A PDCA Approach on Determining Factors to Increase the Profit Contribution of the IT Department of a Local Online Delivery Service Company

Alexa Mae I. Manrique, Aliyah Geeña L. Naldoza, Mae Angelica S. Salonga, Maxine Hannah S. Villanueva
Department of Industrial Engineering
University of Santo Tomas, España Boulevard, Sampaloc,
Manila 1008, Philippines
alexamae.manrique.eng@ust.edu.ph, aliyahgeena.naldoza.eng@ust.edu.ph,
maeangelica.salonga.eng@ust.edu.ph, maxinehannah.villanueva.eng@ust.edu.ph

Engr. Charlie A. Marquez, MSIE, PIE
Department of Industrial Engineering
University of Santo Tomas
España Boulevard, Sampaloc, Manila 1008, Philippines
ccmarquez@ust.edu.ph

Abstract

This study evaluates the productivity in terms of number of transactions, earnings, and profit of a local online delivery service operated by a tech start-up company that has seen increased sales but not profit. Through PDCA, this study identified the problems that affect the productivity of the company the most, the root causes of the top problem, and their correlation with the productivity of the company. Furthermore, solutions were formulated to help the company improve its productivity for the next year. The assessment began with data collection through interviews and survey questionnaires which were run through various quality control tools as well as correlation analysis. At this stage, it was determined that the poor user interface of the application causes the most problems for the company in terms of productivity. From here, various concrete solutions were formulated for high-impact root causes that were controllable and a corresponding risk assessment plan was developed. With a detailed monitoring and response plan, the solutions provided will help the company as well as other companies within the delivery services industry.

Keywords
Start-up, delivery services industry, productivity, quality control, PDCA

1. Introduction
The Philippines is part of the growing start-up scene alongside other countries in Southeast Asia including Singapore and Indonesia. Some of the most popular online applications in the Philippines backed by start-up companies include Grab and Food Panda which offer services such as online taxi booking, as well as food and grocery delivery. With this, many start-ups have considered launching delivery services as a result of their popularity and demand in the market, especially because of the COVID-19 pandemic and people who prefer not to go out can use these services for convenience.

In connection with the influence of delivery applications in the Philippines, this study focused on a local online delivery service application hereinafter referred to as “the app” which is operated by a local tech start-up company that aims to represent Filipino developers in the tech space and be a viable competitor to established international companies in the delivery industry. Founded at the height of the COVID-19 pandemic, the company launched the app in the middle of 2021 which is a service most similar to Grab and Lalamove providing same-day delivery in Metro Manila and the surrounding provinces of Bulacan, Cavite, Rizal, and Laguna. Similar to existing platforms, the app also uses high-performing application-based technology. It provides three main verticals including (1) a point-to-point

delivery service in which riders deliver parcels, documents, and other delivery needs to specified locations throughout the cities, (2) a food delivery service wherein customers are connected with a variety of partner merchants and can have food delivered to their homes within minutes, and finally (3) a personalized logistical needs service where customers can request the riders for essential items like groceries that can be delivered to the customers' homes.

In an initial interview with the founder of the company, it was mentioned that the app is still in the Beta test process of preparing for the official launch as teams are still being built, talents are still being onboarded, and systems are still being strengthened to achieve operational excellence prior to securing funding from investors. The company is currently securing funds through seed financing. Upon launching the app, the number of transactions increased along with the number of losses as per the company's sales report between June and December 2021. With the need to act fast, deliver fast, and avoid a backlog in the system, the app should be able to accommodate more orders from customers should the system be able to manage order-matching and rider-matching effectively. From a financial perspective, the company experienced the highest loss (earnings subtracted from cost) with the food delivery service. From a marketing perspective, the company is aiming to keep the number of app users uninstalling the app lower than the number of users installing the app.

This paper aims to deploy QC tools in order to analyze the problems within each department namely: HR, Operations, Marketing, Commercial & Sales, and IT and to determine the root causes of the problems that affect the profit contribution of the company the most. With problems in these areas addressed, the company will be able to increase its performance in terms of profit by the end of 2023.

1.1 Objectives

This study is framed toward the local online delivery service company. It aims to analyze their existing processes and identify the root causes that significantly affect the growth of the company as well as to formulate solutions to address the issues using QC tools. The study will have the following aims:

- To identify the problem/s in each department that affects the ability of the company to improve its productivity.
- To identify the root cause of the problem/s that affect the productivity of the company the most.
- To determine the relationship of the identified root causes to the productivity of the company in terms of their profit
- To recommend strategies in improving the productivity of the company

2. Literature Review

Start-ups are organizations that look for a business model that is repeatable and scalable. This challenges organizations that use traditional business models because start-ups must build a business model that appeals to the public because they are venturing into markets that have not been explored before (Voinea et al. 2019). Because of this risk, start-up companies often face uncertainties. Identifying the factors that contribute to the success or failure of start-up companies is essential especially if there are already players that have the majority of the market share. By examining five start-up companies that started out successful but eventually failed, Kusumaningtyas et al. (2021) used the SHELL methodology which is an approach that has been adopted for over 40 years in the aviation industry to describe accident causes. In order to be appropriate to the methodology of the study, the SHELL model was modified such that the model explains five categories of start-ups failure: (1) Software - Business model: some companies employ the wrong business model and do not suit the market, (2) Hardware - Product: Poor and not an agile quality product, (3) Environment: Lack of initiate funding and competition to get venture capital, (4) Liveware - Customer/User: Few customers need the product, and (5) L - Organization: Bad organization, running out of cash, problems with the team, and co-founder misalignment. (Kusumaningtyas et al. 2021).

The growing popularity of food delivery applications like Grab and FoodPanda has stimulated the development of a number of OFD start-ups. From a business standpoint, the OFD apps' long-term sustainability is dependent on two factors: (1) to meet the needs of expectations of its current customers, and (2) as the number of OFD service providers grows, the competition between these businesses grows as well. Through the uses and gratifications approach theory, it shows that the eight main gratifications behind the use of OFD apps include: convenience, societal pressure, customer experience, delivery experience, a search of restaurants, quality control, and listing and ease-of-use with the search of restaurants, ease-of-use, customer experience, and listing as the most significant intentions in using OFD apps (Ray et al. 2019). A study that aimed to create an integrated model to analyze and investigates their relationship with the behavioral intention of Malaysian urban consumers towards OFD services found that there is a positive effect

of time-saving orientation, convenience motivation, and privacy and security towards the behavioral intention of OFD services (Chai and Yat 2019). By analyzing control, service convenience, customer service, and service fulfillment as factors that influence consumers, it shows that (a) the e-service quality of the food ordering experience and (b) the quality of the food received are the two most important (Annaraud and Berezina 2020). Furthermore, the correlations among performance expectation, effort expectation, social influence, and promoting factors positively affect purchase intention while the perception of risk negatively affects purchase intention (Zhu et al. 2021).

In the influence of service quality on customer satisfaction when it comes to supply chain, with the goal of examining the delivery process quality in the supply chain as well as the level of logistics service using the Six Sigma DMAIC process, improvements focused on material handling and packaging were analyzed by identifying the most important root causes of defectives. QC tools including run charts, Pareto charts, check sheets, and cause-and-effect diagrams were utilized to analyze the results. After identifying the root causes of the supply chain defects, some of them being process-related particularly in material handling, improvements were piloted and a control plan was developed to monitor the effectiveness of these implementations (Leppanen 2015). According to Rajagopal et al. (2018), focusing on strategic aspects of businesses, such as logistic capability, can help a company gain a competitive advantage and improve overall performance. Furthermore, time-based strategies like marketing, production, and product development can help companies achieve a competitive advantage. When managers focus on increasing customer engagement regularly and attending to customer concerns, positive post-purchase evaluations, customer loyalty, and repeat purchases could occur (Rajagopal et al. 2018).

Quality Control is a technique in the industry that is effective in solving problems in the industry while lowering waste. In a study conducted by Kumar et al. (2020), the following techniques were used: (1) 80/20 rule, (2) Fishbone Diagram, (3) Cause and Effect Analysis, which was used to analyze the root cause of the problem, and (4) Why-why Analysis, which is said to be effective in maintaining the focus on the layer of causes that can lead to the root cause of the problem. In the automobile industry where this study was conducted, rejection quantity decreased from 7,000 pieces to 0, and customer satisfaction and product reliability increased. This technique was also used in a case study led by Kumar (2019) who investigated the problems faced by one of India's leading automobile manufacturing companies which had a large number of defects through QC tools such as Pareto charts, histograms, and check sheets, and further categorized the defects by severity.

Kulkarni et al. (2017) found that techniques like ABC Analysis and 3P Analysis were used to finalize the problem statement in a study about effective QC implementation. These tools were used to categorize problems based on their involvement in other departments and management. The root cause was then discovered using Root-Cause Analysis, 4W and 1H Analysis, Cause and Elimination Analysis, and Why-Why Analysis. Following the implementation of the proposed solution, they were able to reduce waste to zero and save Rs. 3,08,460 per year. Fipiana and Susanto (2019) used the eight steps of PDCA and seven statistical tools, such as the inspection sheet, stratification, Pareto diagram, fishbone diagram, scatter diagram, histogram, and control chart, to determine employee work productivity. They began by identifying the problem, looking for factors that contributed to the problem, determining the dominant cause, and developing a plan for improvement. They were able to determine the leading cause of defects, as well as the dominant factors in equipment, material, human, method, and environment. They were also able to identify the increase in work productivity from 12 defects per month to 0 defects per month.

In the manufacturing industry, specifically in a micro-scale manufacturing industry of automotive parts where the aim is to minimize lead time without significantly changing the present system, lean approaches were applied. Through the proper application of lean approaches, an attempt was executed to improve the machining cell capacity. Ultimately, capacity expansion was accomplished without a significant capital investment (Nallusamy and Saravanan 2016). A case study was conducted in a medium-scale aluminum coating industry and implemented QCs to improve the quality, productivity, and safety of the operations. Moreover, the same tool was used to train workers in improving their positive and problem-solving attitudes in their workplaces. With the objective of improving the productivity of one of the most important processes in the plant being studied, Kulkarni et al. (2017) formed a QC of 8 members and 1 facilitator. After thorough planning and discussion were done, several plant problems were identified. The study utilized the Ishikawa Diagram (Fishbone Diagram), problem selection was done with the 3P (Proprietary, Priority, and Preference) Analysis, and a pie chart of plant expenditures to identify the main problem: high gas consumption. Several causes were then identified using the Affinity Diagram and then improvement points and action plans were done. In a span of 3 months, the study concluded that the plant had around 38% of savings and a productivity increase was achieved after the QC implementations. Therefore, demonstrates how QCs can handle problems related to

productivity improvement in a workplace and aid small to medium-scale industries in their savings and increase productivity.

3. Methods

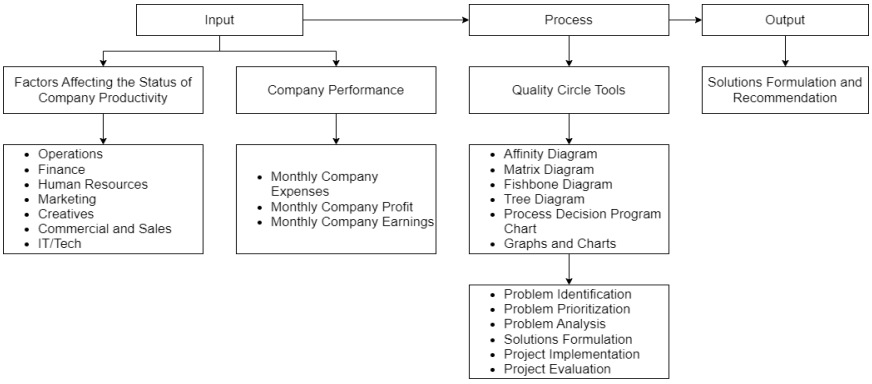

Figure 1. Conceptual Framework Flow Diagram

The study examined the factors influencing the productivity of the company in terms of their employee, operations, marketing, merchant, technical, competitors, and company. Along with these were the determination of a company's performance through the analysis of different financial documents. Company productivity was measured in terms of their profit. These data served as the input of the research itself. In order to do this, this research underwent data gathering and data processing. Data gathering entailed information needed to address the research problems and achieve its objectives. In this study, data was provided by the selected company in this research through an online interview with the different departments of the company concerned.

Afterward, the input of the study underwent a process with the use of different QC tools specified in figure 2.5. The research findings included all corresponding output from each QC tool, particularly, problems to be prioritized, their root causes, and the solutions to be formulated to address these problems. Upon proper utilization of the QC tools, analysis and accurate interpretation was produced that was then needed to address the research problem and attain the research objectives, thus the formulation of a solution and recommendation to the company were performed.

4. Data Collection

The researchers conducted the study in an online local delivery service company, thus the data were collected from its employees and department heads. Online interviews with the department heads, requests for documents needed for the study, and surveys with the employees were conducted for data collection.

5. Results and Discussion

5.1 Graphical Results

Table 1. Affinity Diagram

Human Resources	Operations	Marketing	Commercial & Sales	IT/Tech
Insufficient number of departments because the company is still in the beta stage	Frequent cancellation of orders when it comes to merchants due to information not updated	Inability to secure rider when orders from other competitors come in simultaneously	Repeatedly occurring problems in partnering with merchants	Several glitches in the technical system
Insufficient turnover procedures with resigning employees/new hires	Low number of orders received by the rider in a day	Lack of preference by riders for the brand over other competitors	Failure to meet expectations of key accounts in terms of number of users	Poor user interface of application
No pre-onboarding and social benefits for riders	Frequent delay in delivering the orders	Lack of on-the-ground activities	Outdated merchant operational status	Lack of standardized system
Inexclusive hiring of riders	Poor order-matching for riders	Lack of budget for promotional activities		
Poor task performance of employees		High number of similar food delivery applications		
Lack of particular employee trainings		Lack of customer loyalty		

To sort through the data collected from the identified problems during the interview with the company department heads, the affinity diagram was used. These problems were organized under 5 categories namely: Human Resources, Operations, Marketing, Commercial & Sales, and IT/Tech. After which, the matrix diagram was used for the problem prioritization phase of the study.

Table 2. Matrix Diagram of Employee Survey Results

	Problems	Criteria						
		F	**I**	**S**	**U**	**DA**	**Total**	**Rank**
HR	Lack of particular employee trainings	6	3	7	3	2	21	22
	Poor task performance of employees	4	6	6	5	3	24	17
	Insufficient turnover procedures with resigning employees/new hires	4	3	6	4	4	21	22
	Inexclusive hiring of riders	4	5	6	4	4	23	19
	Insufficient number of departments because the company is still in the beta stage	4	4	6	5	4	23	19
	No pre-onboarding and social benefits for riders	4	4	6	4	4	22	21
Operations	Low number of orders received by the rider in a day	7	7	4	7	7	32	5
	Frequent cancellation of orders when it comes to merchants due to information not updated	7	7	4	5	7	30	10
	Poor order-matching for riders	7	7	4	7	7	32	5
	Frequent delay in delivering the orders	7	7	4	7	7	32	5
Marketing	Lack of budget for promotional activities	7	4	6	4	6	27	14
	Insufficient promotional activities	7	4	6	4	6	27	14
	Lack of on-the-ground activities	7	4	6	4	6	27	14
	Lack of customer loyalty	7	6	5	7	6	31	9
	High number of similar food delivery applications	7	6	1	4	6	24	17
	Inability to secure rider when orders from other competitors come in simultaneously	3	7	6	7	6	29	12
	Lack of preference by riders for the brand over other competitors	3	7	6	7	6	29	12
IT/Tech	Several glitches in the technical system	7	6	7	6	7	33	3
	Poor user interface of application	7	7	7	7	7	35	**1**
	Lack of standardized system	7	4	7	5	7	30	10
	Outdated merchant operational status	7	7	6	7	5	32	5
	Failure to meet expectations of key accounts in terms of number of users	7	7	6	7	7	34	2

Commercial & Sales	Repeatedly occurring problems in partnering with merchants	7	7	7	7	5	33	3

Based on the categorization of the problems in the affinity diagram, a questionnaire was deployed to employees of the company based on their respective departments to determine the ratings for each problem based on the following criteria: familiarity, impact, solvability, urgency, and data availability. Each problem was ranked using the ratings of 1-2 for low, 3-5 for medium, and 6-7 for high. Upon getting the total for each problem, they were ranked against each other and the problems with the highest overall total ratings were prioritized in this study. From the results of the matrix diagram, the problem that ranked the highest is IT.Tech category: Poor user interface (UI) of application. With this, the problem is explored and analyzed further in the next QC tool: the cause and effect diagram.

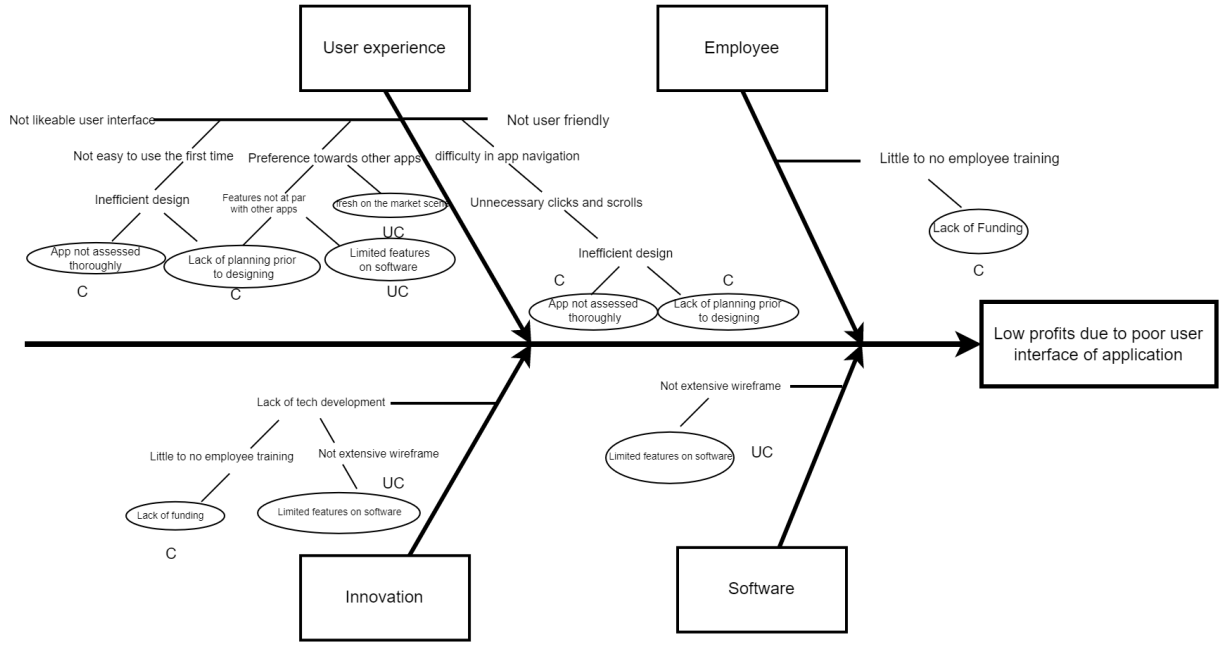

Figure 2. Cause and Effect Diagram (Ishikawa)

The cause and effect diagram, famously known as the Ishikawa or the fishbone diagram, is a widely used QC tool that examines the potential causes of a problem and turns it into smaller categories. From here, the relationship between subcategories and their causes is identified. For this study, the following categories were set to determine the causes of why the application of the company is having low profits due to poor UI of the application: Employee, Software, User interface, and Innovation. The determined root causes are the following: (a) the app is not assessed thoroughly, (b) there is a lack of planning prior to designing the app, (c) lack of funding, (d) there are limited features available on the app, and (e) that the app is new to the market.

Each root cause was categorized into controllable and uncontrollable and high or low impact to further narrow down the areas to be prioritized during the data analysis process. From the diagram above, three root causes were identified to be controllable and have a high impact on the poor UI of the application of the company: (a) the app is not assessed thoroughly, (b) lack of planning prior to designing, and (c) lack of funding. The “limited features” root cause was determined to be uncontrollable with high impact. The “fresh on the market” root cause was determined to be uncontrollable with low impact.

In preparation for the solutions formulation, three objectives were developed for the three controllable and high-impact root causes of poor UI on the app. The first objective for "app is not assessed thoroughly" is to improve app testing procedures by 70% by the end of June 2023. The next objective is to increase the planning scope by 80% by the end of June 2023 for the root cause of the lack of planning prior to designing. Finally, to address the lack of funding, the objective to increase funding for app improvement by 40% by the end of June 2023 was developed.

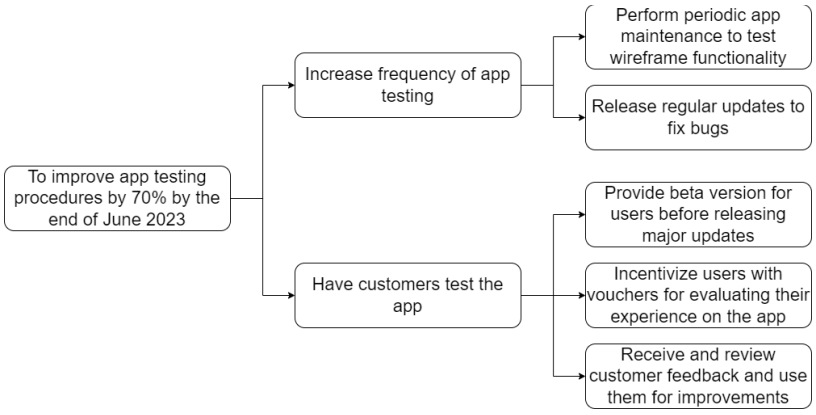

Figure 3. Tree Diagram for "To Improve App Testing Procedures"

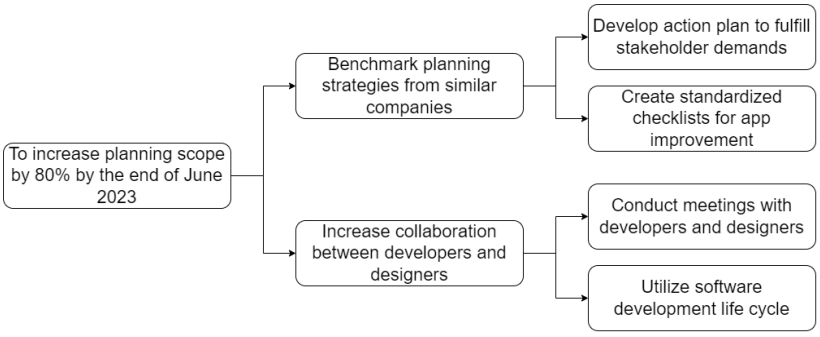

Figure 4. Tree Diagram for "To Increase Planning Scope"

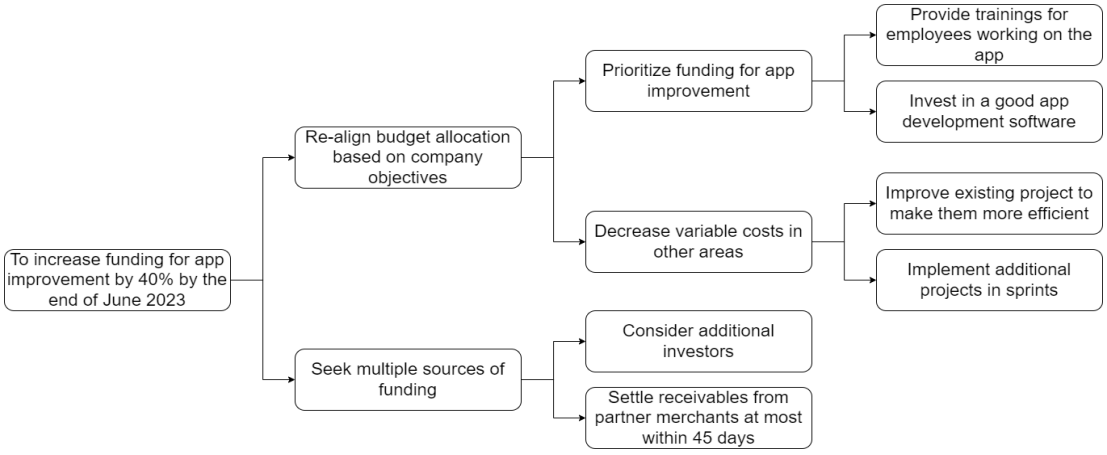

Figure 5. Tree Diagram for "To Increase Funding for App Improvement"

With the tree diagram, solutions were formulated by continuously developing potential solutions and branching out from the objective until they were concrete and implementable.

To assess the effectiveness of the higher-order factors which are the alternative solutions, a prioritization matrix was developed using the same criteria and ratings as the matrix diagram. From the last branch in the tree diagram, the solutions that ranked first based on the criteria in the prioritization matrix were then given priority. The alternative solutions that ranked first for the "app not assessed thoroughly" problem are: to perform periodic app maintenance to test wireframe functionality and receive and review customer feedback and use them for improvements. For "lack of funding", the solutions are to provide training for employees working on the app, improve existing projects to make them more efficient, and to settle receivables from partner merchants at most within 45 days. Lastly, for "lack of planning prior to designing", the top solutions are to create standardized checklists for app improvement and conduct meetings with developers and designers.

5.2 Numerical Results

Observing the significant relationships between the number of registered users and other variables such as the number of transactions, earnings, and costs, different relationships can be observed. Firstly, the number of registered users and the number of transactions have a strong positive relationship (r = 0.822) which indicates that as the number of registered users increases, the number of transactions made on the app increases as well. In addition, the number of registered users and the costs incurred by the company in fulfilling customer orders have a strong positive relationship (r = 0.814) which indicates that as the number of registered users increases, the costs incurred by the company increase as well by a lot.

Table 3. Correlation table for the number of registered users and profit

		No. of Registered Users	No. of Transactions	Earning	Cost	Profit
No. of Registered Users	Pearson Correlation	1	0.822*	0.343	0.814*	-0.686
	Sig. (2-tailed)		0.045	0.506	0.049	0.133
	N	6	6	6	6	6
No. of Transactions	Pearson Correlation	0.822*	1	0.283	0.819*	-0.778
	Sig. (2-tailed)	0.045		0.587	0.046	0.068
	N	6	6	6	6	6
Earning	Pearson Correlation	0.343	0.283	1	0.751	0.323

	Sig. (2-tailed)	0.506	0.587		0.085	0.532
	N	6	6	6	6	6
Cost	Pearson Correlation	0.814*	0.819*	0.751	1	-0.382
	Sig. (2-tailed)	0.049	0.046	0.085		0.455
	N	6	6	6	6	6
Profit	Pearson Correlation	-0.686	-0.778	0.323	-0.382	1
	Sig. (2-tailed)	0.133	0.068	0.532	0.455	
	N	6	6	6	6	6

*. Correlation is significant at the 0.05 level (2-tailed).

By looking at the relationship between other variables, it can be seen that the number of transactions and cost have a strong positive relationship (r = 0.819). With that, even though the relationship between the number of registered users and the number of transactions has a strong positive correlation that implies the company's success in converting users into customers, the company is still unable to sustain profit that is enough to cover their expenses in fulfilling customer orders. Moreover, costs increase more significantly as the number of transactions increases.

5.3 Proposed Improvements

Table 4. Corrective Action Plan

Activity	Responsible Person/Unit	When	Where	Resources Needed	Estimated Budget
Perform periodic app maintenance to test wireframe functionality	IT Staff	Every end of the month	Head Office	Application, Program Software, Historical data/results from previous maintenance	₱0.00
Receive and review customer feedback and use them for improvements	Marketing Department	Every end of the month	Head Office	App Reviews on Google Play Store or Apple App Store	₱0.00
Provide trainings for employees working on the app	HR Training Officer	Every 2-3 months	Head Office	Program, Surveys, Assessments, Training manuals	₱67,360.00
Improve existing projects to make them more efficient	Project Management Dept. Head	Every quarter	Head Office	Historical data/results of existing projects	₱0.00
Settle receivables from partner merchants at most within 45 days	Finance Department	Every 45 days	Head Office	Financial-related documents	₱0.00
Create standardized checklists for app improvement	IT Staff	Every first week of the month	Head Office	Productivity software	₱59,483.00
Conduct meetings with developers and designers	IT Department Head	Every week	Head Office	Journal/tracker	₱3,400.00

In the project implementation and control phase, the corrective action plan was used to identify the factors needed to implement the alternative solutions. There are no expected additional fees for the first two activities because the responsible units are already covered by salary and the resources are already accounted for prior to the implementation of this solution. Moving forward, the "provide training" activity has an estimated budget of ₱67,360 for four employees. According to the Philippine Statistical Research and Training Institute (n.d.), the 2022 fee or rate for face-to-face training courses for those employed in private agencies/offices cost about ₱16,840.00 per person. Meanwhile, no budget was allocated for the next two activities since the resources needed for these alternatives are available within the company.

The next activity has an estimated budget of ₱59,483.00 taking into account the software acquisition cost of ₱3,499 per employee. There are currently 17 IT staff as of the time of completing this paper. Lastly, the estimated budget for the last activity is ₱3,400 for all the employees within the department. The timeline for the completion and frequency of checking that each activity is done is provided in the above table. For easier reference during scheduling activities, a Gantt chart could be used to isolate the time elements for each activity.

Table 5. Potential Risk Assessment

Solution	Risk Item	I	P	RPN	Preventive Plan	Contingency Plan
Perform periodic app maintenance to test wireframe functionality	The performance of an app may eventually be badly impacted by overlooked coding and errors that happen during app maintenance	H (7)	M (5)	35	Use of five-point scale assessment forms to perform detailed team review app functionality before releasing to end-users	Frequent and consistent review and tracking on the status and specification updates on the app
Receive and review customer feedbacks and use them for improvements	By relying just on the customer feedback, incorrect solutions for improvements may be made, which could worsen the severity of the primary issue.	H (6)	H (7)	42	Sending regular notifications and alerts as encouragement for customers to leave reviews on their app experience	Offer in-app incentives such as discount vouchers, to encourage customers to review their experience
Provide trainings for employees working on the app	There will be a waste on spending money on ineffective training courses, and the employees' productivity on working the app will still be done inefficiently	H (6)	M (5)	30	Create an effective training program management and align it with the company's objectives with right training metrics	Create modern and relevant training contents and assess the employees after the training program
Improve existing projects to make them more efficient	The employee will work either inefficiently or ineffectively as a result of their difficulty adjusting to their new responsibilities if processes in ongoing projects are abruptly changed.	H (6)	H (6)	36	Establish the capability of the team, distribute resources, and if necessary, divide up and modify individual tasks.	List all possible concerns of the employees, continue to figure out each team's capacity and address their workloads
Settle receivables from partner merchants at most within 45 days	The company's cash flow may still be slowed down, and the time and effort spent managing the receivables results in missed opportunities.	H (6)	M (5)	30	Establish a systemized procedure for billing and payment	Establish updated credit and collection policies that partner merchants must be committed to.
Create standardized checklists for app improvement	There won't be any established guidelines for improvement as the checklists are subject to unforeseen modifications, making it impossible to follow regularly.	H (7)	M (4)	28	Take note of significant feedbacks from stakeholders and trends in the industry prior to checklist creation	Expand scope of application evaluation, then generate a complete standardized checklist
Conduct meetings with developers and designers	Inability to communicate properly with the developers and designers due to schedule meeting conflicts, this can also lead to insufficient to no concrete plan of actions	M (5)	H (6)	30	Utilize a centralized work schedule	List coworkers' availability (range of date and time) through a productivity software, then set a meeting schedule

In order to identify, analyze, and develop controls to counter the hazards and risks of the implemented solutions, a potential risk assessment plan was developed to identify the risks that come with each solution. Upon determining the extent to which each risk could impact the company and the probability of occurrence, appropriate preventive plans were developed to help avoid the risks from occurring. Contingency plans were also put in place to address the risks should they still occur after following the preventive plans.

Table 6. Monitoring and Response Plan

		MONITORING PLAN				RESPONSE PLAN		
Measure	**IPO**	**Target**	**Method of Data Capture**	**When**	**Unit Responsible**	**Trigger Point**	**Unit Responsible**	**Reaction Plan**
App Maintenance Assessment Scores (FivePoint Scale)	O	4-5 assessment scores	Assessment forms from the IT Staff	Every end of the month	IT Staff	<2 assessment scores	IT Staff	Take action on the specific app problem and relay information to end-users and other company departments to keep them updated with the ongoing maintenance
App User Reviews	O	4 to 5 star app user reviews	App Reviews section on Google Play Store or Apple App Store	Every end of the month	Marketing Department	<4 stars	Marketing Department	Respond to the reviews to assess how they will further improve in the app and their services and relay information to departments of interest
Training Assessment Scores	O	80-100% passing rate	Training Assessment Sheets	Every 2-3 months	HR Department	<80% of total passing rate	HR, Supervisor or Managers	Communicate with each employee and evaluate their knowledge, interest and capability based on their assessment results
The no. of settled receivables from partner merchants	O	At least 50% from the partner merchants	Software used for managing accounts and other finance related concerns	Every month	Accounts Receivable Clerk or Finance Department	<50% settled from the partner merchants' receivables	Auditor or Finance Department	Send reminders on unpaid invoices and establish specific payment terms and rules.
Success rate of improving existing projects	P	At least 50% of their objectives are achieved	Milestones list and schedule in the project charter	Every quarter	Project Manager	<50% of their objectives are not met	Executive Board	Review the company's master plan and re-establish objectives of the existing projects
Checklist criteria	O	90% of the criteria are met	Productivity software	Every month	IT Staff	<70% of the criteria are not met	IT Department Head	Adjust the criteria based on the present trend in the industry
Number of meetings with the IT team	O	At least one meeting per week	Productivity software	Every month	IT Staff	No conducted meeting in two weeks	IT Department Head	Follow up with the meeting organizer; call a meeting if there is no response from the other end

The monitoring plan is a data collection method that serves to keep the implementation of the solutions on the right track and keep it at an optimal performance. Meanwhile, the response plan establishes a trigger level that is based on the measures indicated in the monitoring plan. Once these triggers are reached, specific actions are done in order to keep and maintain the performance of the implemented measures. Table 6 shows the monitoring and response plan, the final part of the implementation phase of the study, in achieving its objective where strategies are recommended to improve the productivity of the company.

6. Conclusion

Upon the completion of data collection and analysis, different problems that affect the company's productivity were identified from each department. The top five problems that affect the productivity of the company the most were found to be as follow respectively: poor user interface of an application, failure to meet expectations of key accounts in terms of number of users, several glitches in the technical system, repeatedly occurring problems in partnering with merchants, low number of orders received by the rider in a day, poor order-matching for riders, frequent delay in delivering the orders, outdated merchant operational status and lack of customer loyalty.

Through the affinity diagram and matrix diagram, it was found that there is a specific department within the company that affects its productivity and this department was found to be the IT/Tech Department which has the problem of "poor user interface of the application." This problem keeps the company from sustaining profit despite the increase in the number of users that register on the app. Through correlation analysis, it was verified with a Pearson's r value of -0.686 that as the number of registered users increases, the profit of the company decreases. However, with a significance level of 0.133, this relationship is not significant. Looking at the relationship between the number of registered users and number of transactions ($r = 0.822$) as well as the costs incurred ($r = 0.814$), Pearson's r value indicates a high positive relationship for both pairs and a significance level below 0.05 thus the relationship is significant. This means that although the users are converted into paying customers, these customers do not spend enough to cover the expenses incurred by the company in fulfilling customer orders. The high impact and controllable root causes of the top 1 problem are the following: (1) App was not assessed thoroughly, (2) Lack of planning prior to designing and, (3) Lack of funding. By identifying the root causes of this problem through the cause and effect diagram, the high impact and controllable root causes were identified. Furthermore, the tree diagram and prioritization matrix were used to determine the alternative solutions that would have the highest impact on the productivity of the company once implemented.

The following solutions were recommended by the researchers to improve the productivity of the company: (1) Perform periodic app maintenance to test wireframe functionality, (2) Receive and review customer feedback and use them for improvements, (3) Provide training for employees working on the app, (4) Improve existing projects to make them more efficient, (5) Settle receivables from partner merchants at most within 45 days, (6) Create standardized checklists for app improvement and, (7) Conduct meetings with developers and designers

Along with these solutions, a detailed response and monitoring plan are added to give recommendations to the company in addressing the root cause that affects its productivity the most.

References

Akehira, S., Alcantara, E., & Laforga, A., Competition and Innovation: The Rise of Startups and Its Effects Towards the Philippines Economy. *Journal of Economics, Finance and Accounting Studies*, 4(1). 383-411. 10.32996/jefas. 2020

Agarwal, Richa., Techniques To Prevent Software Bugs. Testsigma. Retrieved from https://testsigma.com/blog/techniques-to-prevent-software-bugs/. May 25, 2022).

Annaraud, K., & Berezina, K., Predicting satisfaction and intentions to use online food delivery: What really makes a difference?. *Journal of Foodservice Business Research*, 23(4), 305-323. 2018.

Association for Project Management. What is a Gantt Chart?. Retrieved from https://www.apm.org.uk/resources/find-a-resource/gantt-chart/

Chai, L. T., & Yat, D. N. C. , Online food delivery services: Making food delivery the new normal. *Journal of Marketing advances and Practices*, 1(1), 62-77. 2019.

Delmas, M.A. and Pekovic, S., Organizational Configurations for Sustainability and Employee Productivity: A Qualitative Comparative Analysis Approach. *Business & Society*. 1–36. https://doi.org/10.1177/0007650317703648. 2017.

Fipiana, Wahju Inggar, and Wenda Susanto., "Effect of Quality Control Circle Application to the Employee Work Productivity of PT Z." *International Journal of Research in Engineering, Science and Management*, vol. Volume 2, no. Issue 11, 2019, pp. 621-626. 2019.

GoLeanSixSigma., Monitoring & Response Plan. Retrieved from https://goleansixsigma.com/monitoring-plan/

Hinkle, D.E., Wiersma, W., Jurs, S.G. *Applied Statistics for the Behavioral Sciences*. (5th ed.). Houghton, Mifflin. 2003.

Josue, N. L., Borres, R. D., Yapo, C. M. P., & Canlas, K. J. B., Factors Affecting the Efficiency of Online Food Deliveries: A Comparative Analysis among GrabFood, Foodpanda, and Zomato Ph. http://ieomsociety.org/proceedings/2021rome/633.pdf. 2021.

Karnane, K., & Goss, C. , Automating root-cause analysis to reduce time to find bugs by up to 50%. *Cadence Design Systems*, Tech. Rep. 2015.

Kulkarni, S., Welekar, S., & Kedar, A. , Quality Circle To Improve Productivity: A Case Study In A Medium Scale Aluminium Coating Industry. *International Journal of Mechanical Engineering and Technology (IJMET)*, 8(12), 800-816. 2017.

Kumar, J., Kataria, K. K., & Luthra, S., Quality circle: a methodology to enhance the plant capacity through why-why analysis. *International Journal of Mathematical, Engineering and Management Sciences*, 5(3), 463. 2020.

Kumar, R. Kaizen a tool for continuous quality improvement in Indian manufacturing organization. *International Journal of Mathematical, Engineering and Management Sciences*, 4(2), 452-459. 2019.

Kusumaningtyas, A., Bolo, E., Istianah, Chua, S., Wiratama, M., & Tirdasari, N.L., Why Start-ups Fail: Cases, Challenges, and Solutions. *Advances in Economics, Business and Management Research*, 1(198). 155-159. https://dx.doi.org/10.2991/aebmr.k.211207.024. 2021.

Leppänen, Sanna. Improving Delivery Quality in Supply Chain : a Case Study. , *Tampereen ammattikorkeakoulu*, 2015. Print.

Malone, Thomas W., Heuristics for designing enjoyable user interfaces: Lessons from computer games. *In Proceedings of the 1982 Conference on Human Factors in Computing Systems (CHI '82)*. Association for Computing Machinery, New York, NY, USA, 63–68. https://doi.org/10.1145/800049.801756. 1982

Marcus, A. User Interface Design's Return on Investment: Examples and Statistics. essay. Retrieved December 5, 2022, from https://www.sciencedirect.com/science/article/pii/B978012095811550002X.

Memon, I. A., Jamali, Q. B., Jamali, A. S., Abbasi, M. K., Jamali, N. A., & Jamali, Z. H. , Defect reduction with the use of seven quality control tools for productivity improvement at an automobile company. *Engineering, Technology & Applied Science Research*, 9(2), 4044-4047. 2019.

Montgomery, D.C. & Runger, G.C., Applied statistics and probability for engineers. (6th ed.). J*ohn Wiley & Sons, Inc.* 2014

Nallusamy, S., & Saravanan, V., Lean Tools Execution in a Small Scale Manufacturing Industry for Productivity Improvement- A Case Study. *Indian Journal of Science and Technology*, 9(35). https://doi.org/10.17485/ijst/2016/v9i35/100162. 2016.

Nurzaki, A., Santoso, A., Benawan, C., Wahyudin, D., & Santoso, S. Improvement of DEET level of product X using Deming cycle (PDCA Method) in PT Z. *In IOP Conference Series: Materials Science and Engineering* (Vol. 1034, No. 1, p. 012110). IOP Publishing. February 2021,

Patel, G. S., & Mawandiya, B. K. , Productivity Improvement of Rubber Roller Mixing Process Using Cause and Effect Analysis: A Case Study. *Nirma University Journal of Engineering & Technology*, 5(2), 24-31. 2017.

Pearson's Product-Moment Correlation using SPSS Statistics. https://statistics.laerd.com/spss-tutorials/pearsons-product-moment-correlation-using-spss-statistics.php

Philippine Statistical Research and Training Institute. Training Program. Retrieved from https://psrti.gov.ph/home/training/?fbclid=IwAR1mVCezmOal-F7twA6Ilqrqgs772t9Z3QSMLvcVC0CRDmMoUgy-zPOGacQ

Rajagopal, S., Krishnamoorthy, B., & Khanapuri, V. B. , Competitive logistics capability for sustainable organisational performance: a study of the textile industry in India. *International Journal of Logistics Economics and Globalisation*, 7(2), 105-124. 2018.

Ramdhani, A., Ramdhani, M.A., Ainisyifa, H., Model Conceptual Framework of Corporate Culture Influenced on Employees Commitment to Organization. *International Business Management 11* (3): 826-830. 2017.

Ray, A., Dhir, A., Bala, P. K., & Kaur, P., Why do people use food delivery apps (FDA)? A uses and gratification theory perspective. *Journal of Retailing and Consumer Services*, 51, 221-230. 2019.

Safety Culture., What is a Risk Assessment? Retrieved from https://safetyculture.com/topics/risk-assessment/. November 25, 2022.

SixSigma Institute. Six Sigma DMAIC Process - Analyze Phase - Control Impact Matrix. Retreived from https://www.sixsigma-institute.org/Six_Sigma_DMAIC_Process_Analyze_Phase_Control_Impact_Matrix.php

Statista Research Department. Philippines: commonly used food delivery apps 2021. Statista. Retrieved April 22, 2022, from https://www.statista.com/statistics/1278591/philippines-commonly-used-food-delivery-apps/. January 18, 2022.

Summary Inflation Report Consumer Price Index (2018=100): November 2022. Philippine Statistics Authority. Retrieved December 7, 2022, from https://psa.gov.ph/statistics/survey/price/summary-inflation-report-consumer-price-index-2018100-november-2022. December 6, 2022.

Voinea, C. L., Logger, M., Rauf, F., & Roijakkers, N., Drivers for Sustainable Business Models in Start-Ups: Multiple Case Studies. Sustainability, 11(24), 6884. *MDPI AG*. Retrieved from http://dx.doi.org/10.3390/su11246884. 2019.

Zhu, Y., Tian, Y., Wang, T., Regua, O., Consumer Purchasing Behavior on Food Delivery Platforms. *Academic Journal of Business & Management*, 3(8). 30-33. 10.25236/AJBM.2021.030806. 2021.

Zippia. 25+ Useful User Experience Statistics [2022]: What Is The Value Of UX. https://www.zippia.com/advice/user-experience-statistics/. October 10, 2022.

Biographies

Alexa Mae I. Manrique is a fourth year B.S. Industrial Engineering student at the University of Santo Tomas.

Aliyah Geeña L. Naldoza is a fourth year B.S. Industrial Engineering student at the University of Santo Tomas.

Mae Angelica S. Salonga is a fourth year B.S. Industrial Engineering student at the University of Santo Tomas.

Maxine Hannah S. Villanueva is a fourth year B.S. Industrial Engineering student at the University of Santo Tomas.