University of Warwick
MSc Business Analytics

Module Code: IB9E00 Pricing Analytics
School Year: 2024/25

Group Assignment Question and Guidance

Business Background

BuildMax Rentals is one of the largest construction equipment rental companies in Europe and North America, providing flexible leasing solutions for a wide range of industries, including:

- Construction & Infrastructure
- Mining & Earthmoving
- Oil & Gas
- Agriculture
- Municipal and Public Works

BuildMax operates 80 branches across key urban and industrial locations, supplying customers with excavators, cranes, bulldozers, and other heavy machinery. Given the high cost of purchasing equipment, many companies prefer short-term or long-term rentals, depending on their project needs.

Heavy equipment rental companies operate in a competitive market where pricing, availability, and customer service dictate success. BuildMax faces several challenges that require an advanced Revenue Management (RM) approach:

1. Construction projects are seasonal, with higher demand during spring and summer.
2. Mining and oil companies require long-term rentals with flexible return policies.
3. Government and municipal projects have fixed budgets, requiring predictable pricing.
4. Each rental branch has a fixed inventory of equipment.
5. Accepting too many long-term leases reduces availability for short-term, high-paying customers.
6. Fleet utilisation must be optimised to maximise revenue without overcommitting resources.
7. Short-term rentals (1 week) are priced higher per day compared to long-term rentals (4, 8, or 16 weeks).
8. Discounts are provided for bulk corporate bookings.
9. Pricing is dynamic, fluctuating based on demand, competitor rates, and market conditions.
10. Equipment must be delivered and returned at the designated rental branch.
11. One-way rentals (where equipment is returned to a different location) create logistical issues.
12. Equipment must be serviced and maintained before it can be rented out again.

Customers can lease equipment for 1-week, 4-weeks, 8-weeks, or 16-weeks, depending on their project requirements. The rental process includes:

1. Booking & Pricing:
   Customers request equipment through branch offices or online, selecting lease duration and expected usage. Prices are quoted dynamically.
2. Rental Acceptance & Fleet Allocation:
   BuildMax evaluates whether to accept or reject rental requests based on:
   - Current fleet availability
   - Expected future demand
   - Revenue potential of short vs. long-term leases
3. Equipment Utilisation & Revenue Management:
   - Utilisation Rate: The percentage of available equipment that is rented out.
   - Revenue per Unit (RPU): The average revenue generated per piece of equipment.
   - Return on Investment (ROI): Profitability of rental operations relative to equipment purchase costs.
4. Returns & Equipment Maintenance:
   - Equipment returns after the rental period are tracked and scheduled for servicing.
   - Delays in returns affect availability for future customers.

To optimise revenue and fleet utilisation, BuildMax is implementing a Revenue Management (RM) strategy, leveraging data analytics and linear programming to:

1. Determine optimal pricing for different lease durations and demand patterns.
2. Decide which rental requests to accept or reject based on revenue impact.
3. Predict equipment availability based on return schedules and future bookings.
4. Maximise total revenue while maintaining high fleet utilisation.

Your team has been provided with historical rental data from one of BuildMax's largest branches. The dataset includes:

- Weekly rental requests for each lease duration and equipment type.
- Pricing per day for each equipment type.
- Accepted vs. rejected rental requests.
- Equipment returns.

Your group has been tasked with executing the revenue management (RM) project for BuildMax Rentals. For the purpose of your analysis, BuildMax has provided a dataset from one of their UK branches.

BuildMax requires you to formulate a proposal that will guide the management on the application of RM within the company, highlighting both its potential advantages and possible challenges. Your document is not intended as a sales pitch to BuildMax. Therefore, the document should not only clearly and accurately describe the proposed RM methodology and demonstrate its potential value for BuildMax, but also critically evaluate the chosen approach noting any limitations or drawbacks where appropriate (the technical details can and should be included.).

Questions

The following questions should be answered in the document:

1. Assess the suitability of revenue management for BuildMax Rentals. How does this compare to RM in airlines, hotels, or car rentals? What are the key challenges?

   [15 marks]

2. Using the provided dataset, formulate and implement a linear programming model to maximise total revenue. Clearly define the decision variables, constraints and objective function (maximising revenue). Compare your optimised results with actual revenue from the dataset. What insights can you draw? Are there any differences between types of equipment?

   Report the revenue and ROI improvements of your approach over what was actually achieved according to the data (prices of equipment are given in the dataset). What do these results tell us regarding the potential of implementing a revenue management solution at BuildMax?

   [35 marks]

3. How can BuildMax implement your revenue management strategy in practice? What are the potential limitations of your model, and how might they be improved?

   [20 marks]

Presentation [30 marks]

Your team will present findings to BuildMax executives (Module's lecturer). Focus on business value rather than technical details.

Keep in mind, in designing the presentation, that the audience is your clients; they are managers who may not necessarily have technical knowledge, so reflect carefully on what you present. They will be interested in understanding the challenges and the meaning of your work for their business, and whether their investment in this project will be worth it or not.

Presentations will be judged on style and structure (e.g. time-keeping, verbal and visual clarity, ability to present a topic in a well-structured coherent manner, interest, ability to keep the audience engaged), and the technical correctness of the subject matter.

Presentation Time:	**Maximum 10 minutes per group (this is a strict limit, not a guideline).**
Submission Format:	**You should submit your group project report as a 1500 word PDF and also provide the presentation and Python code excel file(s), all in a ZIP file.** **One member of each group should make the submission on behalf of the whole group.**
Assessment Weighting:	**20%**
Submission Deadline:	**Monday 10th March 2025 before 12:00:00 (Midday, UK time)**
Marks Released by:	**Monday 7th April 2025** (we will aim to release marks by this date, but in the event of an unavoidable delay a message will be posted on the module page)
Artificial Intelligence:	**PROHIBITED OR RESTRICTED**

Use of Artificial Intelligence

The University recognises an increasing number of technologies such as Artificial Intelligence and that they may be applicable in your completing this assessment. The assessment brief sets out specific requirements or restrictions, and your student handbook has further guidance and advice.

You are reminded that the inappropriate use of such a technology may constitute a breach of University policy, such as the Proofreading Policy or Regulation 11 (Academic Integrity). If you breach these policies, it may have significant consequences for your studies. Please make sure you read and understand the assessment brief and how AI may or may not be used.
When you submit the assessment, you will be required to explain the use of any AI. Failure to disclose at the point of submission may be prejudicial in any later investigations should they arise.

For this assessment, AI is:

PROHIBITED OR RESTRICTED
You MUST NOT use any generative Artificial Intelligence in this assessment unless specifically authorised for reasonable adjustments. You MAY use non-generative tools such as a spell-check, basic grammar check (non-generative), calculator or similar. If you have any doubts about a tool or service you plan to use please contact the module leader.

Submitting your work

Before you submit your assessment, you should ensure you are familiar with the guidance and rules in the "Your Assessments" section of your Student Handbook, paying particular attention to:

- Academic Integrity (including Plagiarism)
- Referencing
- Word Count Policy and Formatting
- Confidentiality of your work
- Extensions and late submission of work
- Guidelines for Online Submission

Mitigating Circumstances

Mitigating circumstances MUST be submitted **within 20 working days following the submission deadline**. Mitigating circumstances not submitted by the relevant deadline are not required to be considered by the School/Department and may have to be considered by an Academic Appeals Committee as part of an academic appeal – for further information, please see: https://warwick.ac.uk/services/gov/calendar/section2/regulations/reg42academicappeals

Please see your Student Handbook for more guidance on mitigating circumstances