

Assignment 2 1602826

by Sean Jones

FILE	10202_SEAN_JONES_ASSIGNMENT_2_1602826_179131_1263840927.DOCX (296.84K)		
TIME SUBMITTED	21-MAY-2021 02:58PM (UTC+0100)	WORD COUNT	3040
SUBMISSION ID	154320773	CHARACTER COUNT	15297

Course: BSc (Hons) Electrical and Electronic Engineering
Module: SGEE6004 Engineering Management
Assignment: Total Engineering Management
Name: Sean Jones
University number: 1602826
Date submitted: 21/05/2021
Word count: 3044

Contents

Task 1 3

Task 2 6

 SWOT 6

 PESTLE 7

 Porter’s Five Force Analysis 7

Task 3 8

Task 4 11

Task 5 13

Works Cited.....15

Task 1

a)

Nutek States "Design of Experiments (DOE) is a powerful statistical technique introduced by R. A. Fisher in England in the 1920's to study the effect of multiple variables simultaneously." (2021) it goes on to mention that Taguchi didn't start experimenting with this quality technique until the 1940s. the modern method of using DOE is Taguchi's approach which is a more standardised easy to use method. This method is almost a trial-and-error experiment where the factors and variables that go into the production and varied to obtain the optimum output. K. KRISHNAIAH (2012) suggests that cost saving can be a major output from this method as varying the inputs into a process it can be discovered which items have greater affect on the output. If the desired output can be achieved with more of the cheaper input and less of a more expensive input an overall cheaper output can be achieved. For example, if there was compressed air and oxygen going into a process, if it was found the amount of oxygen was negatable after a certain floe rate but compressed air was more affective then it would be cheaper to use the compressed air. Roy (2001) suggests

The initial step of DOE is to firstly decide what the variable inputs that will affect the outcome of the process that are going to be used in the analysis. The best inputs to choose are ones that will likely have a large impact on the output as well as ones that may reduce the process time or cost. Its also wise to decide what output is going to be monitored from these tests such as size, distortion or surface finish.

The second stage is to select the correct orthogonal array which is determined by the number of inputs that are to be monitored along with the number of variants of that input. For example, if it was temperature, it may be chosen to use 3 setpoints. The array will tell the person conducting the experiment which parameters to use on each test.

The next stage is to conduct the tests using the chosen array this then allows the decision of the signal to noise ratio. This is split up into 3 parts, smaller the better, nominal the better, larger the better. This is to fine tune the outputs from the experiments to highlight the correct data at the end of the experiment.

The final step is to use the data at the end of the experiment to see what the most affective input variable was to the output to determine the optimal values. This can then be judged against other factors such as time and money to develop the most suited inputs.

b)

$$\sum T = 182$$

$$T = \frac{182}{9} = 20.22 \text{ Average deterioration}$$

$$A1 = \frac{20 + 12 + 10}{3} = 14$$

$$A2 = \frac{48 + 28 + 20}{3} = 32$$

$$A3 = \frac{20 + 16 + 8}{3} = 14.7$$

$$B1 = \frac{20 + 48 + 20}{3} = 29.3$$

$$B2 = \frac{12 + 28 + 16}{3} = 18.7$$

$$B3 = \frac{20 + 10 + 8}{3} = 12.7$$

$$C1 = \frac{20 + 20 + 16}{3} = 18.7$$

$$C2 = \frac{48 + 12 + 8}{3} = 22.7$$

$$C3 = \frac{10 + 28 + 20}{3} = 19.3$$

$$D1 = \frac{20 + 28 + 8}{3} = 18.7$$

$$D2 = \frac{12 + 20 + 20}{3} = 17.3$$

$$D3 = \frac{10 + 48 + 16}{3} = 24.7$$

The parameters are ranked from the most effective to least effective in the amount of effect that it made.

The differences where;

Parameter	Difference
A	18
B	16.6
C	4
D	7.4

A is the most effective setting to adjust deterioration and c is the least effective.

The best parameters to use would be A1, B3, C1 and D2. If these parameters were used the expected outcome would be;

$$\frac{14 + 12.7 + 18.7 + 17.3}{4} = 15.7$$

c)

The A2 was changed to A3 as for the sake of 0.3 it has saved £300 each load. C1 was changed to C3 to reduce the time from 2 hours to 1.5 hours. This added 0.6 onto C average. The expected outcome was calculated below.

$$\frac{14.7 + 12.7 + 19.3 + 17.3}{4} = 16$$

A	Cost	2500	2200
---	------	------	------

B	Temp	650	650
C	Time	2	1.5
D	Additive	4	4
deterioration		15.7	16

Task 2

SWOT

According to Sarsby (2016) SWOT uses a 4-box strategy from the acronym of SWOT. He also claims that SWOT is the most widely used tool in engineering management. It is a simple to understand in principle with only a simple diagram and no calculations. The outcome of SWOT is only as good as the honesty that goes into it as it is an opinion of the factors that make up the company. This technique helps identify a strategy for business improvements.

Strengths

According to Dergisi (2017) the strengths are internal attributes of the company that benefit it. Seth (2015) suggests that the strength of a company can be;

Financial - this includes a good cash flow in the company, a good credit score or strong investors.

Technology - this can stretch from resources such as manufacturing equipment such as CNC Milling over to knowledge in areas that might excel over companies.

Customer service – this is the quality of service that is given to the customer during and after the purchase. This might be advising and trials given to the customer before the purchase and support and interest with the customer after the purchase. The company's reputation is heavily based off customer service.

People – this is the quality of employees in the company down to the range of skills that they may have that is an asset to the company. If the company trains employees up to a high standard that is a strength. Commitment of employees is also considered

Weakness

According to Lambert M. Surhone (2010) the weaknesses of a company are the parts that go against it. Negative internal factors are weaknesses. These are examples of weaknesses;

Financial – if the company is dept or its outgoings are greater than its incomings and its heading to go into dept.

Out dated – old methods of production and technology which are inefficient and unreliable at producing a quality product.

Customer service – poor support with customers, being unreliable on delivery times

People – low number of skilled workers or a big turn over of employees. Not training employees is also considered a weakness.

Opportunity

Mohamed Abdel-Basset (2018) suggests the opportunities are external factors that might help the company. Examples of these are;

End users – if new social trends occur then the end users may instigate purchases.

Competitors – competitors companies going out of business and no longer becoming a threat.

Technology – new technologies can allow a company to thrive from improving processes.

The law – changes in law may cause opportunities to companies.

Threats

These are external factors that might disbenefit the company, for example;

New competitors – new competitors entering the market might get the companies current customers.

Reputation loss – an external factor could damage reputation, for example if a company did a review on a product produced by the company and it was negative to the product it could influence buyers.

A SWOT analysis then looks at linking the threats and opportunity with the strengths. This then gives the strategy in how to remove as many threats as possible. Its poor practice to use a swat analysis as an appraisal for the company its more effective to use it to perfect.

PESTLE

According to Perera (2017) Pestle is an acronym for the areas it considers, political, economic, sociological, Technological, legal, Environmental. CIPD states” It offers people professionals insight into the external factors impacting their organisation.” (2021). This tool is also used to find a strategy for the company to improve. This is implemented in a similar fashion to SWOT where the positive and negative factors of each area are listed. The strategy is derived from looking at the points made and deciding where improvements can be made. This method again is reliant on the accuracy put into it by the person conducting the analysis.

Porter’s Five Force Analysis

According to mindtools (2021) porters 5 forces is to determine if a company is a strong position or a vulnerable position. It looks at the 5 main forces which determine the position of the company against its rivals. The 5 forces that are looked at in order to make a strategic plan for company are; Threat of new entrant, bargaining power of suppliers, Rivalry among existing customers, Bargaining power of buyers, Threat of substitute products or services. All these points are critically evaluated to determine the strengths and weaknesses of the company. The position of the company can then be understood.

Task 3

a)

According to Qianli Xu (2009) a Kano model brings the 3 important factors of customer satisfaction into a tool that can help a business person ensure their product is up to customer desires against competitors. These features are basic, satisfiers and delighters.

The basic features are the features that are almost the unwritten rule. These features the customer will not ask for but will expect to see it on the product. and example of this is locking doors on a car. Supplying these features on the product will not increase customer satisfaction but not having these basic features on the product will decrease customer satisfaction.

Satisfiers are the features required to compete on the market. These features may be requested by the customer and should be readily available. The product may have all the basic requirements but the customer may want something that a different supply can include as a satisfier. In a car this might be a DAB radio as opposed to the basic FM radio for example.

A delighter is a feature that the customer didn't expect and wouldn't dissatisfy them if it wasn't there but might seal the deal if included this might be a simpler discount or an advanced feature.

b)

i)

Quality function deployment is very important in companies and should be implemented. The advantages are;

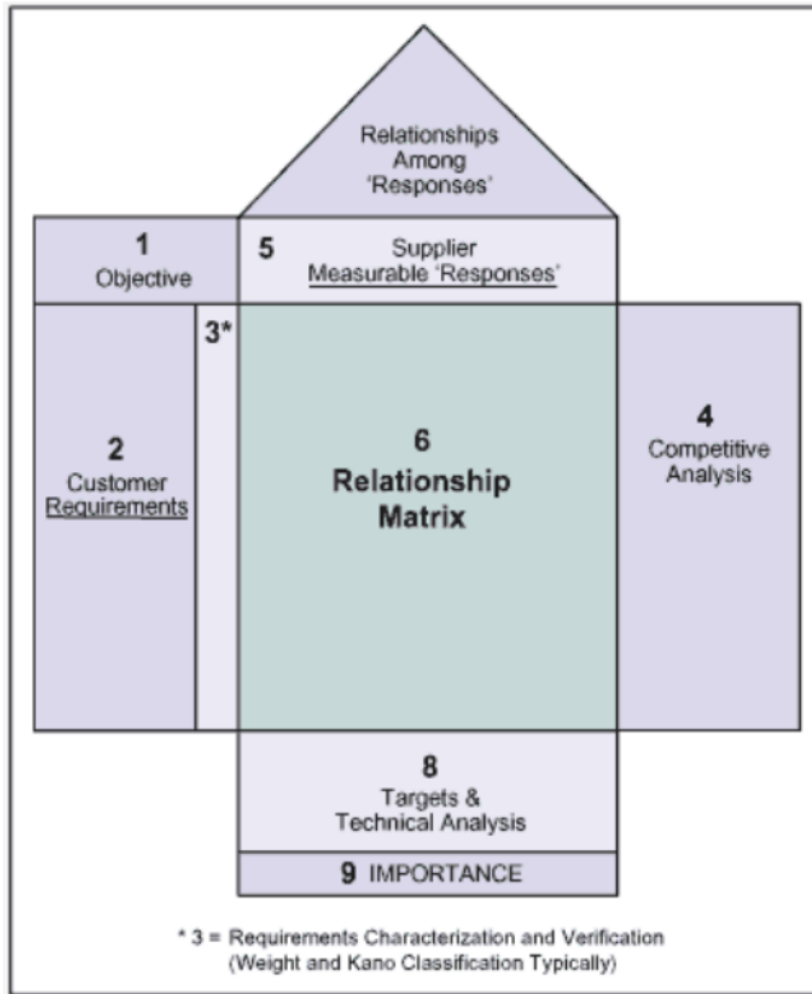
Early deployment of correct features on a product allows the correct design from the start. This will save cost by retrofitting the added features on mid project as well as preventing unnecessary features being designed into the product that the customer doesn't want.

This method looks into what the customer requirements are rather than an assumption of what customer wants from a company image. Many companies assume what the company wants when in fact its only what they want. This is poor market research.

This method also analyses what other companies are doing with their products to meet customer requirements. This then allows to features to be ranked depending what the competition is doing so if none of the competition has a feature that your product has then is a delight but if everybody has your delight then really, it's a satisfier or basic.

ii)

According to Hallowell (2021) the house of quality illustration looks like Figure 1.



According to Madu (2006) the segments mean this;

1. This is the overall objective for the product or service that has to be achieved
2. This box is for customer requirements briefly explained. For example, no figures should be displayed here only non-detailed requirements.
3. This box has to include the importance of each of these requirements using an appropriate scaling method. This is known as the weight of the requirement.
4. This box is a comparator against competitors to gauge where the company sits from a tactical point of view. What other companies are doing for customers should be inserted here.
5. Should include a technical analysis of what the product should include. This might be horse power, torque or handling. The relationship between these is judged in the box above. As some technical factors may play affect on others so the wider picture needs to be looked at. If it was decided that a car must have to have a certain acceleration factor, horsepower and

weight would need to be strongly relational. If a horsepower and handling would be less of a relationship as a car might hold the corners well even though it isn't fast

6. This is the centre of the hose where what the customer wants and the technical factors that can be produced can align. It almost shows how the customer requirements can be fulfilled with resources that are available.
8. is where conflicting factors are negotiated to give the best outcome if the customer really wants a fast car and wants it good on mpg the chances are only 1 is going to be available. This then has to be decided if the product should fulfil 1, the other or a compromise of both.

Throughout this method numbers will be given for each stage and each feature will have a value at the end. The features that are chosen will be one with greatest value.

Task 4

A)

The averages were first worked out

Time	1	2	3	4	5	6	7	8	9	10			
$\bar{x}_1$	20.1	20.1	20.1	20.1	20.2	20.1	20.2	20.0	20.1	20.2			
$\bar{x}_2$	20.1	20.0	20.0	20.1	20.0	20.0	20.0	20.0	20.1	20.0			
$\bar{x}_3$	20.0	20.1	20.2	20.2	20.2	20.1	20.0	20.2	20.1	20.5			
$\bar{x}_4$	20.0	20.0	20.1	20.1	20.1	20.0	20.1	19.9	20.0	20.1			
$\bar{x}_5$	19.9	20.2	19.9	20.1	19.9	20.2	19.9	19.9	20.1	20.0			
Sum	100.1	100.5	100.3	100.7	100.4	100.5	100.1	99.9	100.5	100.8	Sums		
Mean	20.02	20.09	20.06	20.13	20.07	20.10	20.03	19.99	20.10	20.16	200.74	20.07	Process Average
Range	0.24	0.20	0.23	0.17	0.32	0.22	0.33	0.31	0.14	0.51	2.69	0.27	Average Range

The upper and lower limits were able to be calculated after the mean and range averages were found.

$$\text{Mean UCL} = 20.07 + (0.58 \times 0.27) = 20.23$$

$$\text{Mean LCL} = 20.07 - (0.58 \times 0.27) = 19.92$$

$$\text{Range UCL} = (2.11 \times 0.27) = 0.58$$

$$\text{Range LCL} = 0$$

From this data an average and range graph can be plotted with upper and lower limits highlighted. The graphs are shown in Figure 2 and Figure 3

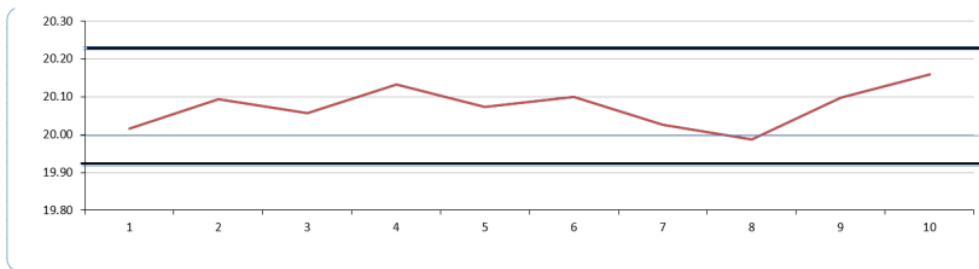


Figure 2 Average Mean graph

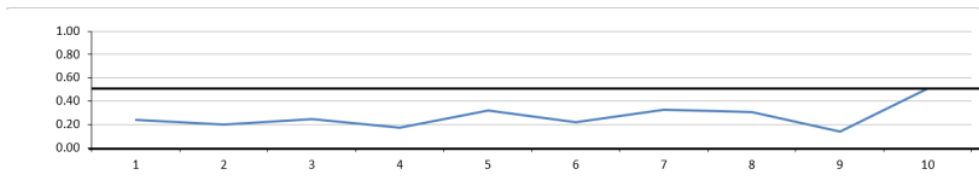


Figure 3 Average range graph

b)

To check that the process is in a state of statistical control more data would need to be recorded along with information on the process along side it. If every part was checked as it came of the machine and every tool change was recorded or material change was recorded trends could be gathered to determine if the dimension inaccuracy is due to the process or factors such as irregular tool changes or the tool not being set in the correct place after a tool change.

c)

firstly the $\bar{x}$ and $(x - \bar{x})^2$ are calculated

Sample	data	$x_i - \bar{x}$	$(x_i - \bar{x})^2$
1	20.11	0.0346	0.00119716
2	20.12	0.0446	0.00198916
3	19.97	-0.1054	0.01110916
4	20.05	-0.0254	0.00064516
5	19.88	-0.1954	0.03818116
6	20.13	0.0546	0.00298116
7	20.04	-0.0354	0.00125316
8	20.1	0.0246	0.00060516
9	20	-0.0754	0.00568516
10	20.2	0.1246	0.01552516
11	20.12	0.0446	0.00198916
12	20	-0.0754	0.00568516
13	20.15	0.0746	0.00556516
14	20.11	0.0346	0.00119716
15	19.9	-0.1754	0.03076516
16	20.06	-0.0154	0.00023716
17	20.14	0.0646	0.00417316
18	20.23	0.1546	0.02390116
19	20.11	0.0346	0.00119716
20	20.12	0.0446	0.00198916

This allows the sum of $(x - \bar{x})^2$ to be calculated.

$$\text{sum of } (x - \bar{x})^2 = 0.652052$$

The standard deviation can now be calculated

$$\text{Standard deviation} = 0.115$$

2 times and 3 times the standard deviation is also required

$$2 \times \text{Standard deviation} = 0.23$$

$$3 \times \text{Standard deviation} = 0.345$$

The warning limits can be set 3sd above and below and 2sd above and below so these are

$$\text{Upper 3SD} = 20.345$$

$$\text{Lower 3SD} = 19.655$$

$$\text{Upper 2SD} = 20.23$$

$$\text{Lower 2SD} = 19.77$$

The process range will be 6 times the standard deviation

$$\text{Process range} = 0.93$$

$$CP = 0.722$$

$$USL = 0.17$$

$$CPKU=0.504$$

$$\text{Mean} - \text{LSL} = 0.33$$

$$CPKL = 0.94$$

This is a poor process as the data is offset on the CPKU value being less than 1 as well as the wide spread data which causes it to go over a limit as cp is below 1. This system will be ineffective to produce consistent quality.

Task 5

Tuckman (1977) suggests that all teams formed follow a standard frame work which was set out in Tuckman's 5 stages. Each stage has its characteristics and strategies. These 5 stages are;

Forming

This is the initial stage of a group. The characteristics are participants tend to be enthusiastic and give lots of contributions to the progressions of the group. The strategies of the group here would be very reactive to command here with strong leadership. This stage tends to be calm as people may be nervous and well well mannered to prevent disruption.

Storming

The characteristics of this stage is poor communications, conflict between members of the group, poor interest, little contributions, little enthusiasm, strong emotions. The strategies of this stage are to normalize and encourage leadership. This stage is more heated due to the members of the group becoming more comfortable and not being afraid to share opinions. The clashing of opinions tends to cause arguments.

Norming

The characteristics of norming is to bring back friendship in the group with reduced worry of conflict. Members of the group become more involved in the team in decision making. Trust within the group to rely on each other's decision making. Strategies here may include learning from previous group behaviour as mistakes can be identified and feedback. The motivation of the group can be reviewed here.

Performing

The characteristics here are when the team is at its best as they are efficiently working to produce work as a team and individuals. Deadlines that would usually be difficult in other stages become easier within this stage. The strategy for this stage is to have minimal input through guidance and let the team find their own way. The strength of the group in this stage will allow them to find the best method around an issue.

Adjourning

The characteristics here usually include the sadness of the time coming to an end after the project is completed. the efforts of the team and individuals can be reviewed and recognised. Strategies here can be to review all the negative and positive factors of the process to improve the next time.

This management technique appears to be a method of identifying what stage a team is in. knowing what stage the team is in allows the manager of the team to use the correct strategical approach to either develop the team to the most desired stage of performance or if already at performance, then to try and maintain that position. This method highlights that management is all about doing the right technique at the right time.

Works Cited

- CIPD. (2021, 05 07). Retrieved from [www.cipd.co.uk: https://www.cipd.co.uk/knowledge/strategy/organisational-development/pestle-analysis-factsheet#gref](https://www.cipd.co.uk/knowledge/strategy/organisational-development/pestle-analysis-factsheet#gref)
- Dergisi, U. S. (2017). SWOT ANALYSIS: A THEORETICAL REVIEW. *The Journal of International Social Research*, 994-1006.
- Hallowell, D. L. (2021, 05 19). Retrieved from [www.isixsigma.com: https://www.isixsigma.com/tools-templates/qfd-house-of-quality/qfd-when-and-how-does-it-fit-software-development/](https://www.isixsigma.com/tools-templates/qfd-house-of-quality/qfd-when-and-how-does-it-fit-software-development/)
- K. KRISHNAIAH, P. S. (2012). *APPLIED DESIGN OF EXPERIMENTS AND TAGUCHI METHODS*. NEW DELHI: PHI LEARNING .
- Lambert M. Surhone, M. T. (2010). *SWOT Analysis*. VDM Publishing.
- Madu, C. N. (2006). *House of Quality (QFD) in a Minute*. New York: Chi publishers .
- mindtools. (2021, 05 07). Retrieved from [www.mindtools.com: https://www.mindtools.com/pages/article/newTMC_08.htm](https://www.mindtools.com/pages/article/newTMC_08.htm)
- Mohamed Abdel-Basset, M. M. (2018). *An Extension of Neutrosophic AHP–SWOT Analysis for Strategic Planning and Decision-Making*. Infinite Study.
- nutek. (2021, 05 07). Retrieved from [nutek-us.com: http://nutek-us.com/DOE_Topic_Overviews35Pg.pdf](http://nutek-us.com/DOE_Topic_Overviews35Pg.pdf)
- Perera, R. (2017). *The PESTLE Analysis*. Independently Published.
- Qianli Xu, R. J. (2009). An analytical Kano model for customer need analysis,. *Design Studies*, (pp. Pages 87-110,).
- Roy, R. K. (2001). *Design of Experiments Using The Taguchi Approach*. New York: John Wiley and Sons.
- Sarsby, A. (2016). *SWOT Analysis*. ENGLAND: Leadership Library .
- Seth, C. (2015). *The SWOT Analysis*. 50Minutes.com.

Tuckman BW, J. M. (1977). Stages of Small-Group Development Revisited. *Group & Organization Studies*, 419-427.

Assignment 2 1602826

GRADEMARK REPORT

FINAL GRADE

GENERAL COMMENTS

Instructor

66/100

PAGE 1

PAGE 2

PAGE 3

PAGE 4

PAGE 5

PAGE 6

PAGE 7

PAGE 8

PAGE 9

PAGE 10

PAGE 11

PAGE 12

PAGE 13

PAGE 14

PAGE 15

PAGE 16

GRADING FORM: NEW CSG-RUBRIC

1. ENGAGEMENT WITH LITERATURE

Reading, referencing, academic conventions and academic honesty. A very good level of research and referencing has been undertaken to support the report, more use of the MOODLE resource could have been made.

06

2. KNOWLEDGE AND UNDERSTANDING

In answering the tasks, you should demonstrate coherent and detailed knowledge and a systematic understanding of the subject area The report demonstrates a good understanding of the business tools. The descriptions are well researched. The interpretation of the control chart missed the characteristics that would indicate an out of control process.

12

3. COGNITIVE AND INTELLECTUAL

Descriptive tasks will be assessed against this generic criterion. The report has a very good description of the business tools and processes in context.

14

4. PRACTICAL APPLICATION



Analytical tasks, you should be able to apply the methods and techniques that you have learned. The calculation undertaken are correct and to a very good standard. However, there was an error in determining the factor differences in the DOE calculation

30

5. TRANSFERABLE SKILLS



Standard of presentation and organisation of your work: The report presented is to an excellent standard. The use of graphics has been made to good effect in parts.

04