## Assignment Two

**Background**

Assignment Two is an **individual** assignment. First, analyse the given dataset and then interpret and draw conclusions from the analysis. Then need to convey the findings in a written report to an expert in Business Analytics.

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|---|---|
| Percentage of the final grade | 35% |
| The Due Date and Time | **8 pm Thursday 15th September 2022** |

**Submission instructions**

The assignment must be submitted by the due date electronically in CloudDeakin. When submitting electronically, check that you have submitted the work correctly by following the instructions in CloudDeakin. Please note that we will NOT accept email copies or part of the assignment submitted after the due date.

**Extensions**

No extensions will be granted unless there are exceptional and most unusual circumstances outside the student's control.

A student who requires a time extension *must use* the *Extension Request* tool in CloudDeakin's Assessment menu. Please make sure to provide relevant supporting documents along with the application. Requests for extensions will not be considered after 5 pm, 15th September 2022.

**Late submission**

The following marking penalties will apply for late submissions without an approved extension:

- 5% will be deducted from available marks for each day, or part thereof, for up to five days.
- Work submitted more than five days after the due date will not be marked and will receive 0% for the task.

Note: 'Day' means calendar day.

The Unit Chair may refuse to accept a late submission where it is unreasonable or impracticable to assess the task after the due date.

**Academic misconduct**

For information about academic misconduct, special consideration, extensions, and assessment feedback, please refer to the document *Your rights and responsibilities as a student in this Unit* in the first folder next to the Unit Guide in the Resources area of the CloudDeakin unit site.

**Assurance of Learning**

This assignment assesses the following Graduate Learning Outcomes and related Unit Learning Outcomes:

| Graduate Learning Outcome (GLO) | Unit Learning Outcome (ULO) |
|---|---|
| **GLO1**: **Discipline-specific knowledge and capabilities** - appropriate to the level of study related to a discipline or profession. <br> **GLO2**: **Communication -** using oral, written and interpersonal communication to inform, motivate and effect change <br> **GLO5: Problem Solving** - creating solutions to authentic (real world and ill-defined) problems. <br> **GLO6**: **Self-Management** - working and learning independently and taking responsibility for personal actions | **ULO 1**: Apply quantitative reasoning skills to solve complex problems. <br> **ULO 2**: Plan, monitor, and evaluate own learning as a data analyst. <br> **ULO 3**: Deduce clear and unambiguous solutions in a form that they useful for decision making and research purposes and for communication to the wider public. |

**Feedback before submission**

Students can seek assistance from the teaching staff to ascertain whether the assignment conforms to submission guidelines.

**Feedback after submission**

An overall mark, together with feedback, will be released via CloudDeakin, usually within 15 working days. Students should refer and compare their answers to the feedback to understand any areas of improvement.

**Support**

The Division of Student Life (see link below) provides all students with editing assistance. Students who wish to take advantage of this service must organise, plan and contact the Division of Student Life to schedule a booking well in advance of the due date of this assignment.
http://www.deakin.edu.au/about-deakin/administrative-divisions/student-life

**Referencing**
Any material used in this assignment that is not the student's original work must be acknowledged as such and appropriately referenced. Students can find information about plagiarism and other study support resources at the following website: http://www.deakin.edu.au/students/study-support

**The Case Study**

The B-Hive is a regional victorian honey producer with a 20-year history. Although its operations are limited to the Gippsland area, the company has been financially successful. B-Hive honey is sold directly to customers (Public, Grocery Chains, Shops and Restaurants) or indirectly through an external distribution network.

Despite its successful operations and solid financial turnovers in the last two years, B-Hive forecasts a shift in consumer demand. Now more than ever, B-Hive management feels the need to ensure a strong relationship with its diverse customer base.

The management team wants to understand the characteristics of B-Hive's customers and their repurchase intention. In addition, they would like a formal procedure to forecast demand for their honey. The formal forecasting would help B-Hive with demand planning and production scheduling.
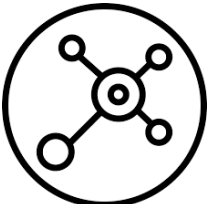
**Data**

The Data and Insight team conducted an online survey asking customers to rate the company on nine attributes using a 1 – 10 scale. The customers also indicated whether they would recommend B-Hive products to others. The survey data was supplemented by information from B-Hive's databases like the loyalty duration, customer type, region, distribution channel and other information. A complete listing of variables, their definitions, and an explanation of their coding is provided in the ***A2T22022.xlsx*** file.

Peter (your team leader) has allocated relevant research tasks and explained his expectations from your analysis in the meeting. The minutes of this meeting are available on the next page. Your task is to review and complete the allocated activities as per the document.

# Team Meeting

| | **B-Hive**<br><br>23 Balook St, Mirboo VIC 3871<br>Phone: (+61 3 212 66 000)<br>info@b-hive.au | **Reference** | Project #12 |
|---|---|---|---|
| | | **Revised** | 24th August 2022 |
| | | **Level** | Expert Analysis |

| Meeting Chair | Peter Ainsworth | | | | | |
|---|---|---|---|---|---|---|
| Date | 23rd August 2022 | **Time** | 11:00 am | **Location** | Meeting Room-1 |
| Topic | B-Hive Demand Planning | | | | | |

| Meeting Purpose: | Specifying and Allocating Data Analytics Tasks |
|---|---|
| Discussion items: | • Model Quantity Ordered.<br><br>• Model the likelihood of recommending B-Hive to others.<br><br>• Forecast demand for the upcoming four quarters.<br><br>• Produce a technical report. |

| Detailed Action Items | Who:<br><br><<you>> | **What:**<br><br>1) Build a multiple regression model to estimate the order quantity.<br><br>2) In a separate project, Peter found that the perception of product quality is a significant predictor of the quantity ordered. In line with his findings, prior research shows that the strength of this relationship may vary according to brand image. That is, customers tend to associate the brand image with product quality. Therefore, Peter believes that the relationship between quality and quantity ordered should be stronger for those with more favourable brand perceptions.<br><br>Model the interaction between image, quality and quantity to test Peter's assumption and comment on whether there is sufficient evidence to conclude that the interaction term is statistically significant in the model.<br><br>3) Build a logistic regression model to predict the likelihood of recommending B-Hive products to others.<br><br>4) Peter has completed the first step for this task. He has narrowed down the key predictors of the likelihood of recommending B-Hive products to "Distribution Channel, Quality and Brand Image".<br><br>    a) Continue Peter's work and develop a logistic regression model to predict the "likelihood of recommending B-Hive products".<br><br>    b) Create a plot that shows how the changes in perceptions of quality (scores from 1 to 10), a positive brand image (a score of 10) and the distribution channel (i.e., those purchasing directly or through a distribution network) affect the predicted probabilities of recommending B-Hive products. |
|---|---|---|

| | | 5) Develop a time-series model to forecast Honey demand for the next four fiscal quarters. |
| | | |
| | | 6) Produce a written technical report detailing all conclusions and all analysis activities. The report should be comprehensive (i.e., describe all critical outputs of the analysis and conclusions). The analysis should drive the conclusions and the recommendations to the management team (i.e., a clear link/alignment). |
| **Next meeting** | Thursday 15th September 2022 | |

## Appendix- A: Explanatory Notes

To accomplish allocated tasks, you must thoroughly examine and analyse the dataset. Below are some guidelines to follow:

### Task 1. – Model building

Follow an appropriate model-building process. Include all steps of the model-building activities (**especially all relevant pre and post-model diagnostics**) in your analysis. Include as many Excel worksheets (tabs) as you require to demonstrate different iterations of your regression model (i.e., 1.2.a., 1.2.b., 1.2.c. etc.). Please note all reasonable/realistic assumptions about the parameters next to the analysis.

The **technical report** should clearly explain why the model might have undergone several iterations (your modelling approach). Also, provide a detailed interpretation of ALL elements of the **final** model/regression output and state the conclusions.

### Task 2. – Interaction effect

To accomplish this task, develop a new regression model using ONLY the factors discussed in the team meeting (Item 2). Is there evidence that the interaction term makes a significant contribution to the model? Please note all reasonable/realistic assumptions about the parameters next to the analysis.

The **technical report** should clearly explain the role of each variable included in the model and use visualisation to illustrate the interaction effect (if any or lack of it). Finally, provide managerial recommendations based on the results of the analysis.

### Task 3 – Model building

It is **IMPORTANT** to follow an appropriate model-building process. Include all steps of the model building activities (**especially all relevant pre and post-model diagnostics**) in your analysis. Watch out for indications of collinearity (look at the correlation matrix / large standard errors) and numerical instability (complete separation/ near-complete separation). The main aim is to identify the independent variables that impact group membership of the dependent variable.

Include many Excel worksheets (tabs) as you require to demonstrate different iterations of your regression model (i.e., 3.1, 3.1.a). Please note all reasonable/realistic assumptions about the parameters next to the analysis.

The **technical report** should clearly explain why the model might have undergone several iterations (your modelling approach). Also, provide a detailed interpretation of ALL elements of the **final** model/logistic regression output and state the conclusions.

**Task 4.a & 4.b – Visualising and interpreting predicted probabilities**

To accomplish this task, develop a new logistic regression model using ONLY the factors discussed in the team meeting (Item 4). Then use the model to develop a predicted probability plot using the parameters mentioned (Item 4).

The **technical report** must include the predicted probability visualisation and practical recommendations. These recommendations should broadly answer the following question:

> *"How changes in perceptions of **quality** (scores from 1 to 10), a positive **brand image** (a score 10) and the **distribution channel** (i.e., those purchasing directly and through a distribution network) affect the predicted probabilities of recommending B-Hive products."*

**Task 5. – Forecasting Sales**

Past quarterly Sales are in the Excel file. The task is to develop a suitable model to forecast demand for **the next four quarters**.

In the **technical report**, explain the reason for selecting the forecasting method. The report also must include a detailed interpretation of the **final** model (e.g. a practical interpretation of the time-series model…etc.)

**Task 6. – Technical report**

The **technical report** must be as comprehensive. ALL aspects of the analysis and final outputs must be described/interpreted in detail.

Remember, the report audience are experts in analytics and expect **a very high standard of work**. High standards mean **quality content** (demonstrated attention to detail) and an **aesthetically appealing report**.

>    **Note:** The use of technical terms is encouraged and expected in this assignment.

The report should include an **introduction** as well as a **conclusion**. The introduction begins with the purpose(s) of the analysis and concludes by explaining the report's structure (i.e., subsequent sections). The conclusion should highlight the essential findings and explain the main limitations.

There is no requirement for a table of content or an executive summary.

## Appendix-B: Submission Guidelines

The assignment consists of **three** documents:

- *Planning and execution tables*
- *Analysis*
- *Technical Report*

### 1) Assignment Planning and Execution Tables

The planning and execution details should be submitted in the appropriate tables provided. The tables should be in dot points. Before filling in the tables, students are strongly encouraged to watch the pre-recorded workshop called 'How to plan an assignment and turn the plan into action?' by a Language and Learning Adviser.

> **Note:** Give the assignment planning and execution file the following name
>
> **A2_Planning_YourStudentID.docx**

### 2) Analysis

The analysis should be submitted in the appropriate worksheets in the Excel file. Each step in the model buildings should be included in a separate tab (e.g. 2.1.a., 2.1.b., …; and 3.2.a. 3.2.b., …). Add more worksheets if necessary.

Before submitting the analysis, make sure it is logically organised, and any incorrect or unnecessary output has been removed. Marks will be deducted for poor presentation or disorganised/incorrect results. The worksheets should follow the order in which tasks are allocated in the minutes of the team meeting document.

> **Note**: Give the Excel file the following name **A2_YourStudentID.xlsx** (use a short file name while you are doing the analysis).

### 3) Technical Report

The technical report consists of three sections: **Introduction**, **Main Body**, and **Conclusion**. The report should be approximately 2,500 words.

Use proper headings (i.e., 2., 2.1., 2.2., …) and titles in the main body of the report. Use sub-headings where necessary.

Visualisations / statistical output expected in the report are:

1. Interaction effect plots
2. Predicted probability plots.

Ensure these outputs are **visually appealing**, have **consistent formatting style** and **proper titles** (title, axes titles etc.), and are **numbered correctly**. Where necessary, refer to these outputs in the main body of the report.

> **Note**: Give the report the following name **A2_YourStudentID.docx**.