Information differences between closed-ended and open-ended survey questions for high-technology products

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ABSTRACT

Many businesses collect survey data that has two dimensions of satisfaction; namely, quantitative scores to specific questions (closed-ended) and specific comments also associated with the same questions (open-ended). The statistical evaluation from the dimension of quantitative responses is easily tabulated and subject to statistical analysis; however, the analysis and presentation of the comments usually consist of no more than tabulated Pareto charts. While there is software available to extract and summarize the comments, it is rarely performed on an ongoing basis. The concern voiced most often is the content of the comments contain information that may not be contained in the quantitative measures. This research provides a detailed comparison of the open-ended questions and closed-ended questions for a computer product company and a company that manufactures medical electronic equipment. While the results of the comparison do not show a strict one-to-one correspondence between the two types of measures of satisfaction, the evidence indicates that the results are strikingly similar. The conclusion is the closed-ended questions provide metrics which generally track the results found in the open-ended questions and there are no apparent gaps between the two sets of information.

Keywords: survey, questionnaires, closed-ended, open-ended, quantitative research

BACKGROUND

The Computer Technology Industry Association (CompTIA) has created a benchmark survey for customer satisfaction in the high-technology industry. This study was based on the data collected by Service 800, a survey research company in Wayzata, Minnesota for the Computer Technology Industry Association for their on-going benchmark industry metric.

Member companies provide lists of all service events performed by each member company on a weekly basis to Service 800, a market research company. Service 800 then randomly selects service events from each company for the survey. Surveys are taken in over 70 countries around the world in their native language using an identical survey instrument correctly worded for each language with both closed-ended and open- ended questions.

The benchmark survey is reported monthly to the member companies of the benchmark and is used exclusively by those companies who manufacture and support computers, computer peripherals, and medical electronic devices.

There has been ongoing controversy that the information captured by the closed-end questions contains different information than that captured in the open-ended questions. The argument used most often primarily focuses on the amount of information and the content contained in the open-ended comments versus numerical score for the same question in the closed end question.

The purpose of this paper is to examine the information content of the closed-end questions and compare the results with the information content captured in the open-ended questions. The study selected a manufacturer of computer based equipment and a manufacturer of medical electronic equipment. It was decided to separate these two types of equipment to reduce confounding effects that might be present if the two were combined since there is no assurance that services for these two types of products are identical.

THE PROBLEM

The study consists of two components; namely, an analysis of open-ended and closed-ended information for computer products followed by an analysis of open-ended and closed-ended information for medical electronic products. Information from the closed-ended questions was measured by a 5-point Likert scale. The same closed-end Likert scale was used for both computer products and medical electronic products.

While there are a number of commercially available software products on the market that will organize and analyze non-numerical or unstructured data, it was decided to use a single, knowledgeable survey analyst from the survey company who was familiar with both product categories and the survey to manually scale comments for each product group.

One company that manufactured and supported computer hardware and one company that manufactured and supported medical equipment was selected from the list of companies that are in the benchmark study. Since not all companies in the benchmark have the same level of service activity, the number of comments that were available for this analysis thus reduced the number of potential companies that could be used to provide a significant sample. The two companies that were selected had the largest sample of service activities and comments. The names of the companies were kept anonymous.

CAVEATS FOR THE STUDY

There are several serious caveats that must be considered when analyzing the results of the study. The first caveat is that creating a scale for the open ended comments should be comparable with the scale used for the closed-end questions. The scale used for comments was designed to be a 5 point Likert scale with similar anchors for the scale.

The second caveat is that by using exactly one highly-qualified survey analyst to analyze the comments was considered a better way to reduce the variability and confounding that might occur using only structured comment software. In general, customer comments are subject to interpretations, are not necessarily clear, may be ambiguous, may not consistently reflect the level of the closed-end statistical score, and may not have any relationship to the question whatsoever. Hence, the use of a knowledgeable analyst at the research company was used to provide consistent scaling.

A third caveat is the fact that only two companies are being evaluated; namely one computer hardware manufacturer and one medical equipment manufacturer. This study is a preliminary study and is not intended to be statistically representative of the high technology industry.

Finally, the data was provided by the research company. The actual individual scores were considered proprietary so that only descriptive statistics were available for this study. Hence, specific statistical tests of individual parameters were precluded.

CODING

The open-ended questions in the surveys were coded using the following scale:

- A score of 1 represents a very negative or critically sharp comment
- A score of 2 represents a negative comment or a mild rebuff
- A score of 3 represents a neutral comment, one that is neither positive nor negative
- A score of 4 represents a positive comment or mildly encouraging
- A score of 5 represents a very positive comment that may include a strong affirmation.

The comment scale described above was designed to be compatible and consistent with the metric scale used for the closed ended questions. The scale for the closed-end questions is shown below.

The closed-end questions in the surveys were coded using the following scale:

- A score of 1 represents very dissatisfied
- A score of 2 represents dissatisfied
- A score of 3 represents neither satisfied nor dissatisfied
- A score of 4 represents satisfied
- A score of 5 represents very satisfied.

Since all surveys were performed by telephone personnel within a week of each service incident and the open-ended questions were answered by the recipient of the service or personnel

familiar with the product and service provided, the accuracy of the response is assumed to reflect the actual response of the recipient of the service.

THE DATA

Computer Hardware

The following questions were used to measure specific aspects of service satisfaction. The actual wording of the questions listed below has been abbreviated since they are proprietary.
1. Communications
2. Completeness of service
3. Fix time
4. Professionalism
5. Response time.

The following chart (Figure 1) compares the average satisfaction rating for the closed-ended versus open-ended score for each of the five questions used to measure service.

Compare the Measured Stats with Comment Stats

Company A (Computer Hardware Support)

	0	1	2	3	4	5
Communication Rating (1007)						4.83
Communciation Comments (77)						4.91
Completeness Rating (1012)						4.72
Completeness Comments (125)						4.72
Fix Time Rating (1014)						4.75
Fix Time Comments (288)						4.70
Professionalism Rating (1030)						4.87
Professionalism Comments (238)						4.95
Response Time Rating (1015)						4.65
Response Time Comments (231)						4.66

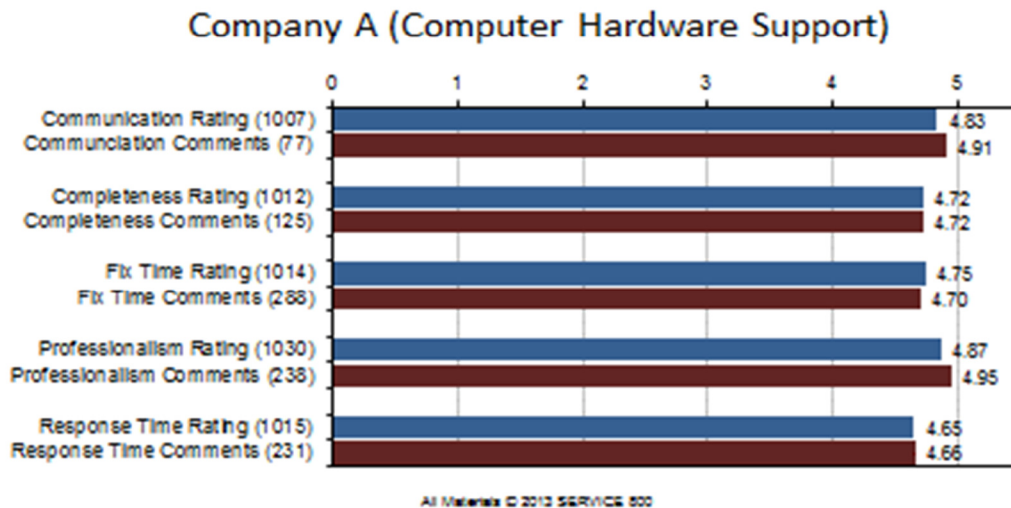All Materials © 2013 SERVICE 800

Figure 1 – Average scores and sample size for each question

It should be noted that even though the benchmark data is ordinal, the data is presented to the companies in the benchmark as ratio data and hence the use of arithmetic averages. The averages used here reflect the current reporting methodology used in the industry.

When the average scores are rank-ordered the results are shown in the table below:

Comparing the average statistics		
Rank	Closed-ended Questions	Open-ended Questions
1st	Professionalism	Communication
2nd	Communication	Professionalism
3rd	Fix Time	Completeness
4th	Completeness	Fix Time
5th	Response Time	Response Time

The ranking of the questions is based on the arithmetic average of the nominal values for each question. While a number of researchers assume a ratio scale ordinal variables with large samples, that assumption was not used in this study. Hence, these rankings were not considered for inferential hypothesis testing.

The following chart (Figure 2) compares the correlation of the closed-end versus open-ended measures for each of the previous five questions when each is correlated to overall satisfaction.
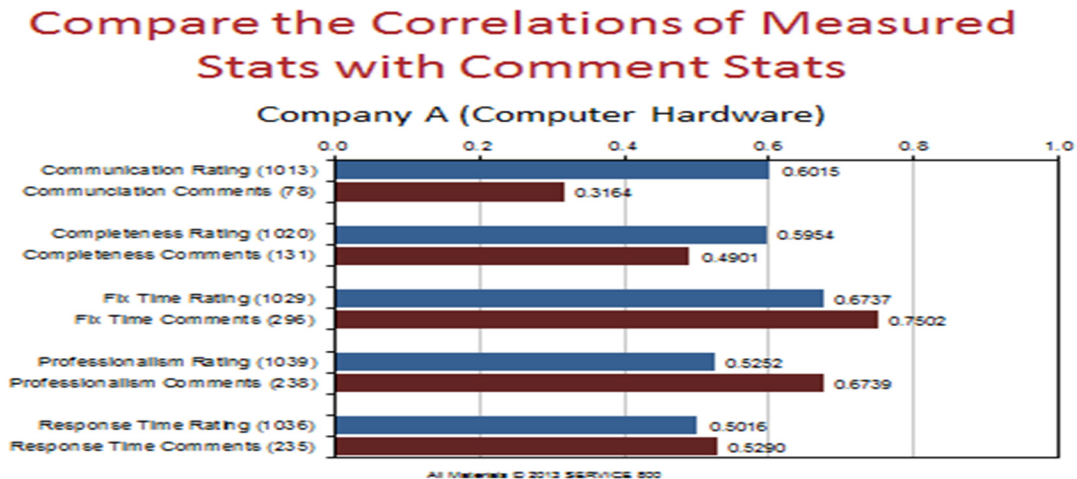

Figure 2 – Correlation with overall satisfaction for both the closed end and open-ended questions shown with the sample size for each question.

When the correlations are rank-ordered the results are shown in the table below:

Comparing the Correlations		
Rank	**Closed-ended Questions**	**Open-ended Questions**
1st	Fix Time	Fix Time
2nd	Communications	Professionalism
3rd	Completeness	Response Time
4th	Professionalism	Completeness
5th	Response Time	Communications

It should be noted that correlation does not imply a cause-and-effect relationship; however, within the technology industry, there is general acceptance that the service components included in the benchmark not only correlate with overall satisfaction, they are considered to have a direct effect on satisfaction. This assumption has been accepted for this study.

Medical Equipment

The following questions were used to measure various aspects of service satisfaction for medical equipment. The actual wording of the questions listed below has been abbreviated since they are proprietary.
1. Time to Arrive
2. Technical ability
3. Completeness of repair
4. Time to complete
5. Estimated arrival time

The following chart (Figure 3) compares the average rating for the closed-end versus open-ended score for each of the previous five questions used to measure service.
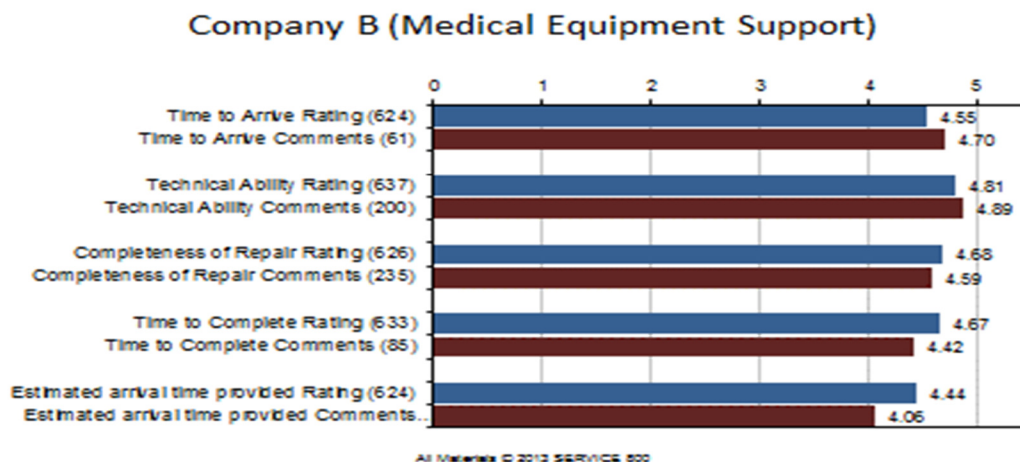

Figure 3 – Average scores and sample size for each question

When the average scores are rank-ordered the results are shown in the table below:

Comparing the average statistics		
Rank	**Closed–ended Questions**	**Open-ended Questions**
1st	Technical Ability	Technical Ability
2nd	Completeness of Repair	Time to Arrive
3rd	Time to Complete	Completeness of Repair
4th	Time to Arrive	Time to Complete
5th	Estimated Arrival Time	Estimated Arrival Time

The following chart (Figure 4) compares the correlation for the closed-end versus open-ended measures for each of the previous five questions when each is correlated to overall satisfaction.

Compare the Correlations of Measures Stats with Comment Stats

Company B (Medical Equipment)

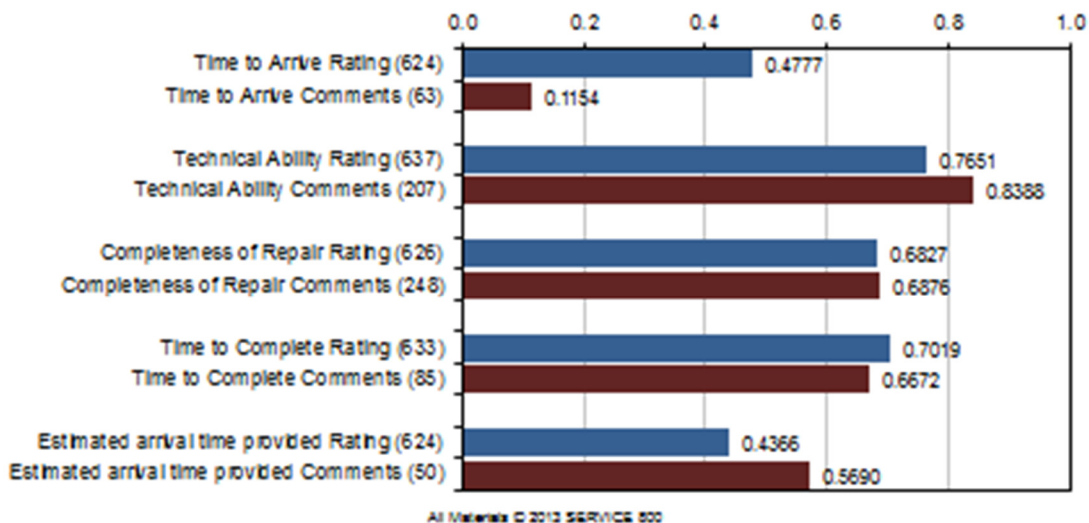|	Correlation
Time to Arrive Rating (624)	0.4777
Time to Arrive Comments (63)	0.1154
Technical Ability Rating (637)	0.7651
Technical Ability Comments (207)	0.8388
Completeness of Repair Rating (626)	0.6827
Completeness of Repair Comments (248)	0.6876
Time to Complete Rating (633)	0.7019
Time to Complete Comments (85)	0.6672
Estimated arrival time provided Rating (624)	0.4366
Estimated arrival time provided Comments (50)	0.5690

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Figure 4 – Correlation with overall satisfaction for both the closed end and open-ended questions and sample size for each question.

When the correlations are rank-ordered the results are shown in the table below:

Comparing the Correlations		
Rank	**Closed-ended Questions**	**Open-ended Questions**
1st	Technical Ability	Technical Ability
2nd	Time to Complete	Completeness of Repair
3rd	Completeness of Repair	Time to Complete
4th	Time to Arrive	Estimated Arrival Time
5th	Estimated Arrival Time	Time to Arrive

FINDINGS AND MANAGEMENT IMPLICATIONS

Computer Hardware

The rank ordering of the averages for the closed-end and open-ended questions indicate that professionalism and communication have the highest average satisfaction and response time has the lowest average satisfaction.

When the rank ordering is performed using the correlations between the questions and overall satisfaction the question relating to fix time has the highest correlation. Professionalism and communication tend to have the lowest correlation with overall satisfaction.

First management implication: Since fixed time has the highest correlation with overall satisfaction, management should focus attention on maintaining the skills of service personnel in the field to assure fix-time skills are sufficient.

Second management implication: although professionalism and communication have the highest averages with regard to individual satisfaction, they have the least impact on overall satisfaction and hence can be given secondary consideration with respect to allocation of resources by management.

Medical Equipment

The rank ordering of the averages indicates that the technical ability of the service personnel has highest level of satisfaction. The time to arrive and estimated time to arrive questions have the lower averages of satisfaction.

When the rank ordering is performed using the correlations the question relating to technical ability has the highest correlation with overall satisfaction. Time to arrive and the estimated time to arrive are the two questions which have the lowest correlation with overall satisfaction.

First management implication: since technical ability of the service personnel has the highest average satisfaction for both closed-end and open-ended questions and the same question has the strongest relationship with overall satisfaction for both closed-end and open-ended questions, management must continue to focus resources on the technical ability of service personnel as its number one priority.

Second management implication: the estimated time to arrive and the time to arrive are the two questions which ranked lowest with respect to average satisfaction for both closed-end and open-ended questions and lowest relationship (correlation) with overall satisfaction for both

closed-end and open-ended questions. These rankings suggest that management can consider reducing concerns about adding additional service personnel to reduce response time.

CONCLUSIONS AND RECOMMENDATIONS

From this limited analysis of one computer equipment manufacturer and one manufacturer of medical electronics equipment there are a few conclusions that are apparent; namely:

1. Open-ended and closed-ended questions provide very similar information for both computer hardware products and medical equipment.

2. Rankings from satisfaction averages and correlations of ordinal data (open-ended questions) give similar results in the rankings from closed-ended questions.
3. The management implications of results from both the computer hardware manufacturer and medical equipment manufacturer support are consistent with generally accepted service operations principles.
4. The results of the analysis indicate that skills of service personnel have the greatest impact on overall satisfaction for both computer hardware manufacturers and medical equipment manufacturers.
5. This technique of rank ordering scoring of questions relating to service operations provides management with another perspective and a possible tool for allocation of limited resources.

There are several recommendations that can be inferred from the results of this analysis; namely:

1. The results of this study yields information that can be used for tactical allocation of resources that will have the greatest impact on customer satisfaction.
2. The trends derived from this benchmark data can be used strategically for multi-year planning. While the service business is constantly changing with each change impacting resource allocation, there remains a need for developing resources beyond the typical one year budgetary cycle. A one-to-three year resource plan developed from these trends would aid both personnel and support planning.
3. Since the closed-end questions have very similar information to the open-ended questions, it is recommended that the closed-end questions be used as a tactical source of information (monthly/quarterly) and the combined analysis of closed-end and open-ended questions be performed on an annual basis for strategy analysis and evaluation.

While it would be very useful to expand this study to include more companies in the computer hardware and medical electronics industries, this preliminary study provides an indication of the value of satisfaction surveys for both tactical and strategic planning and eliminates the myth that information embedded in open-ended comments is significantly different than the information contained in the closed-end questions.

FURTHER READING

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