

EMERGING TECHNIQUES AND TOOLS IN BA  
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# Business Analytics Report

For a Software Company in the Aerospace Industry

# 2023



# EXECUTIVE SUMMARY

In this report, four business analysts will address a given objective which is to analyze the service and engineering-related performances of a given software company in the aerospace industry and give analytical insights on what must be pursued to retain existing customers and please potential future patrons by using critical thinking to make business decisions and recommendations. Platforms such as IBM SPSS, EXCEL along with methods/techniques such as STATISTICAL INFERENCE, ORDINAL and INTERVAL scaling, REGRESSION, and CORRELATION analysis, will be utilized to enhance comprehension of where the company currently stands in the industry and its ability to provide an elevated CX (customer experience). Some limitations faced in the analysis are that only one dataset consisting of 176 customer support survey responses has been provided along with the absence of knowing what specific problems these customers are experiencing within the company. The dataset consists of 7 ordinal (EXP, KMI, CAP, PRE, RAM, SPR, QLP), and 2 interval scaled variables (response time in minutes and days) regarding the CX (customer experience) interactions within the company. With these limitations at hand, it is of utmost importance to achieve an understanding of what these variables mean and how they affect the company's ability to address these unknown problems in a mannerly and professional time frame. Through extensive analysis, it has been concluded that variables KMI, CAP, PRE, and RAM, fell under an average of par excellence exceeding expectations with minimal improvement needed. While EXP, SPR, and QLP fell subpar by meeting the customer's expectations but not exceeding them. Employees took an average of 22 minutes to respond to customer inquiries and the problems faced took around 5.2 days to resolve.



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# NOTHING

The Aerospace Industry is a broad industry which scopes the manufacturing, repair, and maintenance of commercial and military aircrafts. Being a high-tech industry, businesses incur high costs with low volume output limiting businesses from entering and surviving in the market (KPMG, 2019). There were 937 businesses operating within the aerospace industry as of 2018 (KPMG, 2019). Largely comprising of small to medium businesses with a revenue between 50,000 and 200,000 dollars a year (KPMG, 2019). However, growth in the market share of big players means an increase in the outsourcing and subcontracting to smaller players in the industry (KPMG, 2019). Businesses employment is limited with over half of the businesses non-employing (sole proprietors or partnerships) and 380 employing less than 20 employees (KPMG, 2019). There is large diversity of work in the industry, large share of defence production with increase government funding as a part of federal government Defence Export Strategy (2018). Additionally, the improvement in the processing of data from people and manufacturing have been utilised to develop predictive maintenance, helping to improve efficiency in the industry. Growth opportunities and barriers faced by business in the aerospace industry include shortage of technical talent, education and training programs struggling to align with industry needs. Update of regulatory framework (1998) to better align and harmonise with international standards and legislation is currently being undertaken (KPMG, 2019). A lengthy and expensive process in the short term which will help to enable businesses to operate seamlessly globally. An article written by Olivia and Kallenberg (2003) writes “Customers expect a solution to include processes directed at understanding their requirements, customizing and integrating products, deploying them, and supporting them on an ongoing basis” (Oliva & Kallenberg, 2003) highlights the importance of coordinating solutions which the customer will be satisfied with. Demonstrated by the real data analysis of surveyed clients’ recommendations which reflect the company operation can be derived. The data were collected from surveying 176 clients of the company based on their assessments regarding service – related and engineering – related aspects of the software company.

# Identification of the business problem

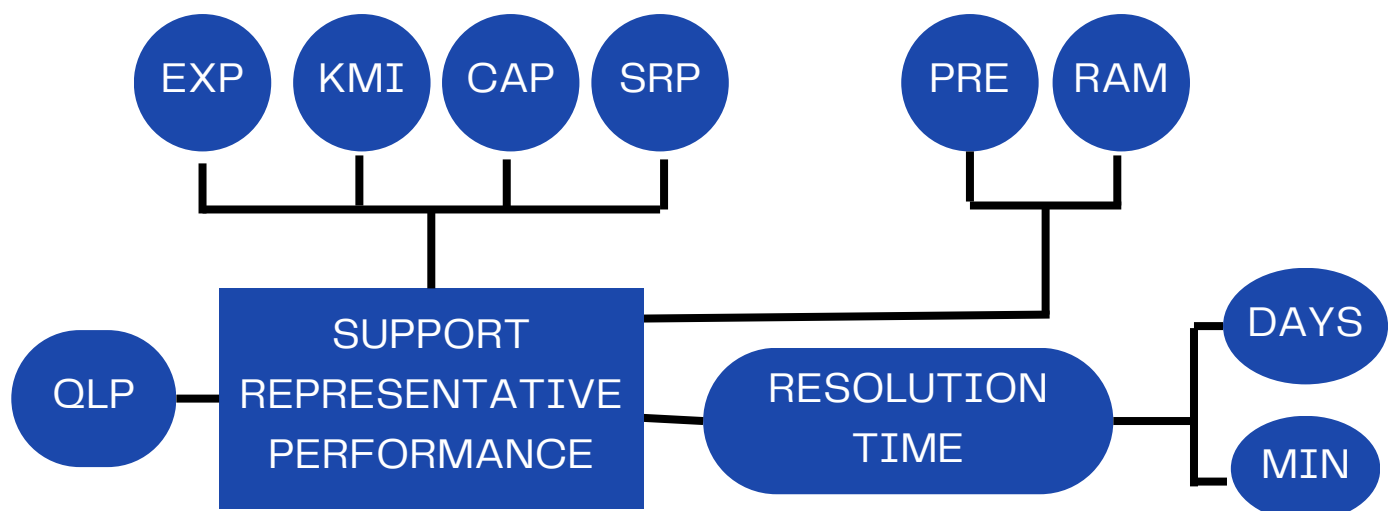
## The Business Problem:

This report answers questions on the overall performance of the support representatives' ability to effectively respond, explain and resolve clients' problems in an acceptable amount of time.

There will be 6 questions addressed in this report:

1. Discuss the service-related and engineering-related performance of a software company.
2. Did the support representative explain the process for resolving clients' problems?
3. Did the support representative inform clients about the progress in resolving the issue?
4. Was the clients' problem resolved in an acceptable amount of time?
5. Overall, how did clients find the service provided by the technical support team of the software company?
6. What was the client's perception of the product's quality?

By identifying the 6 questions through analysis, a deeper understanding of the business problem faced by the software companies. As a result, we analysts will receive a clearer understanding of how to improve service and engineering-related issues and ultimately provide informed recommendations for the software company. By doing so, we can distinguish ourselves within the competitive Aerospace industry.



# Review of past findings and the context

The past findings and the context related to customer service in the aerospace industry are defined in this part. The context is that Customer support is up and running in a business that makes \$20 million a year and targets \$100 million over the next few years. Customer Support at a company in the aerospace industry had a big problem with how they were operating. The workload is constantly increasing every day due to customers' growing needs, and they need to handle the demands that customers give promptly. Due to a large number of customer complaints and low customer satisfaction ratings, they are experiencing severe issues. Long delivery times and poor-quality provided products are the cause of this issue. Besides, the lack of human resources and staff lack experience in handling customers' problems in a reasonable time and explaining the situation to customers. Therefore, the company has also identified the issue and found a solution. The company has added human resources and trained them in customer service skills, such as communication, persuasion, and quick information processing. After applying the innovative method of operation in serving customers, the company has received much positive feedback about its services and employees (Caniels, Marjolein C.J. & Gelderman, Cees J, 2005).

One more of the past findings: website problems of the company. In the past, the aerospace industry confronted several difficulties in customer relationships. A significant concern has been safety, especially in the wake of high-profile incidents like the crashes of the Boeing 737 Max aircraft (Johnson 2020). This has caused a loss of trust among some customers and necessitated a reevaluation of safety protocols and customer communication strategies by aerospace companies. Cost management has also become an issue in the aerospace industry, with some consumers believing they are being overcharged for services or products. This has created tension between aerospace companies and their clients, necessitating more open pricing structures and negotiations (Bruno 2022). In addition, there have been concerns regarding the quality of customer service provided by certain aerospace companies. Some customers report poor communication and response times when issues or problems arise. This has necessitated that businesses invest in enhancing their customer service processes and providing more personalized assistance to customers. Overall, the aerospace industry's relationship with its customers has been complex, with numerous challenges and development opportunities in areas such as safety, cost management, and customer service.

Ferreira et al. (2016), points out that finding a solution to a “predefined customer problem can evolve to take on a much wider scope, creating a new market space and changing the competitive environment”.

# Methodology

The data used in question 1 will be service-related variables such as EXP, KMI, CAP, and SPR along with engineering-related variables PRE, and RAM. The methods used for analyzing each individual variable will be frequency testing through descriptive statistics to see what statistics stand out in the dataset and discuss if they have an effect on the software company. We will use such tests as our methods because they will reveal key observations such as MEAN, MEDIAN, MODE, Standard Deviation, and visual percentages of where the data lies which will be useful in discussing their effects on the company as a whole.

Similar methods will be used for questions 2, 3, 4, and 5. The descriptive analytics will again provide a clear understanding of what scores (0,1,2,3,4 ) control the dataset, what the averages are, how much variance is within each variable, and if key variables have an effect on each other. Additionally, frequency tests alongside frequency histograms will be used to give a visual understanding of what the data looks like. For question 2 data within EXP and PRE will be used alongside a correlation test to see if there is a linear relation between the two metric variables EXP and PRE. If linear relation is present it will be concluded that support representative explanation has an effect on the process of resolving clients' problems.

Variable KMI will be used to find out if the support representatives informed clients about the progress in resolving the issue. Both Frequency distribution tests and histograms will be looked at to determine where the customers stand in regard to KMI.

The fourth question will be addressing both variables RAM and Resolution Time (days, minutes). Frequency distribution will be executed on the data included in RAM alongside a group frequency distribution test amongst both days and minutes for variable resolution time. Specific customer responses of the dataset will also be used to support our explanation of how outliers can affect these tests. RAM and Response time will necessary in trying to answer if the clients' problems were resolved in an acceptable amount of time.

Variable SPR will be addressed in question 5 in regards to the service provided by the technical support team and if this met the client's needs. Both descriptive statistics and a frequency test will be necessary once again. Results from the analysis of SPR throughout these tests will give us a greater understanding of how clients feel towards the software company's service communicated.

Finally, for question 6 we will be using a different type of analysis called Regression Analysis. In addition to regression, we will also utilize methods such as MEAN, MODE, SD, and variance from a frequency test to further understand how QLP has an effect on the software company. Our justification for running a regression test is so that we can see if there is any relation between the performance of variable QLP with any of the other services and engineering-related performances.



# Findings and Implications

As seen in **(1a.)** EXP and SPR held a mean of 2.98 which revealed that on average employees met but did not exceed customer expectations of how well the process was explained and the service that was provided. The variable KMI exhibits a mean of 3.00 which tells us that employees exceeded the customer's expectations of how well they were kept informed about their problems at hand. The most common score for KMI was 4 indicating that staff greatly exceeded patron expectations. The final service-related variable CAP produced the highest mean of 3.25 indicating the highest performance within the service and engineering-related variables. Engineering-related variables RAM and PRE scored means of 3.07 and 3.00 indicating exceeded expectations of not only resolving the problem at hand but in a mannerly amount of time. The most common response within all variables was a score of 4.00 concluding that employees at the software company greatly exceeded customer expectations for both service and engineering-related performances. Through analysis of the service and engineering-related performances provided by customer survey responses, we analysts believe that there are improvements to be made in explaining the processes and the services provided to patrons. Additionally, staff excelled at being courteous and professional at all times holding great value to the software company and should be credited for being a core value within the company. SPR held the highest standard deviation of .99113 revealing the greatest variance of customer responses. For the software company,, enhancements should be made to aim for a greater degree of uniformity in the opinions expressed by customers. The service provided by EXP held the lowest standard deviation of 0.87, with low va of customersponses. For the soe

Analysis of the correlation coefficient communicates both strength and direction of the linear relationship between two metric variables **(7a.)**. Analysis of EXP and PRE found a Pearson correlation of 0.871 falling into the coefficient range of +0.81 to +1; -0.81 to -1.00 holding a very strong positive strength of association. A correlation (  $r$  ) closer to positive 1 indicates a linear relationship between variables therefore  $r = 0.871$  indicates a linear relationship between EXP and PRE. What this means is that a more thorough explanation of the process provided to customers will hold a higher rate of success in resolving clients' problems. Refer to Table **(2a.)**

Analysis of the variable KMI showed as follows. **(3a.)** Information relayed to customers throughout the progress of their problems within the company held a majority response of “greatly exceeded expectations” with a percentage of 38.6%. The mean of responses was 3.00 or “exceeded expectations”. Only 4 customers felt that their expectations were marginally met; contributing to 2.3% of the total sample. The second most frequent response value was “met expectations” at 34.1%. As seen in graph **(3a.)** it can be seen that the mean (exceeded expectations) is lower than both “met, and greatly exceeded expectations”. This variation in data can be explained by the standard deviation being 0.907 concluding that Information was not evenly distributed amongst keeping customers informed. Having inconsistencies with keeping customers informed of the progress of the problems they are facing negatively impacts the software company as customer perception of the company falls and their overall opinion of the QLP diminishes. With this known, strong KMI scores can reassure customer awareness of how the software company is addressing the problems at hand.

Running a frequency distribution of variable RAM **(4a.)** (resolved in an acceptable amount of time) revealed 40.9% of the customer's expectations of their problems being resolved in an acceptable amount of time were greatly exceeded. 34.1% exceeded expectations, 18.2% met expectations, 4.5% marginally met expectations and 2.3% did not meet expectations. Variables resolution time - (days, minutes) play a crucial role in determining if the customer issues were resolved in an acceptable amount of time or not **(4c.)**. The analysis uncovered that customer support representatives took an average of 5.23 days to resolve the problems, and 21.91 minutes to address such problems. Although the most common response times were 2 minutes and the most common turnaround time for problems was 7 hours this was not the case for all of the inquiries. For example, respondent 28 waited 118 minutes to receive a response and 71.68 days to resolve the problem. Similarly, respondent 58 didn't receive a response for 24 minutes and the problem was resolved in 23.24 days. Cases such as respondents 28 and 58 give us an understanding of what influences the mean and how just a few outliers of datasets can skew the mean and misrepresent the results as seen in **(4b.)**. The software company met the expectations of 164/176 respondents regarding how long it would take representatives to solve their problems in an acceptable amount of time.

Using descriptive statistics a frequency test was executed for variable SPR **(5a., 5b.)** revealing a mean of 2.98 with a standard deviation of 0.991; a large variation in the mean exhibits varied customer opinions of the service provided by the software company. It was found that 9.1% of customers felt that the company marginally met expectations, a comparatively high result to expectations marginally met by RAM. 22.7% of respondents felt expectations were met, 29.5% of expectations were exceeded and 38.6% were greatly exceeded.

The majority of responses were concentrated evenly across x-values 2 - 4 **(5c.)**. From these statistics, it is inferred that customer opinions regarding the service varied across the 176 responses and greater consistency must be strived towards for greater 4 value responses in the future. Being able to resolve customer problems in a timely manner reflects positively on the software company. Supporting existing customers improves ROI as the software company gains customer retention. The cost of acquiring new customers is more expensive than retaining existing ones. ROI is also created by adding up the small values regained across thousands or millions of customers and using the right predictive analytics tools.

Through analysis of variable QLP, it can be seen in table **(6a.)** that the client's perception of the product's quality was deemed overall very good with a ratio of 40.9%. Other opinions of the product quality fell under "good" and "excellent" with percentages of "29.5%" and "27.3%". Of Course, outliers exist, contributing to 2.3% of responses considering the quality being "poor". The mean was found to be 2.93, falling under "good". Using multiple regression analysis on the engineering and service-related variables as independent variables and QLP as the dependent variable uses predictive analytics to explain the impact existence (if any) between the variables **(6b.)**. Running this analysis found high p-values for variables EXP, KMI, CAP, PRE, and RAM - 0.19, 0.41, 0.74, 0.72 and 0.98. A p-value higher than significance level 0.05 means the independent variables have no impact on the dependent variable (QLP). Variable SPR resulted in a p-value of 0.004 which is less than 0.05 therefore service provided is the only service and engineering-related variable which will impact the quality of the software product. R square is used to explain how much variation in the dependent variable can be explained by the independent variables. An adjusted R square will account for overfitting, the model produced a value of 0.345. Therefore the model explains only 34.5% of the variation in the quality of the product. The results indicate there is a weak relationship between engineering and service-related variables and the quality of the software product. The quality of the product can not be predicted using regression analysis for the model to be reliable the significance levels must be below 0.05. From the results it can be determined that 48 respondents felt the quality of the product was "excellent" and 52 were considered "good", with this known we can comfortably say that the software company must focus on achieving greater response numbers in "excellent" if an improvement of the mean is desired such as in this case scenario. The client's overall perception of the QLP (quality of product) is vital to the software company's success as this is the pinnacle of their services. The quality of the product being delivered to customers is of utmost importance as a company with poor product quality will not only lose existing customers but will struggle in the acquisition of new customers. Values such as "very good" and "excellent" must hold possession of at minimum 50% of the dataset and values such as "poor" and "good" must be constantly driven as close to 0% as possible.

# Recommendations and Conclusion

This report examines the clients' support surveys of a Software company serving the Aerospace industry. Examining customer interactions with the support team in regard to resolving problems. The software companies' performance in engineering related variables RAM and PRE 'exceed expectations. On the other hand, service-related performances did not all exceed expectations as EXP and SPR had only "met" client expectations. Variable CAP performed the best based on the data given scoring the highest mean of 3.25. Based on these conclusions we recommend that the software company focus investment into the improvement of specifically EXP and SPR and aim for an overall perception score of at least "3 - exceed expectations". The relationship between variables EXP and PRE provided insight into how the explanation process can improve the rate at which problems are resolved. We advise using this to the company's advantage by investment in staff's ability to concisely explain case processes and progress clearly. The company's support representatives showed strength in their overall ability to keep clients informed on the progress of problems being resolved. To further improve and achieve experiences that "greatly exceeded expectations" we suggest encouraging employees not only to respond quickly to problems but to also consistently update the client on progress being made, solutions found etc. Variable RAM did exceptionally well in exceeding the expectations of how well client problems would be resolved. We recommend that the time regarding the resolution of these problems can be improved. It is suggested that in "days" the resolution time should take at most 3 days and the response time should take at most 10 minutes. We guide the software in the direction of having a near 50% reduction in response time and resolution time for a couple of reasons. One is that a quicker response time will build trust in the client's eyes regarding the company's ability to handle their problems quickly. Another reason to reduce problem resolution times by 50% is so that we can increase customer satisfaction and in return build customer loyalty to the company and retain existing customers. Not only will it be a good impression on existing customers we have to consider potential too, having quick turnover rates will be the first impression we can leave on the new consumer.

The service provided to customers is also a very important variable in that this is how customers view the company's value; their service. 9.1% of responses did marginally meet expectations and this needs to be much lower, of course striving for 0%. Having 0% of responses falling into "marginally met expectations" will lower response variance and give greater value to the service provided. The client perception of the product's quality primarily fell under "very good" the variable SPR having the highest influence out of the variables service and engineering variables. The company's product quality is impacted by technological innovation, however, the client's perception of the quality is primarily derived from the client's user experience and the quality of service provided by the company.

We advise Improvement in customer service performance due to customer service being a powerful tool in differentiating from competition and leaving an impression within the market. This can be achieved by hiring and training employees to facilitate growth in customer service skills and behaviour performance. Personalised client interactions should be created within each case so that the customer's value can be evident in each problem at hand. We also recommend that with the trial of the recommendations made an additional survey should be conducted in a month's time to track changes and improvements made to each of the variables. In addition to another survey being conducted, more customer problems included in the survey will prevail more precise data and a more precise understanding of what variables still/ can be improved upon.

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## Appendices:

1a. –

**Service and Engineering-Related Variables**

		Explained the process (EXP)	Keep me informed (KMI)	Courteous and professional (CAP)	Service provided (SPR)	Problem resolved (PRE)	Resolved in an acceptable amount of time (RAM)
N	Valid	176	176	176	176	176	176
	Missing	0	0	0	0	0	0
Mean		2.9773	3.0000	3.2500	2.9773	3.0000	3.0682
Median		3.0000	3.0000	4.0000	3.0000	3.0000	3.0000
Mode		4.00	4.00	4.00	4.00	4.00	4.00
Std. Deviation		.86820	.90711	.95917	.99113	.90711	.98903
Variance		.754	.823	.920	.982	.823	.978

2a. –

**Correlation of Variables EXP and PRE**

		Explained the process (EXP)	Problem resolved (PRE)
Explained the process (EXP)	Pearson Correlation	1	.871**
	Sig. (1-tailed)		<.001
	N	176	176
Problem resolved (PRE)	Pearson Correlation	.871**	1
	Sig. (1-tailed)	<.001	
	N	176	176

\*\* . Correlation is significant at the 0.01 level (1-tailed).

3a. –

**Keep me informed (KMI)**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	marginally met expectations	4	2.3	2.3	2.3
	met expectations	60	34.1	34.1	36.4
	exceed expectations	44	25.0	25.0	61.4
	greatly exceed expectations	68	38.6	38.6	100.0
	Total	176	100.0	100.0	

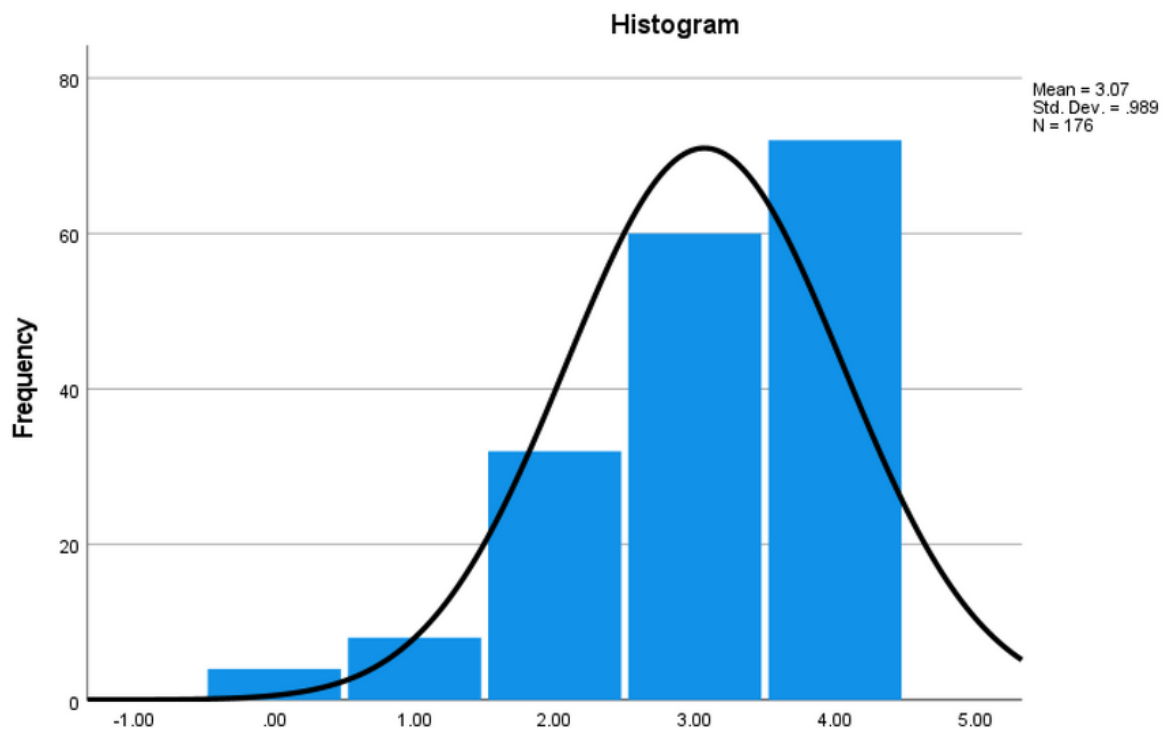


4a. –

### Resolved in an acceptable amount of time (RAM)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	did not meet expectations	4	2.3	2.3	2.3
	marginally met expectations	8	4.5	4.5	6.8
	met expectations	32	18.2	18.2	25.0
	exceed expectations	60	34.1	34.1	59.1
	greatly exceed expectations	72	40.9	40.9	100.0
	Total	176	100.0	100.0	

4b. –



4c. –

### Resolved in an acceptable amount of time (RAM)

#### Resolution Time (days, minutes)

	Resolution Time (Days)	Response Time (min)
N	176	176
Valid	176	176
Missing	0	0
Mean	5.2314	21.9091
Median	.2250	19.0000
Mode	.03	2.00 <sup>a</sup>
Std. Deviation	13.36872	19.31847
Variance	178.723	373.203
Range	71.67	116.00
Minimum	.01	2.00
Maximum	71.68	118.00



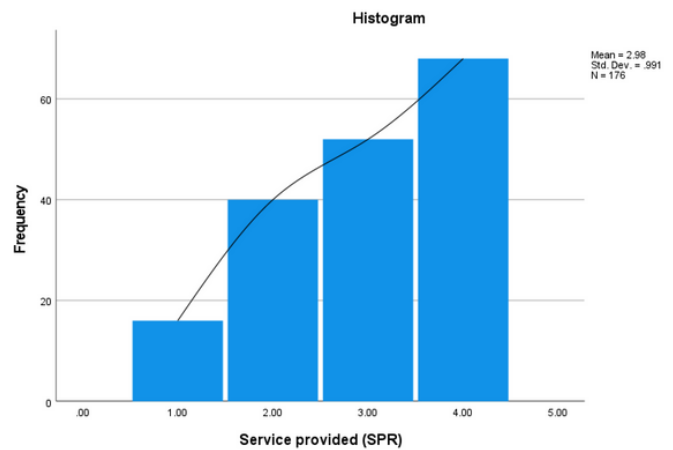
5a. –

**Statistics**

Service provided (SPR)

N	Valid	176
	Missing	0
Mean		2.9773
Median		3.0000
Mode		4.00
Std. Deviation		.99113
Variance		.982

5c. –



5b. –

**Service provided (SPR)**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	marginally met expectations	16	9.1	9.1	9.1
	met expectations	40	22.7	22.7	31.8
	exceed expectations	52	29.5	29.5	61.4
	greatly exceed expectations	68	38.6	38.6	100.0
	Total	176	100.0	100.0	

6a. –

**Quality of the Software Product (QLP)**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	marginally met expectations	4	2.3	2.3	2.3
	met expectations	52	29.5	29.5	31.8
	exceed expectations	72	40.9	40.9	72.7
	greatly exceed expectations	48	27.3	27.3	100.0
	Total	176	100.0	100.0	

6b. –

**Regression of service and engineering variables<sup>a</sup>**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.422	.203		7.019	<.001
	Explained the process (EXP)	.213	.160	.228	1.328	.186
	Keep me informed (KMI)	-.113	.137	-.127	-.829	.408
	Courteous and professional (CAP)	-.031	.093	-.037	-.336	.737
	Problem resolved (PRE)	.044	.124	.050	.359	.720
	Resolved in an acceptable amount of time (RAM)	-.002	.094	-.003	-.025	.980
	Service provided (SPR)	.400	.138	.489	2.911	.004

a. Dependent Variable: Quality of the Software Product (QLP)

7a. –

Coefficient Range	Strength of Association*
+.81 to +1.00; –.81 to –1.00	Very strong
+.61 to +.80; –.61 to –.80	Strong
+.41 to +.60; –.41 to –.60	Moderate
+.21 to +.40; –.21 to –.40	Weak
+.20 to –.20	Very weak