Quantitative Methods

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Course

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**v**

**Task 1(440 words)**

**Introduction**

As Matrix designers endeavours to provide support services to their customers, they established a call centre where clients can call to resolve their issues. The company designs, manufacture, sell and support computer network equipment. The management would benefit by analyzing the information on calls that the clients make as they can get insights on the improvement they need to make on their products to minimize device failure or knowledge gaps existing in consumers on how to company products. This analysis examines some of the issues raised in the call centres and aims to recommend improvements that the company can make on its devices to make them usable by consumers with minimal failure.

**Analysis and results**

**Best and least performing call agent**

The call centre agent's performance is determined by the number of calls they handled during the period. Table 1 below shows the number of calls that each agent handled.

Table 1: Calls handled by each agent.

|  |  |
| --- | --- |
| **Call Handler** | **Number of calls handled** |
| Liz | 912 |
| Mary | 878 |
| Emma | 871 |
| Greg | 826 |
| Gemma | 808 |
| John | 745 |
| **Total** | **5,040** |

Table 1 shows that the total number of calls handled in the period is 5,040. Liz is the best performing agent because she handles 912 calls, while John is the least performing agent as he handles 745 calls.

**Issues raised by customers**

The objective behind setting up a call centre is to address customer issues. When the customer calls, the issues are recorded accorded accordingly. Some of the issue categories are production query (PROD), order query (ORD), and cancellation (CAN), amongst others. An analysis of the frequency of issues raised by customers is presented in chart 1 below. The findings are that the three leading causes of queries are accounts query, cancellations and product died. On the other hand, the three most minor sources of issues are product queries, set-up problems and unexplained problems.

Chart 1: Number of issues by category

**Descriptive statistics**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| *Description* | *Emma* | *Gemma* | *Greg* | *John* | *Liz* | *Mary* |
|  |  |  |  |  |  |  |
| Mean | 43.55 | 40.4 | 41.3 | 37.25 | 45.6 | 43.9 |
| Standard Error | 2.52 | 2.29 | 2.52 | 1.76 | 2.54 | 2.68 |
| Median | 43 | 39.5 | 41 | 37 | 43.5 | 43 |
| Mode | 49 | 37 | 33 | 41 | 38 | 44 |
| Standard Deviation | 11.3 | 10.2 | 11.3 | 7.9 | 11.4 | 12.0 |
| Sample Variance | 126.7 | 104.5 | 127.0 | 62.1 | 129.2 | 143.5 |
| Kurtosis | 4.9 | 3.5 | 1.7 | 0.6 | 1.5 | 6.0 |
| Skewness | 0.9 | 1.2 | 1.0 | 0.5 | 1.1 | 2.0 |
| Range | 60 | 49 | 50 | 33 | 47 | 54 |
| Minimum | 18 | 22 | 22 | 23 | 27 | 30 |
| Maximum | 78 | 71 | 72 | 56 | 74 | 84 |
| Sum | 871 | 808 | 826 | 745 | 912 | 878 |
| Count | 20 | 20 | 20 | 20 | 20 | 20 |

The descriptive statistics above show the characteristics of call distribution in April 2015. Liz handled most of the queries (926), while John handled 745, which were the least.

**Number of calls against time**

Chart 2 shows that the number of calls is high in the morning and gradually reduced as the call centre nears closing hours. The trend shows that the number of calls made from 9 am to 3 pm is 58 (657-599). This trend indicates that the call centre is busy throughout the day, and the agents handle client issues consistently with minimal breaks.

Chart 2: Number of calls against time

**Resolutions**

A resolution is a solution that leads to the closure of the issue raised by the customer. The analysis in chart 3 shows that most customer issues were addressed by checking the order record. There were 761 order-related issues followed by resolutions solved by the sales team, going through the product selection tree and so on. The three most minor resolutions were going through the packaging list, raising a query with finance and arranging for good returns.

**Chart 3: Resolution Frequency**

Customers often raise concerns related to the statement of accounts. Some resolutions adopted to resolve these issues are checking order records, sharing information with the sales team, and going through the product selection tree, as shown in chart 3.

**Conclusion**

The teams involved in processing client orders should cooperate to ensure that the information captured in the order details is correct so that the accounting team can record the client's information correctly. That will help reduce customer queries by 50% because a total of 3,376 issues raised are resolved by checking records used to process invoices sent to clients. Increasing the accuracy in processing orders will also reduce the number of staff required in the call centre.

**Task 2 (450 words)**

**Section 1: Equations for Calculating the total costs**

There are 8 working hours in a day (0900hrs to 1700hrs)

Current wages per hour = £12.00

Suppose that the number of agents is represented by P, and 22 days in a month as the agents are not working on weekends.

Total wages paid to the agents = 22\*12\*8\*p = £1,112p

Training costs are the fixed cost = £ 300

Administrative cost =x; when the employee is <6, cost = £150x. When the number of employees is greater than 6, the administrative cost = 0.8\*150\*x = £120x

Let the number of hours a team leader trains =y, the total training cost = £15y

*Equations when the total number of employees is less than 6:*

Let the total cost = C

C1= £ 300 +£1,112p+150x

*Equations when the total number of employees is greater than 6:*

C2= £ 300 +£1,112p+120x+£15y

**Section 2: Cost Estimation**

The number of calls made in the month was 5040. Assuming that the number of calls is constant and each agent is expected to handle 30 calls daily, the total number of calls an agent should handle per month is 30\*30 =900. Therefore, to process 5040 calls, the total number of agents required are as follows

Number of agents required per month = = 5.6 agents, rounded up to 6 agents

Since the company has 6 agents, equation C1 will be applied.

C1= £ 300 +£1,112p+150x

Forecast cost = £ 300 +£1,112\*6+150\*6 =£7,872

Upper bound =£7,872

Lower bound =£1,562

Forecast = £7,872

**Section 3: Trend line**

The trend line is determined by the number of calls

Chart 4: Number of calls against the number of agents

The equation of Y = 660x implies that each day, each agent will be expected to make 660 calls per month because there are 22 days and 30 calls are made daily.

**Section 4:Executive summary**

Based on the analysis above, it is apparent that as the number of calls increases, the cost of running the calls department increases. If the management decided to put a limit on the number of calls an agent can receive to 30 calls daily, there is a risk that the benefits attained by being able to handle customers' issues and addressing them through the call centre will exceed the costs incurred to run it. As a result, the management should examine the economic effect of their decision before launching its implementation. The limitations of my analysis are that it assumed that the training cost was assumed to be a fixed cost, but it could vary from time to time (Bass, 2018). In addition, training is unlikely to be offered for two consecutive months, but the model assumed that was the case. Moreover, the number of staff required to run the call centre was estimated to be 5.6 but rounded up to 6. The model to predict the number of calls anticipated per month used 6 employees, meaning that the actual number of calls may be lower than those estimated by the model.

**Task 3 (704 Words)**

**Introduction**

Entrepreneurship is essential to economic development because it gives rise to new businesses. However, various factors may affect entrepreneurship development, which is either external or internal. This task examines how people across different countries perceive entrepreneurship and the factors that affect entrepreneurship. The task has been executed about entrepreneurial behaviour and attitudes and entrepreneurial framework conditions in the United States, United Kingdom and Brazil

**Key insights/ Analysis and Interpretation**

**Perceived opportunities**

Chart 5: Perceived opportunities

The respondents perceived opportunities indicate the likelihood that an entrepreneur can find a new business that he/she can start. Brazil had the highest number of perceived opportunities between 2000 and 2015. The United States had the highest perceived opportunity in 2016 and 2019. According to (Griffee, 2019) perceived business opportunities are determined based on the gaps in the market and unmet customer needs. Chart 5 shows that in the initial years, between 2004 and 2007, the United Kingdom market had higher opportunities than the United States. However, the perceived opportunities in the United States remained above UK's from 2008 onwards.

**Fear of failure**

The fear of failure shows the uncertainty entrepreneurs perceive to exist in a particular business environment. Brazil and the UK had the highest fear of failure rate during the period, as shown by chart 6, while the United States remained low. Since the United States had the lowest fear of failure, an entrepreneur can conclude that it is better to invest in new opportunities in the United States than in Brazil and the UK. The increase in failure rates observed in the UK market between 2019 and 2021 resulted from Brexit and the effects of Covid-19 on economic performance (Amadeo, 2022). This made entrepreneurs have negative perceptions of the likelihood of a new business succeeding in the Uk amid the prevailing economic and political environment.

**Chart 6: Fear of failure**

**Entrepreneurship as a good career**

Brazil's respondents considered entrepreneurship a promising career compared to the United Kingdom and the United States. (Griffee, 2019) notes that entrepreneurship is considered appropriate when there are opportunities to exploit. These findings rhyme with the findings that Brazil is perceived to have more opportunities than the United States and the United Kingdom. Chart 7 shows that some data was missing, but the trend is apparent. In the UK, entrepreneurship is deemed a less likeable career than in the US and Brazil.

Chart 7:Entreprenuership as a good career

**Factors affecting Entrepreneurship**

Chart 8: Financing for entrepreneurs

Raising the capital required to finance a business is one of the challenges faced by entrepreneurs. In order to operate profitably, entrepreneurs must raise capital at a lower cost to reduce their operational costs (Dillon, 2022). Over the years, the US respondents considered raising capital to finance their business as one of the main challenges they experienced, especially between 2013 and 2019. Respondents from Brazil had the least concerns about financing their businesses, which indicates that they are satisfied with the laws regulating access to credit for entrepreneurs, as shown in chart 8.

**Chart 9: Tax and bureaucracies**

Taxes reduce the entrepreneurs' income as it is an expense to the business. The United States and the UK hinder the initiation of new business opportunities through their tax and bureaucracies for starting new businesses. However, Brazil has lower taxes and bureaucracies, making entrepreneurial opportunities prevalent. Chart 9 shows the trend of the impact of taxes and bureaucracies

**Hypothesis**

**Hypothesis 1:**

H0: The fear of failure in the United States is the same in the UK

H1: The fear of failure in the United States differs from the UK.

The hypothesis should be tested by setting the significance level at 5% and collecting the relevant data to test it (Glen, 2019). Collect 30 or more observations of failure rates. Set the null and alternative hypotheses as follows

HO: U1= U2

H1 : U1#U2

Where U1 is the average failure rate in the US and U2 is the average failure rate in the United Kingdom

The results obtained from analyzing the collected data are analyzed, and the z-critical value obtained is compared with the z-value from the table (Glen, 2019). If the z-value calculated is greater than the table's z-value On the other hand, if the value Z-value from the table is greater than the z-calculated, it fails to reject the null hypothesis.

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