



University of Technology, Sydney

ASSIGNMENT 3: PROJECT PROPOSAL TO PREDICT THE FUTURE SALES OF LAPTOPS

Submitted by: Nithin Bangalore Srinivas (12127320)

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1. Aim

The aim of this project is to predict the sales of laptops, tablets and PCs, of a given company based on their past sales history and available data. This analysis helps the company to overcome losses in the future by emphasizing on the improvements that can be done for new releases. The proposed project also helps to predict the future trends of their new release based on customer perception. The aim of this project is divided into three objectives:

- Collecting various data from the company portal including customer details, sales ratio of previous models, configuration details of the previously released model.
- Analyze this data and assess various classifier that fits and predicts the future trend and sales of the company's new releases.
- Validate the prediction accuracy of different classifiers and deploy for future use.

The goal here is to develop an implementation model that helps the company to predict the results accurately and attain profit at the same time. The advantage of gaining insights on future trends helps the company to target the area of improvisation - design and configuration.

2. Background

The growth of laptop market is directly proportional to the increase in public demand paired with growing number of projects. Also, the growth in business sector with 24/7 access to the information is one of the factors that drives the product demand significantly (Laptop Market Size & Share | Industry Analysis Report, 2022, 2016). Integrating pioneering features such as touch screen display, increased availability of affordable 2-in-1 hybrid laptops, and the reduction of price in thin and light laptops contribute to the rise in product demand. (Laptop Market Size & Share | Industry Analysis Report, 2022, 2016). Asia Pacific is probable to witness extensive growth over the forecast period, which may be accredited to rapid industrialization and growing corporate sector in the region. North America is predicted to hold majority market share closely shadowed by Europe owing to the presence of a mature laptop market in conjunction with growing efforts for business expansion in the region (Laptop Market Analysis, Forecast & Research Report to 2022, 2016). Key industry contributors include Acer, Apple, Asus, Dell, HP, Lenovo, Fujitsu, Sony, and Toshiba. Innovation and product development is expected to develop as key growth policy for vendors competing in this business. Vendors also focus on R&D activities in order to develop state-of-the-art technologies to meet the ever demanding customer needs. Moreover, vendors also consider mergers and acquisitions to be a vital part of growth and business expansion. (Laptop Market Analysis, Forecast & Research Report to 2022, 2016).

The existing state-of-the-art methods for sales forecast of these products can be categorized into two types – diffusion model and choice model. Diffusion model is based on the data of time sequence from the similar products that were launched earlier and will adopt a sigmoid-shaped curve that represents the diffusion of product over time (Mead and Islam, 2006). The choice model is based on the data at the distinct level that detects the preferences of the customer

for various product features (Greene, 2009). The recent studies have shown the use of both diffusion and choice model. Nevertheless, none of the studies have given an appropriate sales forecast for laptops, PCs or tablets. There are customer surveys wherein the customers are questioned on the likelihood of purchasing a new product (Bass, 1969). Market testing and agent base modelling (Dyussekeneva et al) are also known methods for prediction. Market testing evaluates the level of acceptance of a new product in a small market before it is launched in the bigger market. Agent based modelling is a software model that simulates the action of the customers by taking into account the pre-defined behavioral rules (Dyussekeneva et al).

These existing methods are related to the project proposal in order to solve the underlying business problem. The customer data is recorded and analyzed individually to attain accurate results. The past sales history is also considered. The target audience for this proposal would be companies like Lenovo, Dell, Asus, Acer, Apple and so on. The reason would be that these companies have been manufacturing laptops/PCs/tablets for a considerable amount of time and they enhance certain features of the new releases compared to the previous models.

3. Research Project

This section addresses the topics that are significant for predicting the sales of the future laptops/PCs/tablets.

3.1. Significance

This proposal reduces the loss incurred by the manufacturing companies of laptops/PCs/tablets. There will be huge revenue loss if the sales forecasting is not done. This proposal helps in predicting the future sales based on the data from previous year sales. Laptops and tablets are usually manufactured using the newest trend. This helps in attracting new customers, while satisfying the regular customers. To accomplish their goal, the sales record must improve with every new release and this proposal will provide the momentous impact required for these manufacturing companies.

3.2. Innovation

The revolution behind this proposal is to predict the sales of the laptops/PCs/tablets by comparing the various attributes related to these products. The comparison of different configurations from previous releases are performed to predict the sales forecast. This proposal contains a methodology wherein sales and configurations of different years are compared. The output obtained will drive the companies to improve their sales in the future. Also, this proposal can be used before commencing the design of these products and the proposed specification can forecast the precision in getting better sales.

3.3. Outline

The problem to be considered here is to overcome the already existing problem of predicting the future sales of laptops/PCs/tablets of any company. The companies do not tend to make any profit, if there is no analysis performed. The project drives towards making the existing idea of the product an achievable one. To dodge this problem, we deduce the sub-projects that are in line with the objectives discussed earlier. There are three stages:

- i. Build the training set considering the data provided in the example below.
- ii. Analyze the training data set and build classifiers using machine learning tools like R.
- iii. The accuracy of different classifiers will be compared and the best will be showcased as the prediction in conjunction with the software development required for deployment.

In a nutshell, stage one collects all the details like a laptop/tablet's sales and configuration information in a training data set. Pre-processing will be performed on this data set that eliminates missing values or duplicate data. In the next stage, i.e. stage two, different classifiers are built and predict their accuracy. In the final stage, comparison of the different classifier predictions is done and the software will be developed for deployment in the companies.

The stages are practically explained in the below illustration. The data considered from an example scenario covers overall idea of predicting laptop sales in a company. The data varies from every company. Data can be considered according to the specification of the company. For instance, comparison can be made based on the size of the screen and processor or display and cost etc. In this example, we consider a laptop.

3.4. Simple illustration

Data analysis and prediction play an important role in improving the sales of the laptop each year. Here, we reflect on attributes related to sales of the previous models, customer ratings, and current competitors. This information forms a knowledge base to gain insights on future sales of a laptop, while in production or even before the commencement of it. Analyzing the data in this manner helps the investors or stakeholders to completely understand the new product.

The below tables describe the laptop sales, model specification, model review and sales table.

S. No	Model Name	Model Number	No. of Items Produced	No. of Items sold	Customer satisfaction ratio
1	Vostro 10	10	14500	9000	65
2	Vostro 11	11	14500	7400	60
3	Vostro 12	12	18500	12000	72
4	Vostro 13	13	18500	12800	76
5	Vostro 14	14	18500	17000	79

Table 1 - Laptop sales

S. No	Model Name	Model Number	Screen Size (in inches)	Storage (in GB)	RAM (in GB)	Bluetooth
1	Vostro 10	10	11	256	2	Yes
2	Vostro 11	11	17	256	2	Yes
3	Vostro 12	12	13	256	4	Yes
4	Vostro 13	13	13	512	4	Yes
5	Vostro 14	14	15.6	512	8	Yes

Table 2 - Model specification

S. No	Model Name	Model Number	Number of New Defects reported	Number of Fix	Online Rating
1	Vostro 10	10	40	NA	6.5
2	Vostro 11	11	50	35	6
3	Vostro 12	12	30	10	7.5
4	Vostro 13	13	20	30	8
5	Vostro 14	14	15	40	9

Table 3 - Model review

S. No	Model Name	Model Number	Pre-booking	Online sales	Showroom sales	No. of Units sold
1	Vostro 10	10	1000	2000	6000	9000
2	Vostro 11	11	1500	1400	5500	7400
3	Vostro 12	12	4000	3500	4500	12000
4	Vostro 13	13	4500	4100	4200	12800
5	Vostro 14	14	6000	5000	6000	17000

Table 4 - Sales table

Prediction from the data collected

Comparing the data from the sales table, we can say that Vostro 10 sales was higher than the Vostro 11 model. This can be due to the screen size that increased to 17 inches in Vostro 11. There was no upgrade in the memory and storage as both remained the same. From the sales table, we can infer that the sale volume increased for the consequent three models namely Vostro 12, Vostro 13 and Vostro 14. Based on the analysis, the increase in number of units sold may be due to decrease in screen size in conjunction with increase in storage and memory. We can

conclude this by saying that the newer models' sales can be improved or maintained by not increasing the screen size, while improving the storage and memory.

Decision tree classifier is chosen to predict the sales of the above collected data. This is explained in a tree structure for the companies to understand the working of the classifier. It is as illustrated in the below figure. The figure depicts the reason for the earlier version (Vostro 10) faring better than the newer one (Vostro 11). Based on the outcome, we can predict the future sales of a laptop by considering the number of units sold as shown in the figure. The classifier compares several measures and will forecast the accuracy of future sales based on the prior sales data. While this is one of those scenarios where decision tree is used, there are multiple classifiers that can be used to measure the accuracy and the best one will be chosen for deployment.

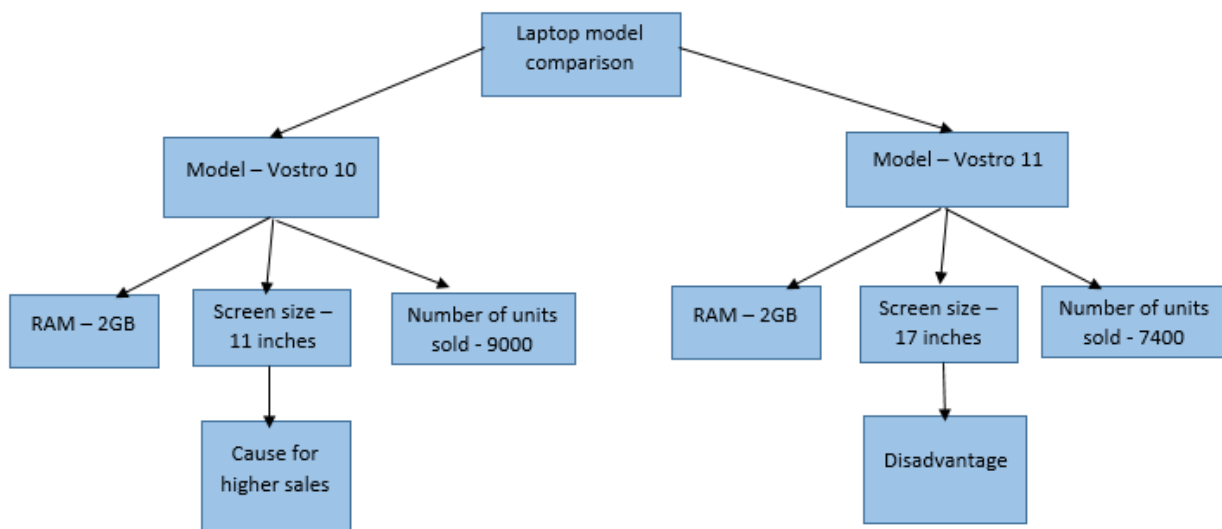


Figure 1 - Decision tree classifier

3.5. Gantt Chart

This refers to the total time taken to complete this project. The total number of days is 265, which includes the buffer. The project is set to finish within the set duration. The buffer required for any phase is considered in the planning. This is as shown in the figure below –

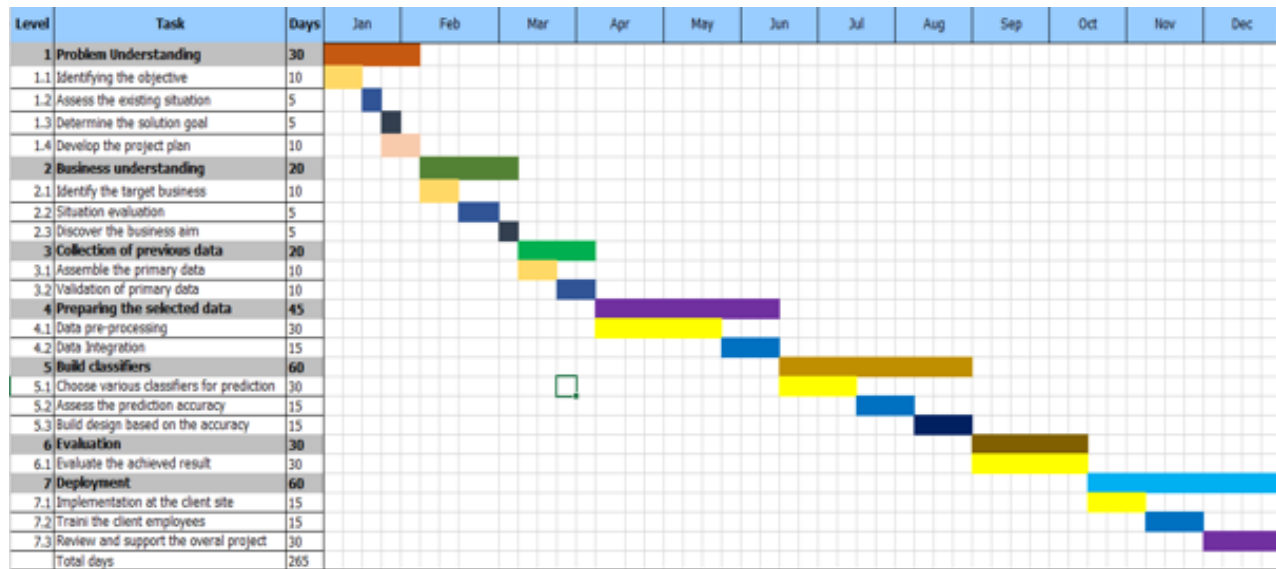


Figure 2 - Gantt chart

3.6. Outcome

An interesting fact from table 3 is that each succeeding model has efficiently addressed the previously reported faults. Also the occurrences of new flaws have reduced gradually, indicating the improvement in the quality of the product. Any successive model should satisfy two conditions –

- i. Address the defects of its previous model.
- ii. Avoid new defects.

This is a recurring process. So the improvement should be done every time a successive model is built. In short, the outcome of this proposal would be predicting the future sales and also overcoming the current flaws which is a notable achievement (before beginning the production of new models).

3.7. Benefits

The marketing strategy plays an important role in reaping benefits. Advertising is a way to determine the sales ratio by increasing the demand. This can be explained using tables 3 and 4. As we can observe, online booking and pre-booking of successive models have increased, which may be due to the advertisements and promotion of products online or offline. From this we can infer that innovative strategies used for product advertising enhance the sales ratio. One other fact that we can observe is decrease in showroom sales. This may be due to the fact that the products are expensive in-store compared to online. This can be overcome by providing attractive offers to the customers purchasing in the showroom. Ultimately, the main area of benefit would be reducing or cutting down the extra expenses by predicting the future sales.

4. Budget

The total expenses of this proposal can be split into three levels.

- i. Personnel cost
- ii. Software cost
- iii. Hardware cost

The contingency considered here would be 15% and the expenditure is as shown below –

PROJECT EXPENDITURE			
PERSONNEL COST			
Designation	Approximate working days	Cost/day (in A\$)	Total cost
Principal Investigator	70	250	A\$ 17,500.00
Research Assistant	60	120	A\$ 7200.00
Data Scientist	60	200	A\$ 12000.00
Developer	45	180	A\$ 8100.00
Marketing consultant	30	250	A\$ 7500.00
Sub total			A\$ 52,300.00
SOFTWARE COST			
Requirements			Total cost
Application software user licences			A\$ 1,000.00
Software modifications			A\$ 500.00
Database user licences			A\$ 5,000.00
Additional security applications			A\$ 1,000.00
Sub total			A\$ 7,500.00
OTHER RESOURCES (HARDWARE COST)			
Requirements			Total cost
Servers (new or upgraded, dedicated or shared)			A\$ 10,000.00
PC's (new or upgrades)			A\$ 3,000.00
Sub total			A\$ 13,000.00
Overall Cost (Personnel, Software & Hardware)			A\$ 72,800.00
Contingency (15%)			A\$ 10,920.00
Total Amount			A\$ 83,720.00

Table 5 - Detailed Project Expenditure

5. Personnel

This section provides the details on number of employees required for the completion of this project and their contribution. They are as described below –

5.1. Principal Investigator

Principal Investigator is the person who makes final decision at any certain point of the project phase and also manage the capital and disbursement of the project.

5.2. Research Assistant

After the collection of data and configuration required for the project, Research Assistants are essential to assist Data Scientists in data preprocessing, integration and building classifiers.

5.3. Data Scientist

They play a major role in building classifiers and predicting the future sales accuracy using the data set provided.

5.4. Developer

The main role of a Developer here would be developing reporting solutions and handling the deployment process.

5.5. Marketing Consultant

This project requires a marketing consultant for advertisement purposes.

Pitch

<https://youtu.be/bxJMQBb6kh0>

References

Bass, F.M. 1969, “A New Product Growth Model for Consumer Durables”, *Management Science*, 15, pp. 215-227.

Dyussekeneva K., Meeran S. and Goodwin P. forthcoming, “Forecasting sales time series for new products: methods and challenges”

Grand View Research. 2014. *Laptop Market Analysis, Market Size, Application, Analysis, Regional Outlook, Competitive Strategies and Forecasts, 2015 to 2022*. [ONLINE] Available at: <http://www.grandviewresearch.com/industry-analysis/laptop-market>. [Accessed 28 October 2016]

Greene, W. H. (2009), Discrete choice modelling; Mills T. and Patterson K. (eds), *Palgrave Handbook of Econometrics: Volume 2: Applied Econometrics*; London: Palgrave

Laptop Market Analysis, Forecast & Research Report To 2022 2016, Grandviewresearch.com. viewed 1 November 2016, <<https://www.grandviewresearch.com/press-release/global-laptop-market>>.

Meade, N. and Islam, T. (2006), “Modelling and forecasting the diffusion of innovation - A 25-year review”, *International Journal of Forecasting*, 22(3), pp. 519-545