Screening New Product Ideas Through User-Generated Content in Social Media to Assist Small and Medium Enterprises in New Product Development

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Endorsement

Dedication

I dedicate this capstone project to all the small and medium enterprises’ owners and their employees who have been working so hard to continue their business operations during these trying times.

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Chapter 1

Introduction

**1.1. Background of the Study**

The recent assessment made by the National Economic Development Authority (2020) showed that the Philippines’ Luzon-wide lockdown, which aims to control Coronavirus Disease (COVID-19), has resulted in an accumulated output loss of 1.1 trillion pesos. Moreover, the Philippines Statistics Authority (2020) has recorded its highest unemployment rate ever. As early as the second quarter of 2020, it rose to 17.7%, amounting to 7.3 jobless Filipinos. Hoping to reduce any further losses and stabilize the economy, the Inter-Agency Task Force recommends the implementation of General Community Quarantine (GCQ). This new and lenient version of the quarantine has allowed business operations and other economic activities to resume. However, GCQ had little to no effect because the consumers’ confidence has influenced their buying habits. People have become conservative and cautious about where they spend their money. Consequently, the government has rolled out programs to help affected businesses and their employees. In particular, through Bayanihan to Heal as One Act, companies have given a 30-day grace period to pay for rents without incurring any penalties and even have the option to settle it in six-month time.

Furthermore, the new amended law recognizes how the global pandemic negatively affected the Small and Medium Enterprises (SMEs); through Small Business Subsidy Wage (SBSW), SMEs have given access to the financial support they need to continue their operations. Accordingly, SBSW allows SMEs to take a loan ranging from 200,000 to half a million pesos depending on the company's asset. The loan has an interest rate of 0.5% and 0.6% per month and per annum, respectively, which is far lower than Banks' 7% on average. Moreover, they could pay the subsidy in a much longer time. However, these efforts can only do so much to assist SMEs in their operations for a few more months. Meanwhile, there are no signs that the pandemic will come to an end anytime soon. Unless there is an approved vaccine, SMEs need to be creative in finding ways to survive. Otherwise, they will have to shut down. Currently, the outbreak has culminated in the closure of 200 companies and temporarily halted 3,000 more. Experts predicted that the Philippines' economy might collapse if this trend continues, causing more Filipinos to drown in poverty (Bouey, 2020).

For the past few months, the world has experienced the transition from the pre-COVID-19 phase to the “new normal”. The new normal, among other things, made the mind of the people to be opened to the idea of working and studying from home. In doing so, they realized how essential and useful Social Media (SM) (e.g., Facebook, Instagram, Twitter, YouTube, and LinkedIn.) in everyday living. As a result, the usage of SM has increased since the COVID-19 broke out. To illustrate, Facebook Reports on Second Quarter of 2020 shows that their daily active users (DAU) and monthly active users (MAU) remarkably grew. In particular, there have been 1.79 billion people accessing Facebook daily and 2.70 billion people every month. Most notably, Facebook has given SMEs channel to grow and prosper during these trying times. Likewise, Twitter reached its highest Monetizable Active Daily Users (MDAU) since it launched in 2006. According to Twitter’s quarterly report for 2020, its MDAU improved by 34%, approximately 186 million paying users monthly. The platform has been beneficial in providing information about worldwide happenings, especially on the updates regarding COVID-19. Lastly, Instagram broke a record when it hit its highest number of users using stories daily. In January 2020, more than 500 million Instagram users used the story in a day, of which 200 million are business-related. Story is the most widely-used feature of the photo and video sharing application, and it serves as a tool to showcase people’s lives and businesses in almost every part of the world. According to Clement (2020), the increase in SM users will grow even further in the coming years, as people and businesses become more dependent on these applications. The research projected that the number of users would double in 2025.

New Product Development (NPD) is a process that transforms market opportunities into a product available for sale (Takeuchi & Nonaka, 1986). The output of NPD does not always need to be new and innovative. Rather, it is an extension or an improvement of the existing product, or perhaps a cheaper version to capture more market. It consists of seven stages, including new product strategy development, idea generation, screening and evaluation, business analysis, development, testing, and commercialization (Booz, & Allen & Hamilton, 1982). Initially, NPD follows a rigid sequential order. For instance, the new product strategy development phase must come first before the idea generation, and once new product strategy development is complete, it is final and almost impossible to make any modification. Since every stage is highly dependent on its predecessors, meeting the deadline becomes an issue. On average, it takes ten years for a single new product to reach its official launch in the market. Over the years, it has improved, considering the speed and flexibility, without compromising product quality. For instance, Takeuchi & Nonaka (1986) introduce the rugby approach to remove dependencies by allowing processes to start simultaneously and flexibly go back to the previous stages if changes are necessary. In addition, Koetler and Keller (2011) added two more phases before the business analysis: marketing strategy and concept development and testing to make the foundation of the product development stronger which reduces failures. Other improvements in NPD include creating agile development for incrementally adding new features to the product, design thinking for generating ideas, and lean innovation for efficient product development (Cooper, 2019).

The new product idea screening is the process of selecting and of evaluating new product ideas from a pool of ideas generated during new product ideation (Rochford, 1991). Organizations conduct a screening to assess which idea is worth investing. The majority of the research regarding screening used a dataset that was obtained by giving out questionnaires (Cooper, 1979; Baker & Albaum, 1986; Debrentani, 1988; Kelly & Storey, 2000; Huang, 2002; Verworn, 2006; Mu, Peng, & Tan, 2007; Jespersen, 2007; Soukhoroukova, Spann, & Skiera, 2011; Ledwith & Perks, 2011; Onarheim, 2012; Albar & Jetter, 2013). Pribyl (1994) explains that using questionnaires for data collection can be problematic in terms of reliability, validity, and false answers to intentional or misinterpretation questions. Recent studies have shown that user-generated content (UGC) (e.g., posts, comments, reviews, and tweets) on SM can be a valuable source of information for screening new product ideas (Sindhav, 2011; Bashir, Papamichail, & Malik, 2017; Nascimento & Da Silveira, 2017; Carlson et al., 2018; Bhimani, Mention, & Barlatier, 2018; Ram & Lieu, 2018; Baum et al., 2019; Prantl & Micik, 2019; Balan & Rege, 2017; Baum et al., 2019). According to Krumm & Davies (2008), UGC is any content, usually unstructured data, such as text, image, video, and even audio, created by the users, rather than the brands, to express one’s opinion, sentiment, idea, and support to something including academics, politics, and businesses.

First, Filieri (2012) performs one of the few and first studies that emphasize consumers as co-creators in NPD’s early stages. Filieri (2012) analyzes customers’ participation and engagements on the web. The study gained enough knowledge to develop new food products and additional services for an existing food company. Similarly, Kao, Yang, Wu, & Cheng (2016) propose the interact-engage-propose-act-realize (IEPAR) model that allows enterprises to include consumers as part of the product value creation. The model provides a step by step process in determining valuable insights to improve product concepts through UGC. Hasan (2018) examines the different ways to utilize users’ feedback and suggestions to generate and improve product ideas. The research found out that the next products of the tech company Glostar, which is the subject of the experiment, should be in line with its core values and existing products. The company’s users want to have more freedom to express, create, and share all kinds of content, such as images, videos, and music that their current platform cannot provide. Lastly, Rathore & Ilavasaran (2020) analyze the impact of the consumers’ pre- and post-launch emotions in three types of new products from three well-known brands in the food, car, and phone industry. The study uses tweets from Twitter to classify consumers’ perceived emotions into anger, anticipation, disgust, fear, joy, negative, positive, sadness, surprise, and trust. Companies obtained insights on what and where to develop their new products before becomes available to the market.

Due to the massive amount of publicly available UGC on SM and the proliferation of tools for data mining and analytics, studies suggest that there is a need to take advantage of these data for screening new product ideas (Kelly & Storey, 2000; Nascimento & Da Silveira, 2017). Additionally, Magnusson, Wästlund & Netz (2016) emphasize that a mixed technical and non-technical people complement each other, which yields to an idea with a high percentage of success. Currently, no study has utilized the UGC on SM to screen new product ideas for SMEs. SMEs are the backbone of the economy, and in the Philippines, 80% of the businesses are considered SMEs, which makes up to 28.9% of the total workforce nationwide (PSA, 2020). Screening new product ideas remains a tedious and resource-intensive, especially for SMEs, yet only 20% of new products launched every year make it to the market (Ford & Terris, 2017; Rodríguez-Ferradas & Alfaro-Tanco, 2016; Akram, 2017).

Nevertheless, Booz, Allen & Hamilton (1982) & Ford & Terris (2017) encourage SMEs to consider NPD to stay competitive and achieve prosperity in a rapidly changing market. Hughes and Chaffin (1996) suggest that in such a fast-paced environment, NPD needs to be iterative and take advantage of continuous feedback from the consumers. By developing an application that screens new product ideas through UGC on SM such as Facebook, Instagram, and Twitter, SMEs may conduct NPD effectively with ease.

**1.2.** **Statement of objectives**

This paper aims to develop a web application that will assist SMEs in screening new product ideas. Specifically, the objectives of this research are as follows:

1. To identify the success factors for screening new product ideas.
2. To define a model that will screen new product ideas through UGC on SM.
3. To design a dashboard for screening new product ideas based on the defined model.
4. To implement a dashboard for screening new product ideas based on the defined model.

**1.3. Scope of the Project**

The output of this research is a web application that will screen new product ideas of SMEs through UGC on SM. First, the research will conduct a literature review to identify proven and effective success factors in screening new product ideas. The success factors will be filtered out to remove those that cannot be measured through UGC on SM. Through the same set of literature, a model will be chosen to perform the screening. Baker & Albaum (1986) suggest that people involved in NPD resist and often abandoned complex models. The identified success factors will be converted into its quantifiable form, which the model will use to perform the screening. A model to be chosen should have been proven to be effective and perform better than other models. Also, a model must be simple enough to implement but also sufficient enough to satisfy the requirements of the project. New product ideas from the Philippines’ SMEs will be randomly collected and used to train the defined model. The dataset will consist of recently launched new products and cover the diverse industry of SMEs. To ensure that there will be sufficient data for the analysis, the SMEs from whom the new product ideas were taken from should have at least 10,000 combined followers on Facebook, Instagram, Twitter and use hashtags when posting about their new offerings. A dashboard will be designed to screen new product ideas based on the identified success factors. A user interface (UI) design tool will create the initial mockups for the dashboard. The design will consist of three parts, including features, conceptual design, and technical design. The features will discuss the requirements for the dashboard. The conceptual design will present the UI for the dashboard. Lastly, the technical design will provide in-detailed the different components of the dashboard and how it will be structured. The dashboard will be developed using Flask, a python-based web framework. New product ideas will be randomly collected from the recently launched product from the Philippines’ SMEs to train the defined model. These data will be visualized, analyzed, and manipulated using packages from Python to perform the screening.

**1.4. Significance of the Study**

The output of this research will assist SMEs in developing new product ideas (Ford & Terris, 2017; Rodríguez-Ferradas & Alfaro-Tanco, 2016; Akram, 2017). The proposed dashboard will provide an insight into how a specific new product idea may perform in the market based on the identified success factors for screening new product ideas through real-time data from consumers. Also, the output of this research will encourage SMEs to develop new products (Booz, Allen & Hamilton, 1982; Ford & Terris, 2017). The proposed dashboard is a web-based application that will be accessible to any computing device with a browser. Through the application, SMEs can quickly assess their new product ideas with minimal efforts required. Moreover, the output of this research will help close the gap identified by (Kelly & Storey, 2000; Nascimento & Da Silveira, 2017) regarding the insufficiency of literature that screens new product ideas using data on SM. In particular, the output of this research will add to the body of knowledge on utilizing UGC on SM for screening new product ideas.

Chapter 2

Methodology

**2.1. Identifying the success factors for screening new product ideas**

Screening starts with identifying the success factors to be used for evaluation (Rochford, 1991). According to Robert (1981) there are no standard criteria for screening. It is up to the organization to come up with their own. By that, this research will identify the criteria to be used for screening new product ideas. A set of empirical studies will be reviewed to identify proven and effective success factors that can be used for the research. The success factors to be selected will be filtered twice. First, the success factors should have been empirically tested out to actual organizations or ideas. Second, the success factors should be measurable through UGC on SM. For instance, company culture and financial data will be disregarded because it cannot be quantified through UGC on SM alone. Once the success factors are identified, it will be further reduced by combining interrelated success factors to make it more manageable. The number of criteria for screening will be kept at a minimum. Brentani (1986) argues that the number of criteria for screening new product ideas does not impact the result. He concludes that fewer criteria can simplify the screening process, which could save up time and resources. Some researchers even claim that few are more and could help improve decision making (Albar and Kocaoglu, 2009; Fasolo et al., 2007; Rieskamp & Hoffrage, 1999).

**2.2 Defining the model for screening new product ideas through UGC on SM.**

A model will be utilized for screening new product ideas using UGC on SM. It will be adapted from the same literature set for identifying the success factors. The model that will be used should have been tested out and have a reputation for selecting and rejecting new product ideas accurately compare to other models. Firstly, the identified success factors will be converted into quantifiable forms to be utilized by the model for evaluation. Baker & Albaum (1986) suggest that people involved in NPD resist and often abandoned complex models. The model to be chosen must be simple enough but sufficient to satisfy the objectives of the project. Once the right model is selected, it will be trained by randomly collecting new product ideas from the Philippines’ SMEs. The new product ideas should be recently launched, specifically from October 10 to October 30, 2020. The list should also cover the diverse industry of SMEs. To ensure that there will be enough data for analysis, selected SMEs should have at least 10,000 combined followers from three of the most popular and highly generated UGC social media platforms of 2020, namely Facebook, Instagram, and Twitter, followers on Facebook, Instagram, and Twitter. The model will determine the viability of a new product idea by collecting and analyzing UGC on SM and will return a numerical value. A positive value will indicate that the new product idea will be accepted. Otherwise, it will be rejected.

**2.3 Designing the dashboard for screening new product ideas based on the defined model.**

A dashboard is a type of application used to track and monitor the overall performance of a company or organization by providing reports on Key Performance Indicator (KPI), business metrics, and analytics. A good structure of a dashboard possesses a clear understanding of how the system works (Gemignani & Gemignani, 2009). This research will develop a dashboard to determine the viability of a particular new product idea based on the identified success factors. The primary goal of the design is to ensure that the application is ready for implementation (Akaikine, 2010). The process for designing for the dashboard will consist of three parts: features, conceptual design, and technical design. The features will discuss the requirements for the dashboard. The conceptual design will present the initial mockups for the dashboard. Lastly, the technical design will provide the technical components for the dashboard and how it will be structured.

**Features**

The dashboard will determine the viability of a specific new product idea. There will be two types of users for the dashboard the SMEs and the system admin. The SME is the primary user, who will do most of the interaction with the dashboard, while the system admin role is only to monitor the activities happening in the dashboard. The dashboard will allow SME to enter a new product idea, a product category, select sources of (i.e., Facebook, Instagram, and Twitter) where UGC will be taken from (all sources can be selected) an elevator pitch for the new product idea. All fields must be filled out to perform the screening. When the submit is submitted, the dashboard will show the score for the new product idea with all the UGC categorized based on the success factor it belongs to. A positive value will indicate that the new product idea is accepted, while a negative value will mean that it will be rejected.

**Conceptual design**

Over the years, the devices that are capable of accessing the Internet has grown. Gardner (2011) reports that a new standard for web design has been proposed. It aims to standardized web responsive design to reduce the workload of the developer by developing a single application that can adapt across devices and improve the experience of the users. The dashboard will be accessed through any computing devices with a browser. The UI design will consider different device perspectives, including a computer and a mobile. Design patterns solve recurring problems in application design by applying ready-made and industry-tested solutions (Fowler, 2001; Fowler, 2003). The design will be simplified to allow more time for the actual implementation but will ensure not to compromise the basic design principles. A UI design tool will be used to design the UI for the dashboard.

**Technical design**

The design will discuss the different components of the dashboard that need to be developed. It will also explain how these pieces will work together by creating an application architecture and software diagrams.

**Dataset**

The dataset to be used by the application to perform the screening will be limited to text-based UGC on SM. The UGC will be collected in real-time from Facebook, Instagram, and Twitter. Since each dataset consists of many metadata, only relevant columns will be included when performing data acquisition. For instance, according to the Twitter documentation, a single tweet has more than 30 columns. Some of the metadata included in the UGC to be collected will be the author, the actual post or tweet, language, age, location, date posted, and the number of followers or retweets.

**Operations**

**Data acquisition**

The UGC will be acquired using the package *tweepy*. It will allow the application to search and collect all related UGC based on the information entered by the SME.

**Preprocessing**

First, since the collected UGCs will consist of sentences or strings, each UGC will need to be cleaned to remove extra spaces at the beginning and the end of each sentence using *strip()* function. Second, each UGC will be broken down into words or tokens using the *split()* function. Also, duplicate words will be removed by converting all the words into lower case and transforming those words into a set using the *lower()* and *set()* functions, respectively. Finally, to make the analysis easier, non-English words will be translated into English using the *translate* package in Python.

**Analysis**

**Software architecture and diagrams**

The architecture and the diagrams for the dashboard will be designed using Draw.io, an online diagram software. The dashboard will consist of two three actors: SMEs, system admin, and the system itself. A sequence diagram, unified modelling language (UML) diagram, activity diagram, and entity relationship diagram (ERD) will be created to show how the system will work.

**2.4 Implementing the dashboard for screening new product ideas based on the defined model.**

**Methodology**

The dashboard will be simultaneously developed alongside the design. Since the application requirements are already defined, the main activity will be the development and training of the model.

**Technology stack**

Web application development has two parts, the front-end, and the back-end. Front-end or client-side development focuses on the components that users can see and interact with or simply the UI. It includes the layout of the page, the arrangement of the navigation bars, the rotating animation when the application is loading, and the forms and inputs for signing up on the page, to name a few. On the other hand, back- end or server-side development deals with the logic behind all the processes being performed by the application. For instance, when the user searches for a particular item in the application, the back-end is responsible for getting that item and returning it to the user by requesting that resources to the server.The dashboard will be implemented in two parts

**Front-end (client-server development)**

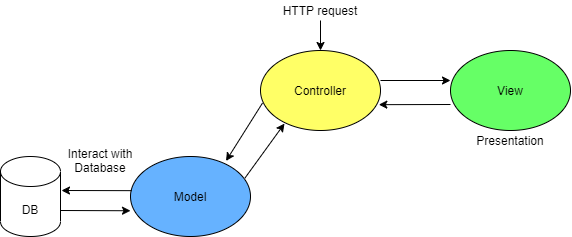
The UI will be implemented using the fundamental web technologies, such as HTML 5, CSS 3, ES 5 (JS). To make the designing process easier, the CSS framework Bootstrap will also be utilized. Since the dashboard will be developed using a framework, Jinja2 will be used as the templating engine.

**Back-end (server-side development)**

**Web Framework**

The dashboard is a web application that will be developed using Flask 1.1.2. It is an open-source web python microframework for building data-driven and dynamic web applications quickly. Python is the language of choice for performing analysis for big data (Oliphant, 2007). It follows the Model-View-Controller (MVC) architecture pattern that separates the application into three main components: the model, view, and controller representing the data or the database, logic, and display of the application. Flask is the most popular web framework for python, along with Django. It has 52,400 stars and 13,800 forks on its Github page at the time of writing. Unlike Django, a full-stack and comes with pre-built dependencies, libraries, and layouts, Flask is lightweight. It only offers suggestions for possible tools for developing Flask application, giving developers the flexibility and freedom to select other technologies for implementation. The Flask framework is relatively new. Version 1.1.2 was recently released on April 3, 2020; it is considered its first stable release. Nevertheless, its community has been growing. There are currently 621 contributors and trusted by more than 5,000 projects, including well-known brands such as Netflix, Reddit, and Lyft.

*Figure 1***:** *The Flask’s MVC architecture*



**Database**

The dataset will be stored in a database using SQLAlchemy. It is the Python SQL toolkit and Object Relational Mapper (ORM) that gives developers the full power and flexibility of SQL.

**Server**

The server is a computer program that provides a service to another co computer and its users (clients). The application will be served using Nginx/uWSGI. Nginx is a free, open-source HTTP web server. It is known for its performance, rich feature, and simple configuration. Along with Nginx, Uwsgi is often used for serving Python web applications. It will be used to load the Flask application using the Web server gate interface (UWSGI).

**Deployment**

The application will be deployed using Ubuntu. It is the modern, open-source operating system on Linux for the enterprise server, desktop, cloud, and IoT. It can be used for a home network or scale it up to an enterprise level. Moreover, it requires minimal system requirements, making deployment inexpensive.

*Table 1: List of the technology stack for developing the dashboard.*

|  |  |
| --- | --- |
| Front-end | HTML 5, CSS 3, ES 5 |
| Back-end | Python 3.9.0, Flask 1.1.2, Jinja2 |
| Database | SQL Alchemy |
| Deployment | Linux Ubuntu |
| Server | Nginx/uwsgi |

**Development Tools**

**Integrated Development Environment (IDE)**

IDE is a software application that provides comprehensive facilities to developer for development. The IDE of choice will be PyCharm Professional. Although, the professional version comes with a price, Jetbrains, the creator of PyCharm is kind enough to offer a free 1-year subscription for students. It is the recommended code editor for building python-based projects. PyCharm is equipped with all the necessary development tools for modern development, including command-line interface (CLI), features to connect to the database, create a virtual environment, and integration with Github. Also, it offers features for handling big data and developing data-driven applications like conda integration to manage packages for python, scientific libraries and plots for performing data analytics and visualization, and coding assistance for Python framework like Flask.

**Version Control System (VCS)**

The repository is a source code storage where developers and designers store large amounts of source code for safekeeping. All the source code will be stored on Github. It is a version control tool for storing source code. The codes will be pushed and pulled using Git. It is a free and open-source distributed VCS designed to handle everything from small to large projects with speed and efficiency.

**Testing**

Along with PyCharm, which will be used for debugging, Google Chrome and Mozilla Firefox will also be utilized for testing and debugging the codes for the. Both browsers offer developer tools to inspect the behavior of the applications in run-time.

**Requirements organizing tool**

Trello will be used for keeping track of the system requirements and their status in the development. It is a web-based collaboration and to-do list application that organizes projects into boards. It can be customized to list the requirements that need to be done, being done, and done.

**Development**

**Virtual environment and packages**

Python is a multi-purpose language that serves different needs, from creating basic web applications to training models for machine learning and artificial intelligence. It contains lots of packages from different sources, even from other programming languages. If a developer uses one machine to develop multiple projects, installing packages globally will cause conflicts. To solve this, Python creates a virtual environment for each application so that the configuration of one project is different from the others. For the implementation of the dashboard, a virtual environment will be created to store all the packages to be utilized. To better manage the environment and its packages, Miniconda, a free minimal installer for conda, will be installed. Conda is used to manage both the environments and packages. Unlike pip, which is the default package management of Python, conda is lighter because it contains fewer packages that are mostly used for performing data analysis and data science. Once the environment is created and packages are installed, a new project will be created in PyCharm, and it will use the created environment as its interpreter to import all the packages need for the development.

Chapter 3

Results and Discussions

**3.1 Success factors for screening new product ideas.**

*Table2: List of the literatures for identifying the success factors*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Literature** | **Samples** | **Model** | **Model accuracy** | **Success factor** | **Quantifiable form** |
| Cooper (1979) | 195 actual industrial new product success and failures | Cross-split-half method with multiple regression. | Overall = 80.41%  False positive = 17.4%  False negative = 14%  *\*It is more accurate in predicting failures than successes.* | Newness to firm (negative)  Overall project/company resource compatibility  Product superiority and uniqueness  Market competitiveness  Market need, growth, and size  Technical resource compatibility  Economic disadvantage of product (negative) | New customers to the firm?  New product class to firm?  New types of customer needs?  Production process new to firm?  New distribution/sales force to firm?  New type of advertising/promotion to firm?  New competitors for the firm?  \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*  Had adequate financial resources for project?  Had compatible R&D resources?  Had compatible engineering skills?  Had necessary marketing research skills?  Had compatible production resources?  Had compatible salesforce/distribution resources?  Had adequate advertising/promotion skills?  \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*Highly innovative product, new to market?  Product had unique factors?  Superior to competing products?  Product let customer reduce his costs?  Product did unique task for customer  Product higher quality than competitors  \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*  Highly competitive market  Intense price competition in market  Many competitors in market  Many new product introductions  Changing user needs in market  \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*  Customers had great need for product type  Market size (peso volume) was large  High growth market  \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*  Had compatible R&D resources for project  Had compatible engineering skills  \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*Product did not let customer reduce his costs.  Product priced higher than competing product. |
| Copper (1981) | 103 industrial firms that were active in product development | Analysis of variance (ANOVA)  The correlation coefficient |  | Demand  Market growth  Customer satisfaction with current products  Manpower  Distribution skills  Marketing skills  Promotion skills  Advertising skills  Managerial skills  Newness to the market  Newness of the type of customer need served to the firm  Newness of the product class to the firm |  |

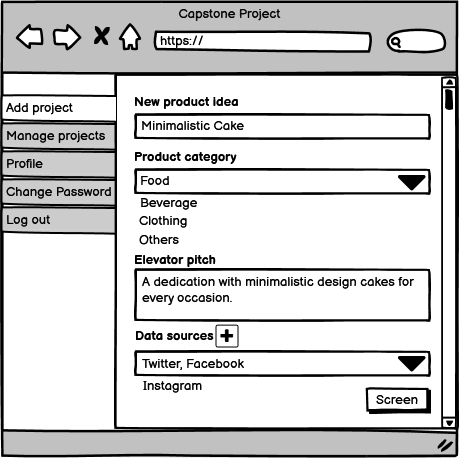
**3.2 Model for screening new product ideas through UGC on SM.**

**3.3 Design of the dashboard for screening new product ideas based on the defined model.**

**Feature**

**Conceptual design**

Initial mockups for the dashboard



**Technical design**

**Components**

**Diagrams**

**Sequence Diagram**

**UML diagram**

**Activity diagram**

**ERD diagram**

**Architecture**

**3.4 Implementation of the dashboard for screening new product ideas based on the defined model.**

Chapter 4

Conclusions

References

Neda: PH Economy lost 1.1T during lockdown. (2020, May 23). De Vera, B. Retrieved from <https://business.inquirer.net/298037/neda-ph-economy-lost-p1-1t>

Employment Situation in April 2020. (2020, June 5). Philippines Statistics Authority. Retrieved from <https://psa.gov.ph/statistics/survey/labor-and-employment/labor-force-survey/title/Employment%20Situation%20in%20April%202020>

Small Business Wage Subsidy Program. Retrieved June 19, 2020 from <https://sites.google.com/dof.gov.ph/small-business-wage-subsidy>

Bouey, J. (2020). Assessment of COVID-19's Impact on Small and Medium-Sized Enterprises: Implications from China.

Facebook. (2020, July 2020). Facebook Reports Second Quarter 2020 Results.<https://investor.fb.com/investor-news/press-release-details/2020/Facebook-Reports-Second-Quarter-2020-Results/default.aspx>

Cision-PR Newsire. (2020, April 30). Twitter Announces First Quarter 2020 Results. <https://www.prnewswire.com/news-releases/twitter-announces-first-quarter-2020-results-301050109.html>

Clemente, J. (2020, July 24). Distribution of Instagram users worldwide as of July 2020, by age group. Statista. <https://www.statista.com/statistics/325587/instagram-global-age-group/#:~:text=With%20over%201%20billion%20monthly,91%20million%20Instagram%20users%20each.>

Clemente, J. (2020, July 15). Social network penetration worldwide from 2017-2025. Statista. <https://www.statista.com/statistics/260811/social-network-penetration-worldwide/>

Booz, & Allen & Hamilton. (1982). New products management for the 1980s. Booz, Allen & Hamilton.

Takeuchi, H., & Nonaka, I. (1986). The new new product development game. Harvard business review, 64(1), 137-146.

Keller, K. L., & Kotler, P. (2011). Marketing Management. 13.

Cooper, R. G. (2019). The drivers of success in new-product development. Industrial Marketing Management, 76, 36-47.

Sindhav, B. (2011). Co-creation of value: creating new products through social media. International Journal of Management Research, 2(1).

Bashir, N., Papamichail, K. N., & Malik, K. (2017). Use of social media applications for supporting new product development processes in multinational corporations. Technological Forecasting and Social Change, 120, 176-183.

Cooper, R. G. (1981). An empirically derived new product project selection model. IEEE Transactions on Engineering Management, (3), 54-61.

Nascimento, A. M., & Da Silveira, D. S. (2017). A systematic mapping study on using social media for business process improvement. Computers in Human Behavior, 73, 670-675.

Carlson, J., Rahman, M., Voola, R., & De Vries, N. (2018). Customer engagement behaviours in social media: capturing innovation opportunities. Journal of Services Marketing.

Bhimani, H., Mention, A. L., & Barlatier, P. J. (2019). Social media and innovation: A systematic literature review and future research directions. Technological Forecasting and Social Change, 144, 251-269.

Ram, J., & Liu, S. (2018). Social media driven innovations: An exploratory study in China. Journal of Innovation Economics Management, (3), 123-146.

Baum, D., Spann, M., Füller, J., & Thürridl, C. (2019). The impact of social media campaigns on the success of new product introductions. Journal of Retailing and Consumer Services, 50, 289-297.

Prantl, D., & Mičík, M. (2019). Analysis of the significance of ewom on social media for companies.

Balan, S., & Rege, J. (2017). Mining for social media: Usage patterns of small businesses. Business systems research journal: international journal of the Society for Advancing Business & Information Technology (BIT), 8(1), 43-50.

Krumm, J., Davies, N., & Narayanaswami, C. (2008). User-generated content. IEEE Pervasive Computing, 7(4), 10-11.

Filieri, R. (2013). Consumer co‐creation and new product development: a case study in the food industry. Marketing Intelligence & Planning.

Kao, T. Y., Yang, M. H., Wu, J. T. B., & Cheng, Y. Y. (2016). Co-creating value with consumers through social media. Journal of Services Marketing.

Hasan, S. F. (2018). Generating new product ideas for a social media, Case company: Glostars.

Rathore, A. K., & Ilavarasan, P. V. (2020). Pre-and post-launch emotions in new product development: Insights from twitter analytics of three products. International Journal of Information Management, 50, 111-127.

Rochford, L. (1991). Generating and screening new products ideas. Industrial marketing management, 20(4), 287-296.

Kelly, D., & Storey, C. (2000). New service development: initiation strategies. International Journal of Service Industry Management.

Magnusson, P. R., Wästlund, E., & Netz, J. (2016). Exploring users' appropriateness as a proxy for experts when screening new product/service ideas. Journal of Product Innovation Management, 33(1), 4-18.

Ford, P., & Terris, D. (2017). NPD, design and management for SME's. The Design Society.

Rodríguez-Ferradas, M. I., & Alfaro-Tanco, J. A. (2016). Open innovation in automotive SMEs suppliers: an opportunity for new product development. Universia Business Review, (50), 142-157.

Akram Afzal, M. (2017). Risks in new product development (NPD) projects.

Booz, & Allen & Hamilton. (1982). New products management for the 1980s. Booz, Allen & Hamilton.

Hughes, G. D., & Chafin, D. C. (1996). Turning new product development into a continuous learning process. Journal of Product Innovation Management: AN INTERNATIONAL PUBLICATION OF THE PRODUCT DEVELOPMENT & MANAGEMENT ASSOCIATION, 13(2), 89-104.

De Brentani, U. (1986). Do firms need a custom‐designed new product screening model? Journal of Product Innovation Management: AN INTERNATIONAL PUBLICATION OF THE PRODUCT DEVELOPMENT & MANAGEMENT ASSOCIATION, 3(2), 108-119.

Albar, F. M., & Kocaoglu, D. F. (2009, August). Few or more attributes: deleting criteria using sensitivity analysis. In PICMET'09-2009 Portland International Conference on Management of Engineering & Technology (pp. 564-570). IEEE.

Fasolo, B., McClelland, G. H., & Todd, P. M. (2007). Escaping the tyranny of choice: When fewer attributes make choice easier. Marketing Theory, 7(1), 13-26.

Rieskamp, J., & Hoffrage, U. (1999). When do people use simple heuristics, and how can we tell?

McCann, M., & Barlow, A. (2015). Use and measurement of social media for SMEs. Journal of small business and enterprise development

Akaikine, A. (2010). The impact of software design structure on product maintenance costs and measurement of economic benefits of product redesign (Doctoral dissertation, Massachusetts Institute of Technology).

Gardner, B. S. (2011). Responsive web design: Enriching the user experience. Sigma Journal: Inside the Digital Ecosystem, 11(1), 13-19.

Gemignani, Z., & Gemignani, C. (2009). A Guide to Creating Dashboards People Love to Use. Retrieved, 9, 2017.

Oliphant, T. E. (2007). Python for scientific computing. Computing in Science & Engineering, 9(3), 10-20.

Fowler, M. (2001). Avoiding repetition [software design]. *IEEE Software*, *18*(1), 97-99.

Fowler, M., & Highsmith, J. (2001). The agile manifesto. Software Development, 9(8), 28-35.

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