity of the questionnaire. The pilot study participants are debriefed for feedback on the questionnaire design and content. The final questionnaire is updated to account for the feedback and comments. Once the questionnaire is distributed, a follow up procedure is initiated to track response rates. In some cases, focused follow up activities are initiated to increase response rates in specific strata. At some point in time the survey is closed and the data analysis begins. The next section describes various aspects of customer satisfaction survey data analysis.

Survey analysis typically involves a descriptive study of demographic parameters and satisfaction levels from various items. In this section we present several powerful non-standard statistical methods for customer satisfaction survey data analysis.

Once questionnaires are returned, an analysis of possible bias in the returned questionnaires is necessary. Such bias can be evaluated using the M-Test (Fuchs and Kenett, 1980, Kenett, 1992, Kenett and Zacks, 1998, Kenett and Salini, 2011). In simple terms the M-test consists of comparing the number of expected returns, by demographic strata, conditioned on the total number of returns. Standardizing the difference between actual and expected returns and using a Bonferroni bound we can determine if there are strata with under(over) representation. If bias is identified a follow up analysis is carried out to determine if there are significant differences in satisfaction levels between

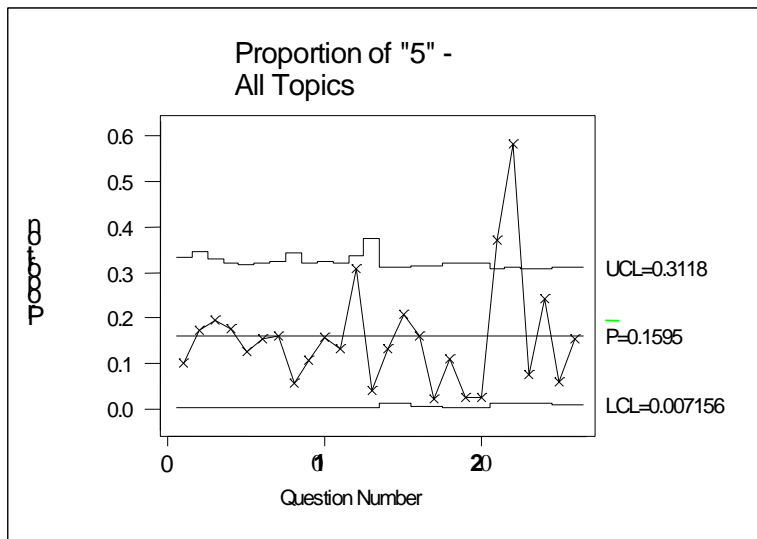
the various strata with a bias in returns. If such differences are demonstrated weighted expansion estimators are used, if not, unweighted estimators are computed.

Another questionnaire analysis technique involves a non standard application of control charts to the analysis of satisfaction surveys data as described in Kenett and Zacks (1998) and Kenett (1998, 2002). Control charts were developed at Bell Laboratories to control processes and identify significant changes over time. The underlying concept of the Control Chart for proportions – the p chart – is that observations that characterize a binary event follow a binomial distribution. In a Customer Satisfaction Survey we might want to analyze the responses that correspond to the top evaluation rating – a “5” on a 1-5 scale. These responses correspond to very satisfied customers that give the top rating in a list of questions on satisfaction levels from specific features and dimensions of services and product characteristics. A customer responding “5” to a question on overall satisfaction or his willingness to recommend the company providing the service to others is typically a loyal customer. A response of “4” indicates mere satisfaction and implies significantly reduced loyalty levels.

The following figure presents proportions of “5” to 26 questions. The average proportion is 15.95%. The control limits (UCL and LCL) indicate 3 sigma limits above and below the average proportion. Any question with a proportion above or below the control limits indicates a statistically significant difference from the overall average. Practically speaking it signals a feature or service dimension where the proportion of “5”s is significantly different from the grand average. In the control chart described below questions 21 and 22 have an unusually high proportion of “5”s indicating outstanding strengths. All other questions provide responses consistent with the grand average – i.e. not worth pointing out as unusual or significantly high.

The formulas for computing control limits for a proportion derived from  $n_i$  responses are:

$$UCL = \min(1, \bar{p} + 3\sqrt{\bar{p}(1-\bar{p})/n_i}) \quad LCL = \max(0, \bar{p} - 3\sqrt{\bar{p}(1-\bar{p})/n_i})$$

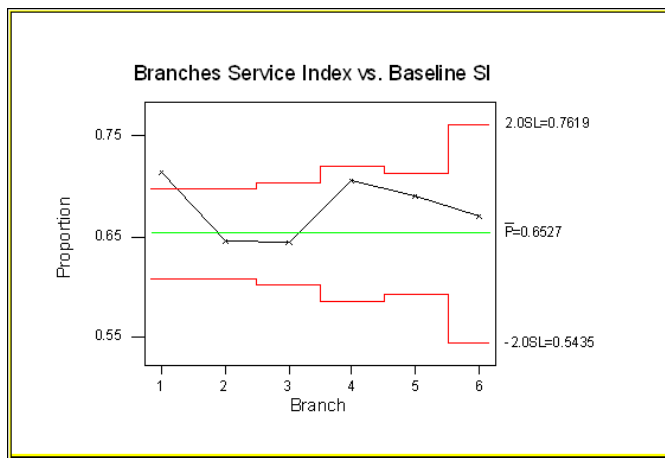


The varying number of responses, per question, is reflected by varying control limits. The more responses the narrower the control limits. The control limits delineate three regions: significantly

above average, as expected and significantly below average.

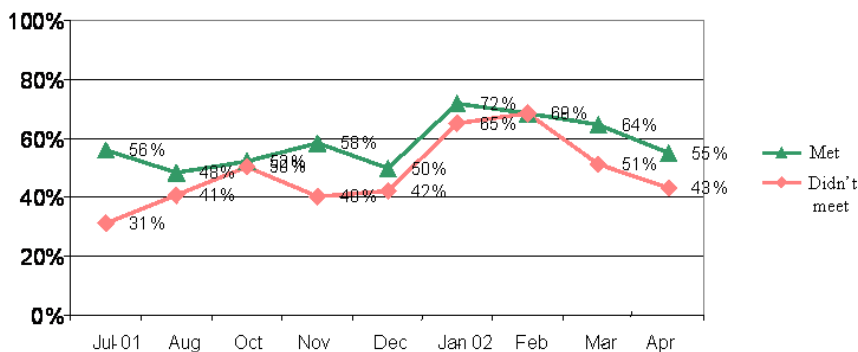
Points above or below the control limits indicate proportions significantly higher, or lower, than the grand average. The probability of making such a statement when it should not be made (Type I error) is about 1/370 – a rather low risk.

Control charts are used, for example, to classify HOD distribution branches using a Service Index that represents the percentage of “5” in a number of questions including overall satisfaction, recommendation and satisfaction from distributor. Plotting the Service Index on a control chart allows us to classify branches as outstanding (green), within expectations (yellow) and below expectations (red). In the chart below, Branch 1 is classified as outstanding – all other branches performed within expectations.



A similar analysis can be performed for topic of low satisfaction. Here the analysis focuses on proportions of “1”. The application of Control Charts to these proportions is identical to the example of proportions of “5”. Significantly high levels of “1” indicate severe weaknesses and opportunities for improvement.

Tracking customer satisfaction survey data over time provides interesting insights that affect the day to day operation of an organization. For example, the HOD operator might want to determine if the distributors should make the effort to be in touch with their customers or not. The chart below presents overall satisfaction levels split by customers who were or were not in contact with the distributor as determined from operational data.



**Clearly, meeting the distributor improves overall satisfaction by about 5%. If this increase represents a 5% increase in customer loyalty one can actually determine the benefits of having the distributor stay in touch with the customer. This can be done by phone, notes or face to face meetings.**



## Customer Satisfaction Surveys and Improvement Projects

Customer Satisfaction Surveys are potentially involved in all steps of an improvement project. We briefly review steps in improvement projects while expanding on the role played by customer satisfaction surveys in each step.

### 1. Elicitation of potential improvement projects

Customer surveys are a natural source of information for identifying topics of low customer satisfaction that are important to customers and therefore require management attention.

### 2. VOC & QFD

Quality Function Deployment is based on an assessment of the features of the product or service that are of interest to the customer, including their prioritization. Customer Surveys and focus groups are a proven methodology to collect such data. VOC might involve conjoint analysis which are surveys combining experimental design techniques with a survey.

### 3. Data Collection & Analysis

Collecting customer satisfaction survey questionnaire is a forming experience for most organizations. This process clearly exhibits the type of relationship existing between company and customers. In some cases the company found out that it simply did not have the name and addresses of its customers to conduct such a survey. In other cases low response rates were attributed to out of date data bases resulting in high returns due to undelivered mail.

### 4. Statistical Inference

Analyzing response data for potential bias is a precursor to any data analysis. The techniques of Fuchs and Kenett (1980), Kenett (1991) and Kenett and Salini (2011) can be used to identify possible bias in actual responses. Should the responding sample be determined as unbiased, unweighted analysis is possible. Alternatively a weighing of responses is required.

### 5. Financial Impact Assessment

Customer loyalty is a clear financial index. Loyal customers are both cheaper to cater for and, de facto, are part of the sales force by recommending the product or service to others. Increasing customer loyalty or customer retention has clear financial impact. Raising customer retention from 65% to 75% in an HOD company was calculated to increase Net Present Value by 4 million dollars.

### 6. Regression Modeling

Figuring out the cause and effect relationship outlined in the section on Integrated Models involves regression analysis. The relationship identified by Sears between employee satisfaction, customer satisfaction and profits is derived through regression analysis. In some cases more advances

Structural Equation Models are used but, in principle, all methods involve modeling and prediction.

#### 7. Design of Experiments

Instead of relying on observation data, a more proactive approach is to invoke Designed Experiments where several factors are combined at different levels to allow for a detailed analysis of factor effects (Kenett and Zacks, 1998). When such experiments are conducted, customer satisfaction survey data, comparing various combinations of factor levels provides an effective approach to determine what works and what does not work, from the point of view of the customer.

#### 8. Lean Manufacturing

Lean manufacturing builds on highlighting operations with added value and eliminating activities without added value. One effective approach to determine what is considered to have added value is to simply ask the customer.

#### 9. Evaluation of results

Once improvements have been implemented a basic approach to evaluate their impact is to simply ask the customer, whether internal or external. Satisfaction surveys are often used in this context.

#### 10. Where else?

Leveraging results of completed projects and identifying what are the best issues to deal with next are activities that can be significantly supported by customer satisfaction surveys.

## Summary and Conclusions

The three questions addressed in this white paper relate to integrated models and the overall customer satisfaction survey process. They are:

1. How to integrate data representing the Voice of the Customer, the Voice of the Process and the Voice of the Workforce.
2. How to design and analyze customer satisfaction surveys
3. How to act on survey results, for example in the context of six sigma.

In order to use customer satisfaction surveys effectively, proper answers to these three questions need to be provided. Such answers require knowledge and experience in statistics, cognitive psychology, business processes, strategic planning, quality management and financial assessments.

The integrated approach we are advocating is multidisciplinary combining various disciplines such as organizational behavior, marketing, statistics, operational management and finance. Achieving such integration is a non-trivial task. Organizations should plan to achieve such integration by combining internal and external capabilities. Large companies typically only require initial guidance in order to set up such a mechanism. Small and medium companies might require more on-line support from external consultants. In any case there are no “off the shelf” solutions – each organization needs to develop its own approach. This paper provides some ideas on how to do it.

## References

1. Fuchs, C. and Kenett, R.S. (1980). A Test for Detecting Outlying Cells in the Multinomial Distribution and Two-Way Contingency Tables, *Journal of the American Statistical Association*, 75, pp. 395-398.
2. Kenett, R.S. (1991). Two Methods for Comparing Pareto Charts, *Journal of Quality Technology*, , 23, pp. 27-31.
3. Kenett, R.S. (1998). Customer Surveys: Why and How (in Hebrew) in **Surveys: Some Good, Some Less**. S. Bar-Lev and C. Fuchs (Eds), Hakibbutz Hameuchad Publishing House Ltd. and Haifa University press..
4. Kenett, R.S. (2002). Issues in Customer Satisfaction Surveys”, DEINDE 2002, Torino, Italy.
5. Kenett, R.S. and Fainstein, R. (2001). Improving Customer Loyalty: The key to business success ” (in Hebrew). Proceedings of the 6<sup>th</sup> National Conference of the Israel Society for Quality, Tel Aviv, Israel.
6. Kenett, R.S. and Fainstein (2003) Customer Retention: The Key to Success in Unstable Economic Times (in Hebrew) in **Researchers Speak: Market Research and its application in the Israeli Market** edited by O. Kaplan, Globes Business Publishing.
7. Kenett, R.S. and Zacks, S. (1998) **Modern Industrial Statistics: Design and Control of Quality and Reliability**, Duxbury Press: San Francisco.
8. Kenett, R.S. Hachohen-Jacobs, M., Bantay, J. and Uriel D. (1997). Is your Employee a Satisfied Customer? or how to incorporate employee satisfaction surveys in the human resources development strategic plan” (in Hebrew). Proceedings of the 8th annual conference of the Israeli Human Resources Organization, Zichron Ya’acov, Israel.
9. Kenett, R.S. and Salini, S. (2011) **Modern Analysis of Customer Satisfaction Surveys**, John Wiley and Sons.
10. Rucci, A., Kim, S. and Quinn, R. (1998). The Employee-Customer-Profit Chain at Sears, *Harvard Business Review*, pp. 83-97.