Best-Worst scaling (BWS)
(Max-Diff Surveys)

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DS223: Marketing Analytics

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The Problem Area:
The project that we are going to do lies in the areas of product development and pricing strategy. It can also be used in HR so the company can understand the preferences and desires of their employees.

Preliminary Research:
Our project primarily focuses on product development, a critical aspect of marketing encompassing the creation or enhancement of new products or services, including their design, testing, and release. Like any other field, product development comes with its set of challenges. Here are some key obstacles commonly encountered in this domain:

- Resource Management: Developing a comprehensive budget and resource allocation plan is crucial for managing upfront costs and ensuring financial sustainability throughout the product development lifecycle. This may involve prioritizing essential tasks, exploring cost-effective manufacturing options, and seeking funding or investment opportunities to support the development process.

- Product Engineering: Engineering dependencies also hinder the progress of product initiatives. For instance, if a company wants to create an app, and the design team misses the deadline, the entire development team has to wait until a prototype is ready for review.

- Competition: Depending on what type of product the company is seeking to create, it will face varying amounts of competitors already on the market. Competition can present a major or minor obstacle, and it is almost impossible to avoid, especially if the company is trying to meet a consumer trend.

- Costs: Much of a new product's cost occurs before the product is even introduced to the market. As such, a significant amount of capital is required upfront to fund a new product. This initial cost covers designing, prototyping, testing, manufacturing, marketing, and more. The costs of each part of the development process can add up quickly, and if the product fails or does not provide a large enough profit to cover these costs, the company must absorb them.

Product development opportunities can arise from various sources, including market trends, technological advancements, consumer needs, and competitive analysis. Here are some avenues to explore for identifying product development opportunities:

- Market Research: Conducting thorough market research will help to identify gaps, trends, and emerging needs in the company's target market. It is crucial to consider working on underserved segments of the product.

- Customer Feedback: Gathering feedback from existing customers or potential users through surveys, interviews, or focus groups will help identify areas where the product needs improvements.

- Customer Satisfaction: Developing innovative products that address customer needs can lead to increased customer satisfaction and loyalty, driving business success.

In today's fast-paced market, product development is driven by dynamic trends. From agile methodologies to various tools, innovation is reshaping how products are conceived, designed, and delivered. Let's explore these key trends defining the landscape of modern product development.

- IoT Integration: The Internet of Things (IoT) continues to expand, with products becoming more interconnected and capable of collecting and exchanging data. This trend enables the development of smart devices and systems that offer greater convenience and efficiency.

- Sustainability: There is a growing emphasis on sustainable product development, driven by environmental concerns and consumer demand for eco-friendly solutions. Companies are incorporating recyclable materials, reducing energy consumption, and designing products with end-of-life recycling in mind.

- Blockchain Technology: Blockchain is being explored for its potential to improve security, transparency, and traceability in product development processes. Applications include supply chain management, digital identity verification, and decentralized finance.

The Specific Problem:

As the broad area of our project's problem in marketing is mostly product development, the more specific problem that we will address is the identification of specific features and attributes of the product that customers and the overall market seek. So the problem is to understand how to create and develop the product in order to make high and long lasting profits. Moreover, part of the problem is to identify the preferences of the product of different demographic groups.

The Solution With Methodology:

- **Data Collection:**
  The data collection will be done with **2** steps:
  1. We will first collect the attributes' list of the product. These attributes might be the features of the specific data, which mainly describe the quality, design, and the usage of the product. Eg. Smartphone: Battery Life, Screen Size, Brand, CPU, Camera, Design, etc.
  2. Secondly, we will collect data through the application, which will be provided to the user in order to answer our survey, which in turn will be designed using the attributes' list.
  All these pieces of information will be written in the database.

- **Analytical Techniques:**
  As the data collection, the analytical part will also include **2** steps:
  1. Attributes' list will be used in order to create the appropriate survey. Meaning that we will be using specific algorithms (eg. D-criterion algorithm or OMED algorithm) in order to create a BIBD matrix of the survey.
  2. After getting the survey results from the user, we will calculate the significance and preferences for each attribute and aggregate those results for the demographic groups. We will also use chi-squared hypothesis testing in order to see the significance of the difference between each demographic group.

- **Implementation Plan:**
  We are going to use a survey design method called best-worst scaling, where the user will be able to pick the best and worst attributes for him/her.
  The package/tool will be developed in Python programming language, it is going to use fastapi as an API tool and SQLite as a database tool. The package will be pushed into GitHub.

Firstly**,** we get the attributes list of the product through our application, which will then be written in the SQLite database.
From the attributes list, we will design the survey using a smart randomization algorithm, which will control the balance between the attributes. Meaning how many times each attribute appears in the survey and how many times each attribute appears in the survey with the other attributes.
The user will be able to fill in the survey through our application.

Survey results will then be transferred or written into our database. We will take the results of the survey from the database and perform the analysis. The analysis will then be served to the user in the form of tables and values.

Expected Outcomes:

Clients will be able to gain a lot of insights using the analysis of our tool. Clients will have the opportunity to see the attribute preferences of their customers or potential buyers. This information will let the client to design the product in a very beneficial way, so that it will have astounding future sales. Also, there will be the chance to see preference differences over each demographic group and see if they are significantly different or not.
For achieving these, the user will be provided with aggregated tables which will include all the insights in it, including statistical measures and the results of hypothesis testing.

Evaluation Metrics:

The most valuable evaluation metric will be our client's success. The future of the product, its adoption and sold quantity of the product will determine its success.
So, if our analysis is able to convey the needed information to the client, his/her company will be able to take the corresponding business decisions and make the product development stage more efficient.

Important Note:

All the above mentioned can be implemented in the HR sphere. This will give the opportunity to understand which attributes of the company are the most preferred by employees. Eg. Salary, Vacation, Help from Colleagues, Health Insurance, etc. On this attribute list the survey can be conducted and later analyzed.

References:

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