ATENEO DE MANILA UNIVERSITY
GRADUATE SCHOOL OF BUSINESS
ATENEO STUDENT BUSINESS REVIEW VOL.6 NO.1

TECHNE

7

MANAGING THROUGH NUMBERS

The AGSB 50th Anniversary Issue

Leading by Serving, Serving by Leading

Contents

Message from the Dean

Two quotations highlight for me the importance of research, not just for academics like myself, but for anyone who wishes to be more effective at whatever he or she does; and to be the best person that he or she can be:

“The more important reason [to do research] is that the research itself provides an important long-run perspective on the issues that we face on a day-to-day basis” (Ben Bernanke); and “What we find changes who we become”. (Peter Morville).

No graduate education is complete if it doesn’t train its students to do research. No amount of knowledge that we transmit will ever be enough to last our students the rest of their lives. The best education is not one that transmits information--- it is one that transmits wisdom, and the ability to learn how to learn. Research is one of the most important paths to learning, and the output of our research can help us not just to understand the long term impact of the decisions we make on a day to day basis, but indeed helps us to understand who we are and who we can be.

The AGSB celebrates a 50-year milestone this year, and we are especially pleased to find that so many of our student papers and projects are reflective of our golden anniversary theme, “Leading by Serving and Serving by Leading”.

I would like to congratulate the Department of Operations and Information Technology on coming up with yet again another issue of Techne. We thank the leadership and the faculty of the Department for their advocacy of research among our students, and their effort to draw from them the excellent research output of which the papers in this volume are but a small sample.

Rodolfo P. Ang
Dean

Message from the Operations and IT Head

Congratulations to our Department of Operations and IT (DOIT) for coming out with the Techne 7 issue coinciding with the 50th anniversary of AGSB. It is fitting to note that all the articles in this issue are aligned to our school anniversary theme of "Leading by serving, serving by leading."

I am also very happy that in this issue, for the first time, the operations management classes from the Ateneo School of Medicine and Public Health (ASMPH), and from the Sta. Rosa satellite campus were able to field very interesting and timely articles.

One paper from ASMPH examines the effectiveness of the Ateneo Blue Plate feeding program while another paper attempts to improve a local health clinic. The Sta. Rosa class attempts to tackle the sustainability issue in the fashion industry.

Three other articles delve on applications to nation building using various tools of management science and operations management.

I also wish to convey my warmest greetings to all our friends in business and the academe, to those in the corporate world, and, most especially to all our MBA students.

We are very much excited that our students every year are exerting great efforts to apply their learnings to create continuous improvements in their communities.

We also thank Dean Rudy Ang for his unequivocal support to this department's undertaking.

On behalf of my colleagues in DOIT and AGSB, I wish to thank you all and, do enjoy your reading!

Ralph Ante
Head, Department of Operations and IT
Ateneo Graduate School of Business

Message from the Editor

The big word for today is **paraprosdokian**. According to Wikipedia, a paraprosdokian is "a figure of speech in which the latter part of a sentence, phrase, or larger discourse is surprising or unexpected in a way that causes the reader or listener to reframe or reinterpret the first part." Hmm, that statement is by itself a paraprosdokian, isn't it? Also, paraprosdokian is a noun but the presence of that letter "n" at the end of the word makes you think of it as an adjective. To be sure I understand what the term means, I googled for examples and found the following interesting captures:

- Knowledge is knowing a tomato is a fruit; Wisdom is not putting it in a fruit salad.
- The voices in my head may not be real, but they have some good ideas!
- I used to be indecisive. Now I'm not sure.
- To steal ideas from one person is plagiarism. To steal from many is research.
- Light travels faster than sound. This is why some people appear bright until you hear them speak.
- A clear conscience is usually the sign of a bad memory.
- Why does someone believe you when you say there are four billion stars but check when you say the paint is wet?
- Do not argue with an idiot. He will drag you down to his level and beat you with experience.
- Always borrow money from a pessimist. He won't expect it back.
- War does not determine who is right - only who is left.
- Evening news is where they begin with 'Good evening' and then proceed to tell you why it isn't.
- Some cause happiness wherever they go. Others whenever they go.
- I want to die peacefully in my sleep, like my grandfather, not screaming and yelling like the passengers in his car.
- When tempted to fight fire with fire, remember that the Fire Department usually uses water.

Learning from above, I tried my hand at constructing paraprosdokians on Techne concepts and principles that guide the writing of student papers. The choice of the six papers in this issue of Techne is somehow influenced by these paraprosdokians. To wit:

1. The shortest time to finish a project is dictated by the longest way to reach the end.
2. To search for the best answer, you have to navigate inside the area bound by the constraints; however, the optimal answer is usually found at the edges of the area, more precisely, at the corners created by the constraints.
3. We know that the time it takes to be in the queue is influenced by the length of the queue, but the precise relationship between the two is dictated by the arrival rate of the entity requiring service.
4. Chasing time is a good way to forecast.
5. The strength of a supply chain is determined by its weakest link. (contributed by Manny Tenmatay)
6. For this issue, the overall theme is leading by serving and serving by leading.

Come to think of it, a paraprosdokian boils down to a play on words, seriously.

Ed Legaspi
Editor
Techne: Managing through Numbers
Ateneo Graduate School of Business

Masaya Masarap Malusog
Lessons from Blue Plate

Michaella Paula **Aldea** • Christian **Cerafica**
Moira **Larin** • Betina Therese **Lazaro**
Jaime Antonio **Magalong** • Kryzka **Medina**
Marc Timothy **Tan**

Introduction

Blue Plate for Better Learning, a feeding program developed by the Ateneo Center for Educational Development (ACED) in partnership with the Ateneo Professional Schools, aims to improve public education by addressing malnutrition (Maligalig, n.d.). Since its inauguration in 2011, the 130-day in-school feeding program for malnourished children has expanded its operations from four schools in Quezon City to more than a dozen across Valenzuela City, Cainta, Quezon City, and Leyte (Ateneo Center of Educational Development, 2015).

In 2012, with the support of Ateneo de Manila University (ADMU) 616569 Foundation, Inc., the central kitchen for the Cainta Feeding Program was established in Cainta Elementary School (CES). Figure 1 depicts the floor plan of the renovated classroom that was converted into the central kitchen in 2016. Parent volunteers of beneficiaries, a kitchen supervisor, and a feeding coordinator from ACED prepared a nutritious low-cost lunch meal, budgeted at P11.50 per beneficiary, for 280 students of CES, 136 students of Marick Elementary School, and 60 students of Francisco P. Feliz Elementary School; for a total of 476 students (Ateneo Center of Educational Development, 2015). Figure 2 shows the organizational chart of the Cainta central kitchen.

The feeding coordinators of ACED were in charge of developing nutritious recipes good enough for 130 school days. These recipes were then forwarded to the kitchen staff of the different schools. A sample recipe can be seen in Figure 3. Each recipe lists the ingredients needed for the day, as well as provides the necessary measurements per number of serving. It also serves as the basis for the daily delivery of fresh vegetables (Diaz, 2017).

Daily kitchen operations were adapted to the pioneer schools, thus ensuring an efficient and effective process consistent within the ACED Blue Plate Program. The variations between school kitchens are only limited to procurement of ingredients. Figure 4 shows the service blueprint of the Cainta central kitchen, and it depicts the daily operations for the preparation of the food for beneficiaries. Figure 5, meanwhile, provides the process flowchart that demonstrates the interaction of the kitchen staff and volunteers with the beneficiaries. The presented processes were based on an interview (Diaz, 2017).

To identify students who fall under the severely wasted (low weight-for-age) and wasted categories, the National Status reports accomplished by the teacher every year are compared against the World Health

Organization's Body Mass Index (BMI) chart. These students are prioritized for the feeding program according to the severity of malnourishment per grade level. Table 1 depicts the baseline BMI of the beneficiaries based on the Year-End Report of ACED for the 2014-2015 School Year. Extra slots for the feeding program are then given to those who are recommended by the teachers or to students who appeal to be a part of the feeding program (Ateneo Center of Educational Development, 2015).

In order to monitor the impact of the feeding program, the baseline BMI of beneficiaries is obtained at the start of the feeding program each school year. BMI is calculated by dividing the weight (in kilograms) by the square of height (in meters squared). Additionally, BMI is also obtained midway and near the end of the feeding program. Academic grades of the students from the first to the fourth grading period are also evaluated (Ateneo Center of Educational Development, 2015).

Based on personal observation, narrative from the current kitchen supervisor, and data from the daily attendance of the feeding program, it was revealed that several beneficiaries have been consistently absent. Based on the Year-End Report of ACED for the 2014-2015 School Year, daily attendance for year 2015 was around 36% on average when the records of the three schools in Table 2 were combined. This has led to the surplus of food, and it could have also been a factor in the normalization of the beneficiaries' BMI throughout the whole program. Reported reasons for the low attendance in CES include students' aversion to the prepared food and uncooperative parents who discourage attendance due to their misconception of the implications of having a child in the feeding program. In order to achieve their goal of improving education by improving the BMI of the beneficiaries, it is necessary for Blue Plate Cainta to increase the utilization of their services.

Figure 1. Floor Plan of Cainta Central Kitchen.

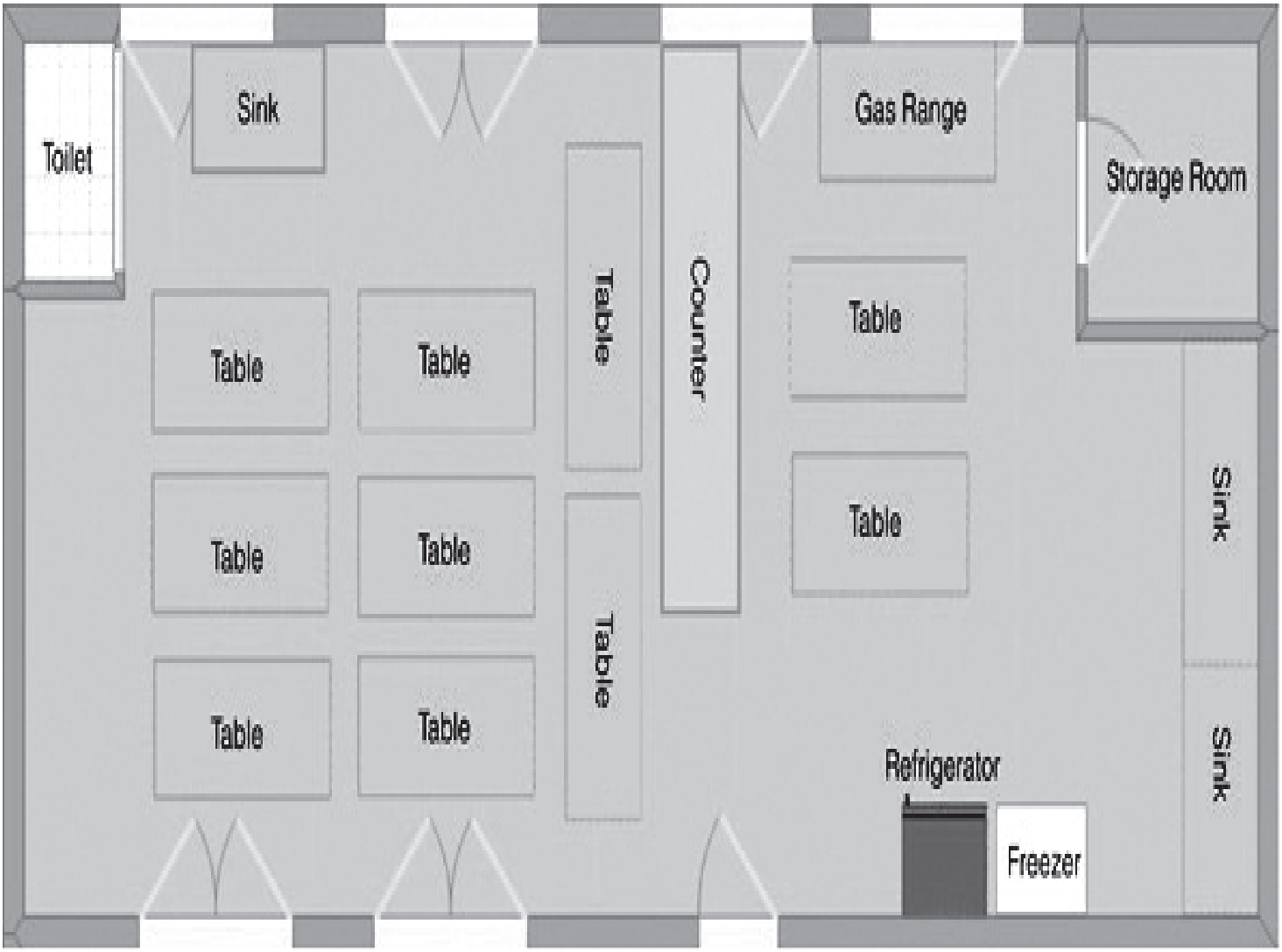


Figure 2. Organizational Chart of ACED Blue Plate

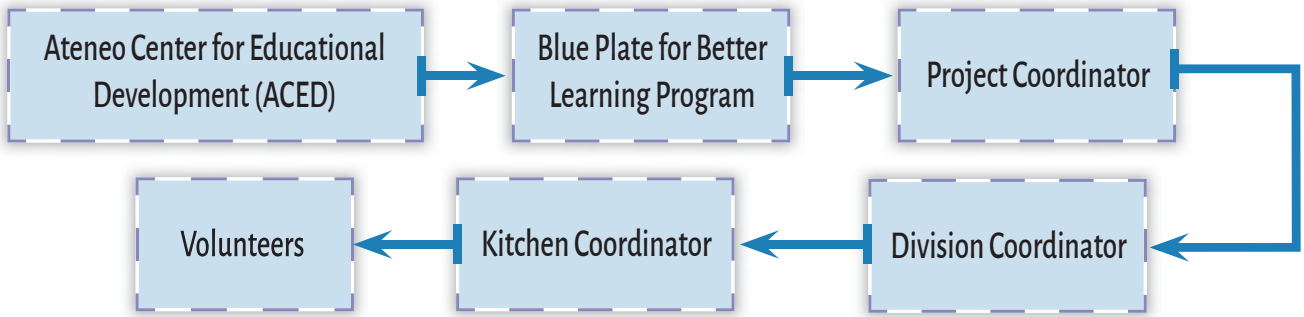


Figure 3. Sample Recipe of Blue Plate Prepared by the Feeding Coordinator of ACED.

Kanin Serving Size: 1/2 cup

			Number of servings						
			400	200	300	600	700	750	1500
Pangsaing	Bigas	kilo	19	9.5	14.3	28.5	33.3	35.6	71.3

1. *Hugasan muna ang bigas.*
2. *Magpakulo ng ilang litro ng tubig depende sa klase ng bigas.*

Ulam Serving Size: 1/3 cup

Karne at/o Protina	Manok (thawed)	kilo	3	1.5	2.3	4.5	5.3	5.6	11.3
	Tokwa (malaki), strips	piece	5	2.5	3.8	7.5	8.8	9.4	18.8
Pangprito	Mantika	liter	1	0.5	0.8	1.5	1.8	1.9	3.8
Gulay	Malunggay, hinimay	kilo	1/2	0.3	0.4	0.8	0.9	0.9	1.9
	Baguio beans, thin diagonal strips	kilo	6	3	4.5	9	10.5	11.3	22.5
	Repolyo, matchstick strips	kilo	6	3	4.5	9	10.5	11.3	22.5
	Carrots, matchstick strips	kilo	4	2	3	6	7	7.5	15
	Togue	kilo	4	2	3	6	7	7.5	15
Panggisa	Mantika	liter	0.4	0.2	0.3	0.6	0.7	0.8	1.5
	Bawang, crushed	kilo	1/3	0.2	0.3	0.5	0.6	0.6	1.3
	Sibuyas na puti, minced	kilo	1/3	0.2	0.3	0.5	0.6	0.6	1.3
Pangsarsa	Tubig/Chicken broth	liter	12	6	9	18	21	22.5	45
Pampalasa	Asin	gram	60	30	45	90	105	112.5	225
	Paminta, powdered	gram	28	14	21	42	49	52.5	105
	Patis	liter	1	0.5	0.8	1.5	1.8	1.9	3.8

1. *Pakuluan ang manok. Kapag malambot na ang manok, himayin ito at itabi. Itabi rin ang tubig na pinagpakuluan (chicken broth).*
2. *Hiwain ang tokwa sa walong parte at iprito ito. Pagkaprito, hiwain sa 16 piraso (strips).*
3. *Igisa sa mantika ang bawang at sibuyas.*
4. *Idagdag ang carrots at baguio beans.*
5. *Pag bahagyang luto na ang carrots at beans ilagay na ang repolyo at togue.*
6. *Ilagay ang mga pampalasa, asin, paminta at patis.*
7. *Ilagay ang chicken broth para sa sarsa.*
8. *Pakuluin hanggang sa lumambot ang mga gulay.*
9. *Kapag luto na ang lahat ng sangkap, ilagay ang tokwa at malunggay.*

Figure 4. Service Blueprint of Daily Operations of Cainta Central Kitchen in the Preparation of the Food for Beneficiaries.

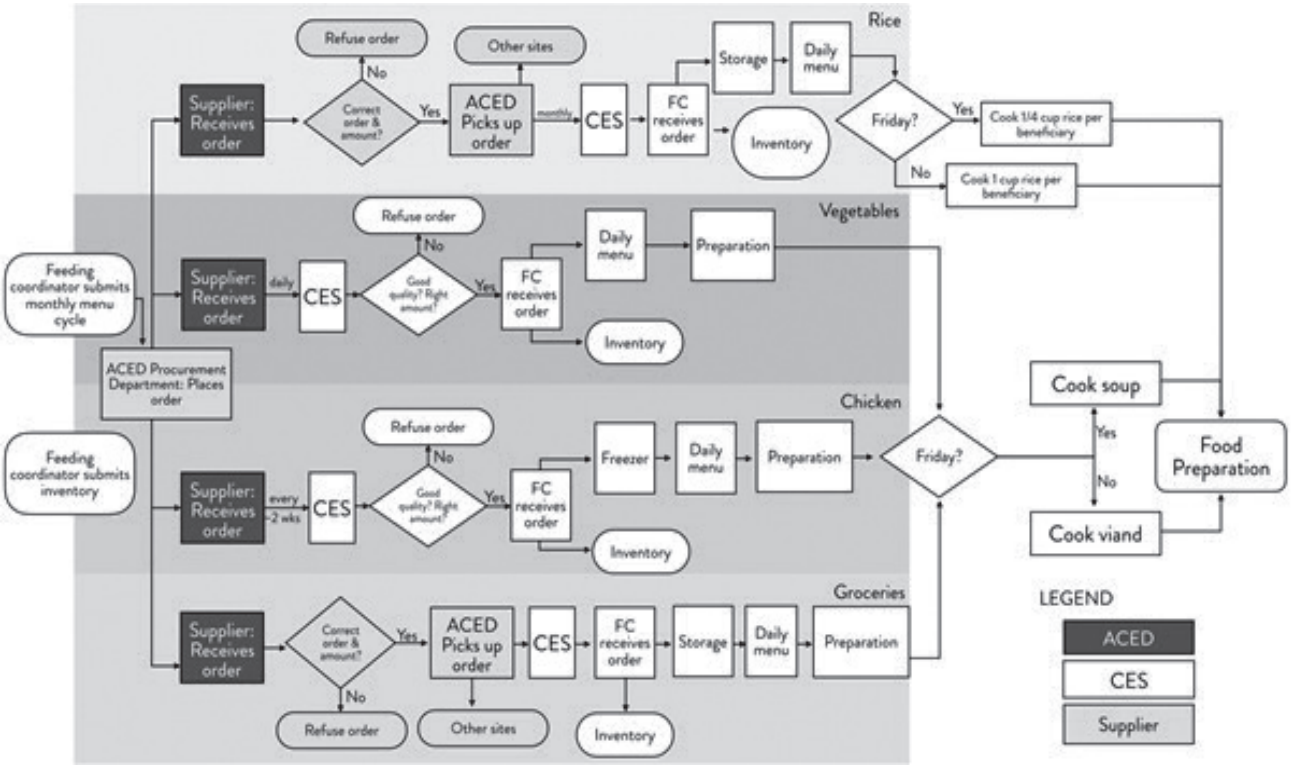


Figure 5. Process Flow Chart of the Interaction Between Beneficiaries and the Kitchen Staff.

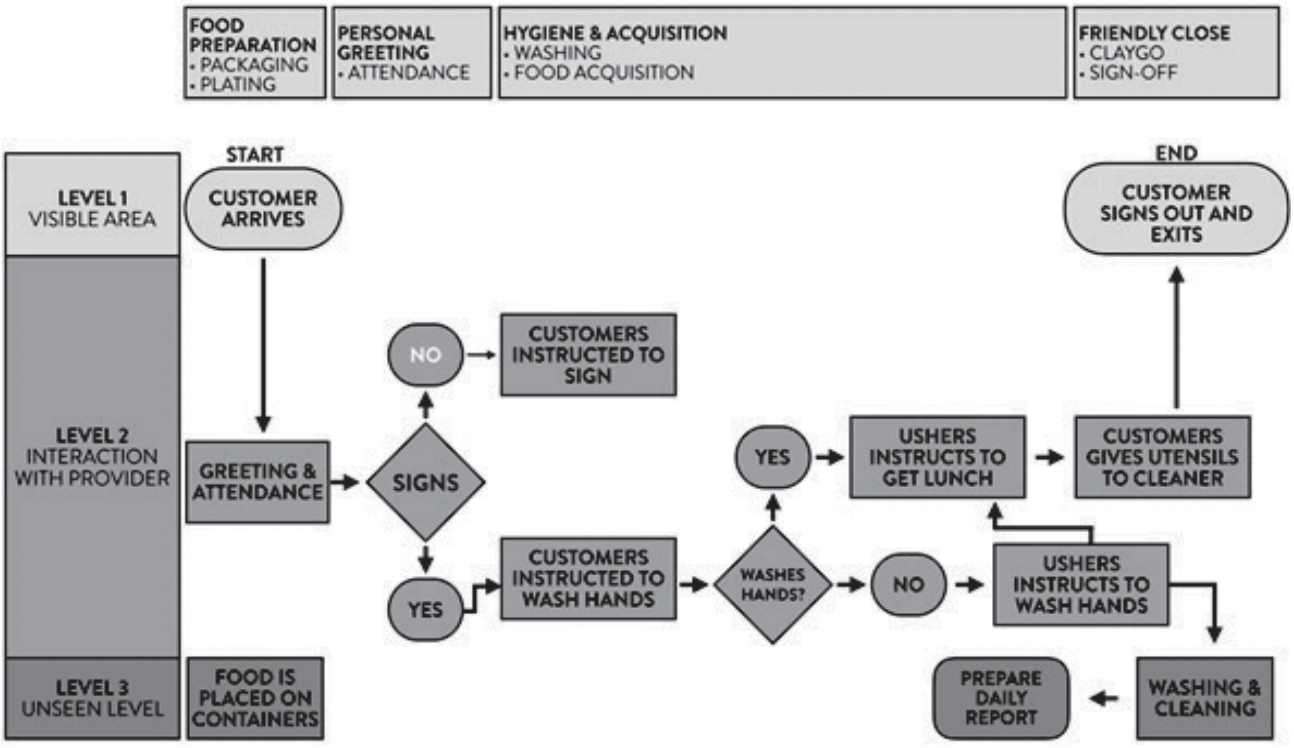


Table 1. BMI of Cainta Elementary School Students in June 2014

BMI	Male	% Male	Female	% Female	Total	% Total
Severely Wasted	77	97.5	56	75.7	133	86.9
Wasted	2	2.5	18	24.3	20	13.1
Normal	0	0.0	0	0.0	0	0.0
Total	79	51.6	74	48.4	153	

Table 2. Daily Attendance Average per Grade Level

Elementary School	Cainta							F.P. Felix				Marick		
Grade Level	1	2	3	4	5	6	Un-official	1	2	3	4	1	2	4
Daily Average	2	13	2	10	15	4	31	18	5	5	2	54	18	8
Base	13	51	7	27	41	15	103	50	14	17	8	101	64	16
Percent	15	25	29	37	37	27	30	36	36	29	25	53	28	50

Gap Analysis (Refer to Figure 6)

Using the GAP Analysis framework by Parasuraman, et. al. (1985), the proponents of this study analyzed the factors and problems within the ACED Feeding Program. The study aimed to determine the barriers and incongruences in administering the feeding program. Five different gaps in the study were identified, each with its own corresponding parameters. These gaps consist of 1) Not knowing what customers expect; 2) The wrong service quality standards; 3) The service performance gap; 4) When promises do not match delivery; and 5) Expected service-perceived service gap. Each gap is explained in detail in the succeeding parts.

The first gap, as shown in Figure 7, pertains to not knowing what customers expect. It is defined as the difference between what customers expect and what managers perceive they expect. For example, managers immediately think of providing healthy food while customers expect to satisfy their hunger with tasty food that is not necessarily healthy. It was noted that there are disparities between knowledge of the food that will be provided and what beneficiaries actually receive in the feeding program.

The second gap, as shown in Figure 8, pertains to the wrong service quality standards. This is defined as the difference between what managers think customers expect and the actual specifications they establish for service delivery. Here lies the gap in task standardization, including the lack of having proper feeding identification cards for beneficiaries.

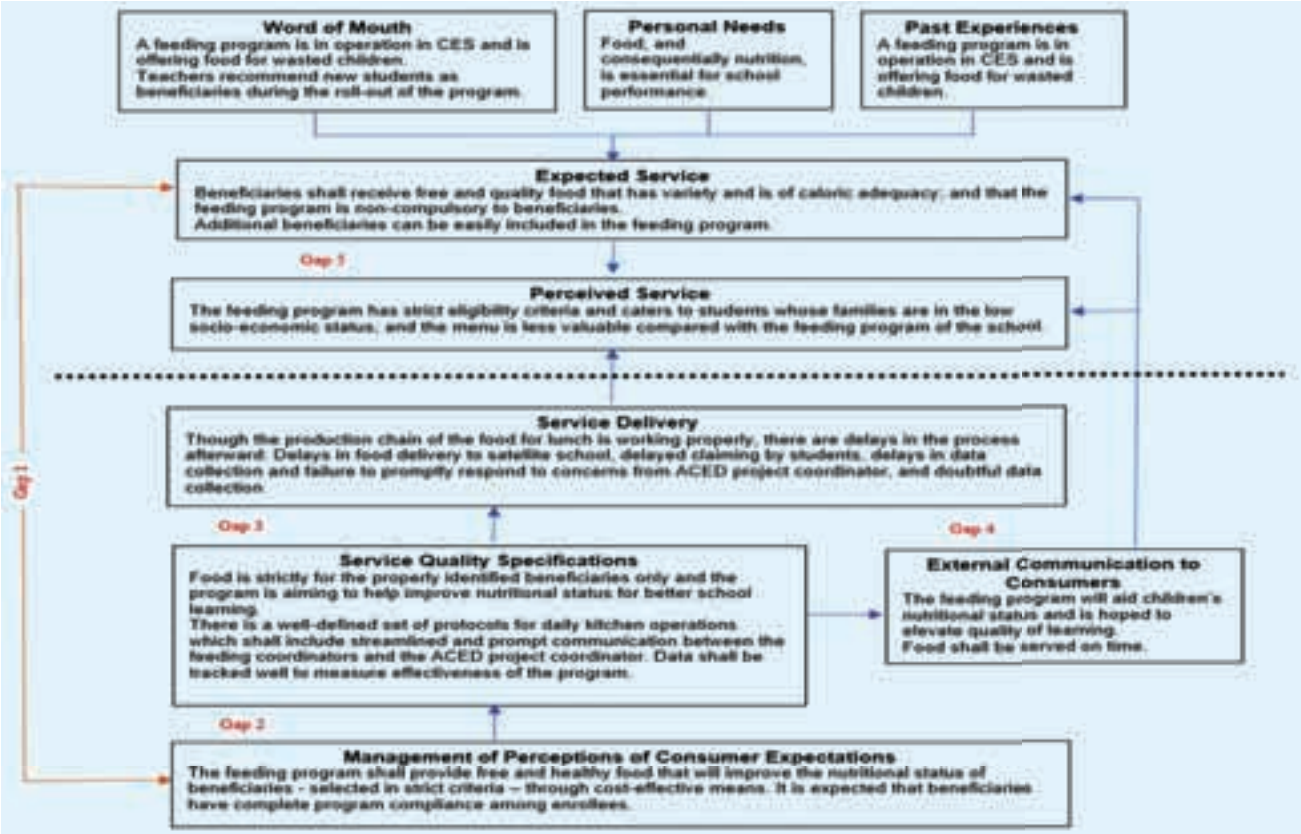
The third gap, as shown in Figure 9, pertains to the service performance gap which is defined as the discrepancy between service specifications and the actual service delivered. According to the ACED year-end report, there is a delay of forwarding data and complaints to the ACED head office because of the overburdened school staff and ACED project coordinators (ACED, 2015). The third gap, therefore, includes the members' preoccupied workload, as well as the lack of proper monitoring.

The fourth gap, as shown in Figure 10, pertains to promises that do not match delivery. This is defined as the difference between what an organization promises about a service and what it actually delivers. With regards to faulty food delivery, some of the volunteers who deliver the food to other satellite schools of Cainta Elementary School

arrive late, thus affecting the delivery of food to other schools. Upon delivery, most of the beneficiaries would already have gone home, thus increasing food wastage (ACED, 2015). Recalling Table 2, it can be calculated that only 187 of the 527 students on average (including unofficial beneficiaries) receive the food daily. The remaining would then be surplus of food. Should the punctual delivery of the food be ensured, this number is expected to decrease.

Lastly, the fifth gap, as shown in Figure 11, pertains to the expected service and perceived service gap. This is the most important gap that focuses on customer and service provider expectations. If the perceived service falls short of the customer's expectations, he/she will be disappointed and dissatisfied. On the other hand, if the perceived service exceeds the customer's expectations, he/she will not only be satisfied but also delighted (Haksever, 2013). Here we can see the disconnect and gap which focus on the perception of customers on the true intention of the feeding program. Furthermore, the use of the terms "malnourished," "wasted," and "severely wasted" as inclusion criteria for the feeding program may be one of the factors contributing to the misconceptions of its beneficiaries. The scenario that parents do not accept that their children are branded as such is not far from reality. This "labeling" influences perception and could even progress to the misconception that the program only caters to those in the low socioeconomic status. This could be misleading given the fact that the project actually targets children with low weight- and height-for-age.

Figure 6. Gap Analysis Showing the Five Different Gaps in the Study.



Boxes above the dotted line show the perspective of the customers. Boxes below the dotted line show the perspective of the managers.

Figure 7. The First Gap

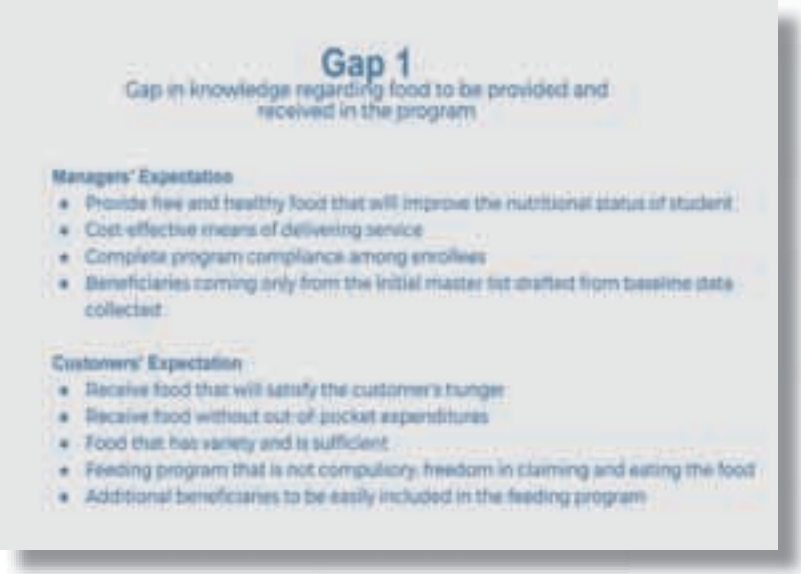


Figure 8. The Second Gap

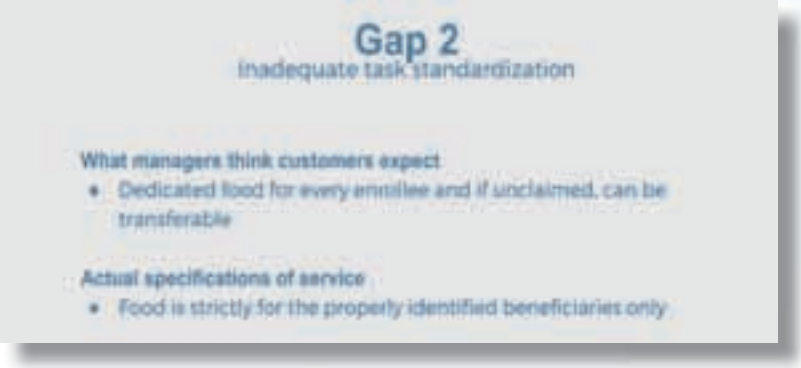


Figure 9. The Third Gap

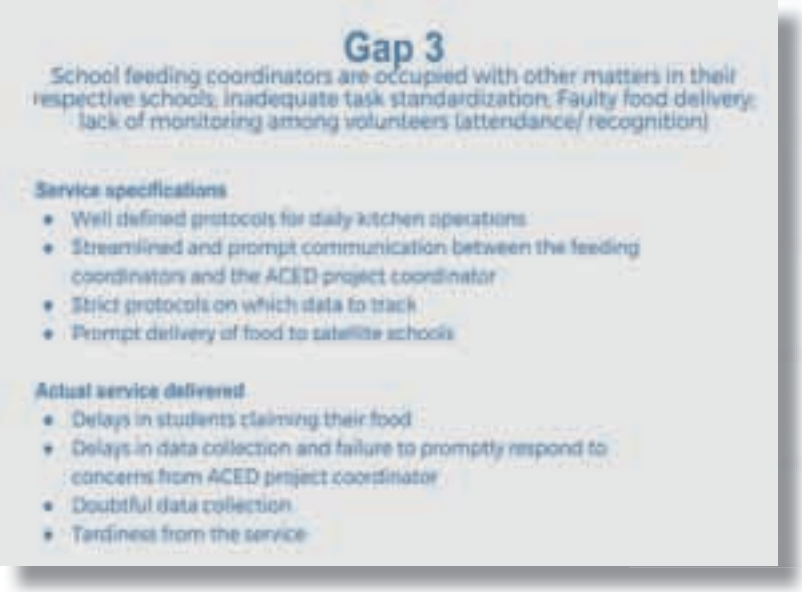


Figure 10. The Fourth Gap

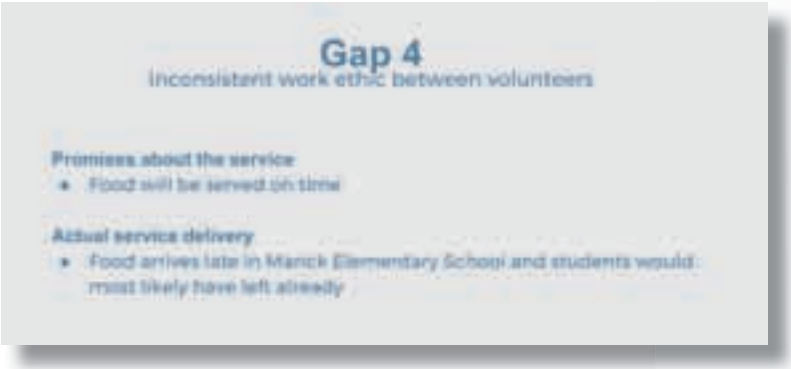
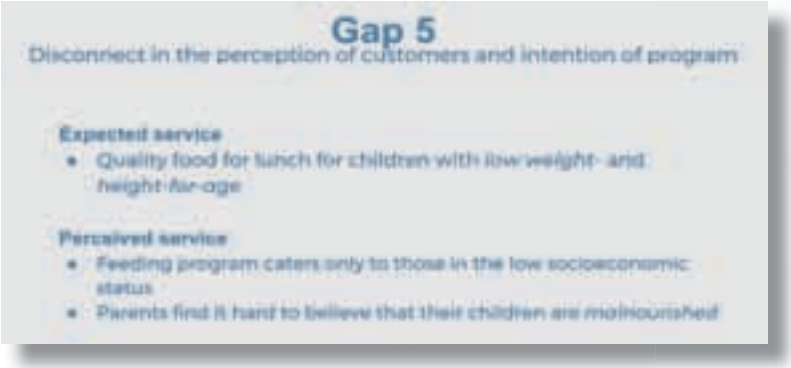


Figure 11. The Fifth Gap



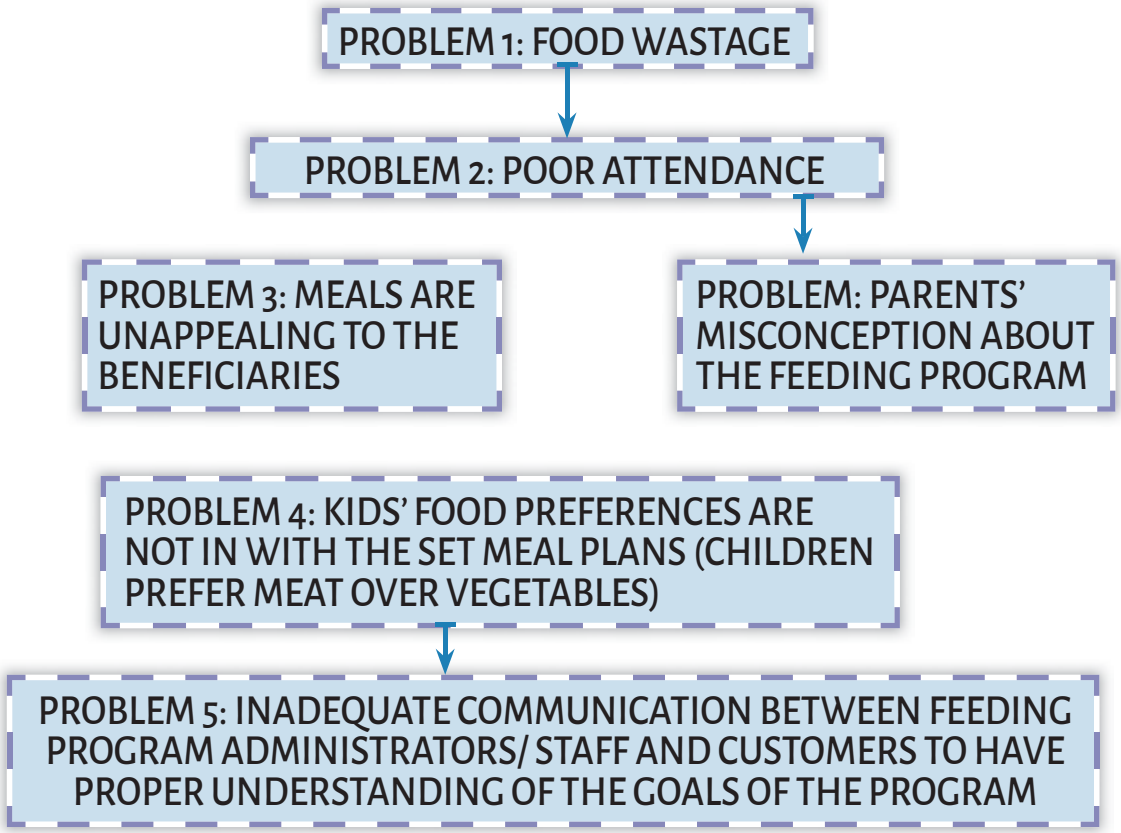
To further understand the previously identified gaps, the use of the "Five Why's" method is presented in an attempt to determine the root cause of these gaps (Figure 12). It was explicitly stated that there is poor attendance among the beneficiaries of the feeding program (Daily Attendance Average for 2015: Cainta = 30% of n = 257; Felix = 34% of n = 89; Marick = 44% of n = 181). This results to food wastage equivalent to about >50% of beneficiaries who do not claim their rations. In the figure above, the latter is depicted as the first problem, and the former as the cause of it.

Aside from the fact that a number of beneficiaries do not attend the program and receive the prepared meals, interviews also revealed that some of the pupils found the food to be unappealing. This becomes the third problem. Further exploration shows that some children prefer other meal plans such as meat over vegetables. Problem 4, thus, is the misalignment of the pupils' food preferences.

The aforementioned problems lie on the side of the customers of the program as the pupils' meal preferences make the food unappealing, thus resulting to poor attendance and food wastage. A possible reason for this is that the organization fails to adequately or effectively relay the purpose of the feeding program. Given that the aim is to improve the nutrition status of the beneficiaries through healthy ways, the meals must strictly follow the approved dietary plans. Hence, the fifth why – the root cause – can be traced back to the inadequate communication between the administrators or staff of the feeding program and its customers. There is an apparent lack of proper understanding and matching of expectations of the program's real intention.

Also, another possible reason for the poor attendance is the misconception of the parents about the program. Interviews reveal that some parents think the program

Figure 12. 5 Why's Illustration of the Different Problems Surrounding the ACED Feeding Program



solely caters to families belonging to the low socioeconomic class. As a result of this misconception, these parents do not allow their children to be enrolled in the program because they believe they can provide for their children on their own. Likewise, the word "malnourished" could be misinterpreted, resulting in the parents' refusal to have their children be labeled as such. Ultimately, these problems stem from the inadequate communication of the real objectives of the feeding program.

Proposed Interventions (Refer to Table 3)

Intervention 1: CES-Blue Plate Grand Cook-off

A cooking contest shall be held to introduce the feeding program. By actively engaging beneficiaries and their parents in the simulation of the program's operations, they are shown a better perspective on healthy meals. The beneficiaries' parents shall participate as contestants and will be grouped into teams. They will be tasked to prepare healthy meals featuring a special ingredient within a specified budget. Each team would then be judged based on creativity, food presentation, food palatability, and resourcefulness. An interactive lecture will also be simultaneously conducted so the beneficiaries can learn more about the basic knowledge on food groups and the Pinggang Pinoy concept which is a visual guide on proper, age appropriate, and healthy food proportions made by the Department of Health.

Intervention 2: Individual Consultations on Nutrition

Each beneficiary, together with a parent or guardian, shall be invited for a consultation with a Blue Plate volunteer knowledgeable about nutrition and child

growth/development. The consultation has the following objectives: To inform each beneficiary and parent or guardian about their current nutritional status; to briefly orient each pair on the feeding program, its objectives, benefits, and day-to-day operations; to address the misconceptions about the program; and to encourage their active participation of the program. Ideally, the consultations shall be done at the beginning of every feeding program cycle.

Intervention 3: Parent-Blue Plate Breakfast

The beneficiaries' parents, ideally in small groups of ten or less, shall be invited to eat breakfast with the Blue Plate Team. Each group shall spend a morning with the team to give all parents the chance to participate. This program aims to build rapport with the parents, gain insight on their perceptions, inform them about the program in a more casual and personal environment, briefly educate them about nutrition, and address their concerns or questions regarding the feeding program. Ideally, these breakfast mornings will start at the beginning of each feeding program cycle.

Selected Intervention

The Grand Cook-off was chosen as the final intervention as it reiterates the main

Table 3. Comparison of Proposed Interventions

Criteria	Proposed Interventions		
	Blue Plate Cook-off	Individual Consultations on Nutrition	Parent-Blue Plate Breakfast
Reiteration of Blue Plate's Main Objectives	Reiterates main objectives by using creative and interactive methods that facilitate active learning among stakeholders	Reiterates main objectives through a needs-based approach but relies on passive learning	Reiterates main objectives through the vehicle of camaraderie but relies on passive learning
Stakeholders Targeted	Learners, Parents, Teachers, Volunteers	Parents	Parents
Feasibility	Organizing costs and efforts must be considered (i.e., scheduling and logistics for stakeholders, costs of materials to be used)	Minimal organizing costs and more flexible in terms of scheduling and logistics	Organizing costs and efforts must be considered (i.e., scheduling and logistics for parent breakfast meetings, costs of meals to be provided)
Sustainability	Organization may maintain yearly activities but must ensure well-spaced follow-ups in between	Organization may not be able to sustain and track constant individual consultations from many parents	Organization may not be able to sustain constant breakfast meetings; attendance from stakeholders may also be an issue
Long Term Outcomes	Breakthrough dishes from the cook-off may be a permanent part of the long term feeding program	May address individual concerns on the program, but no long term outcomes are assured	Camaraderie may be the foundation of future efforts; but it has no clear indicator or measures of success

objectives of Blue Plate in an inclusive and interactive way. It is the alternative that allows different stakeholders to facilitate each other's learning; thus making it an avenue not only for camaraderie but also for collaboration. Unlike consultations and open discussions, the creative activities of this intervention will remind all stakeholders (students, parents, and other volunteers) of Blue Plate's agenda in a more proactive manner. Not only do they learn, they also get to experience firsthand the whole process of preparing and sampling the healthy meals for the beneficiaries. This experience may also encourage the development of innovative dishes from the community. This simulation, as well as the promotion of innovation, can largely increase the community's ownership and possible involvement in the future. This, in turn, can improve the understanding of the program and ultimately address the main problem of perception mismatch.

Project Proposal and Execution

Figure 13. Parents Shop for Their Group's Cook-off Ingredients Using Their P500 Budget.

Figure 14. Parents and Teachers Prepare the Healthy Meals.

Figure 15. Student Participants Engrossed in Their Activity for the Day Regarding Nutrition

The Gantt chart for the Grand Cook-off is shown in Table 4. The entire planning and actual execution of the project spanned from September 2016 to May 2017. The activities done for the year consists of FGDs (Focused Group Discussion), consultations, immersions, project preparations, cook-off, project evaluation, and data presentation.

The details of the 5W, 2H (What, When, Where, Who, Why, How, How much) for each activity can be seen in Table 5. The Orientation and Ocular was held on September 30, 2016 at CES where the group was introduced to the different stakeholders and toured around the school. From October 2016 to February 2017, a series of consultations and FGDs were organized by the group to identify key concerns and problems encountered by each stakeholder, as well as determine where the Learning Experiences in the Community (LEC) group can intervene. These sessions also allowed the group to better understand how the program is perceived and how each stakeholder affects the feeding program. The consultations also facilitated proper communication between the different stakeholders of CES.

Moreover, an immersion session was held on December 9, 2016 at the Blue Plate kitchen. This allowed for the group to personally experience how the feeding program operates on a day-to-day basis. In order for the group to effectively use their training and knowledge to address the problems raised by the community, the group chose Health and Nutrition as the main intervention. The group prepared the materials and mechanics for the cook-off and lectures from February 24 to March 31, 2017.

The cook-off was held on March 31, 2017 at the CES kitchen where supplementary lectures for the participants were simultaneously held. This activity allowed the participants to prepare a healthy, affordable, and delicious meal, as well as learn more about their health and nutrition. This session also allowed the group to address the misconceptions of the stakeholders. In order to determine whether the objectives of the cook-off project were satisfied, evaluation and data analysis were conducted from April 1 to May 25, 2017. The group then presented the year-end report and their findings to the key stakeholders of CES and ACED.

Table 4. Gantt Chart

Activity	2016				2017				
	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Orientation									
Ocular									
Consultation with ACED Representative									
FGD with School Officials									
Immersion Activity at the ACED kitchen									
Consultation with ACED Kitchen Manager									
Consultation with School Officials									
FGD with Students									
FGD with Teachers									
FGD with Parents									
Consultation with School Officials									
Project Preparation									
Cook-off									
Project Evaluation									
Data presentation and Year-end report									

Table 5. 5W, 2H

What	When	Where	Who	Why	How	How Much
Orientation	Sept. 30, 2016	Cainta Elementary School	» LEC group » LEC field preceptor » CES teachers » CES principal	To be able to get to know the stakeholders and their needs. To get to know each other and the specific roles of each person.	The LEC group will meet with the CES officials in order to get acquainted with each other and to be oriented about the school.	N/A

What	When	Where	Who	Why	How	How Much
Ocular	Sept. 30, 2016	Cainta Elementary School	» LEC group » LEC field preceptor	To be able to be oriented with the school grounds and to get a glimpse of what happens in their school	The CES field preceptor took the group around the school.	N/A
Consultation with ACED Representative	Oct. 28, 2016	ASMPH	» LEC group » ACED Overall coordinator	To be oriented about ACED and their feeding program. To identify areas of concern for ACED.	The LEC group met with the ACED overall coordinator.	N/A
FGD with School Officials	Nov. 25, 2016	Cainta Elementary School	» LEC group » LEC field preceptor » School teachers » School OIC » School principal	To discuss key areas of concern and identify where the LEC group can intervene.	The LEC group along with several school officials discussed the school's problems and plans for the year.	N/A
Immersion activity at ACED kitchen	Dec 9, 2016	Cainta Elementary School - ACED kitchen	» LEC group » ACED kitchen manager » ACED volunteers » ACED beneficiaries	To be able to see how the ACED feeding program operates on a day-to-day basis.	The LEC group became kitchen volunteers for ACED where they cooked the meals that will be served for that day.	N/A
Consultation with ACED kitchen manager	Dec 9, 2016	Cainta Elementary School - ACED kitchen	» LEC group » ACED kitchen manager	To be able to identify key concerns and problems encountered by the ACED feeding program.	The group consulted with the ACED kitchen manager to get his opinions and concerns on ACED operations at CES.	N/A

What	When	Where	Who	Why	How	How Much
FGD with students	Jan. 27, 2017	Cainta Elementary School	» LEC group » ACED beneficiaries	To identify key concerns for the students under the ACED feeding program.	The group had an FGD with the students of CES regarding CES and the ACED feeding program.	N/A
FGD with teachers	Jan. 27, 2017	Cainta Elementary School	» LEC group » CES teachers	To identify key concerns for the faculty of CES.	The group had an FGD with CES teachers regarding CES and the ACED feeding program.	N/A
FGD with parents	Jan. 27, 2017	Cainta Elementary School	» LEC group » ACED parent volunteers	To identify key concerns for the parents of ACED beneficiaries.	The group had an FGD with the parents of ACED beneficiaries regarding CES and ACED feeding program.	N/A
Consultation with school officials	Feb. 24, 2017	Cainta Elementary School	» LEC group » LEC field preceptor » School teachers » School OIC » School principal	To finalize the objectives and details of the project. To propose the activities and flow of the project.	The group consulted with several school officials regarding the problem that will be addressed and the project that will be done by the group.	N/A
Project preparation	Feb. 24 to Mar. 31, 2017	ASMPH	» LEC group	To prepare for the cook-off project that will be conducted.	The LEC group prepared all the activities, lectures, and materials that will be needed for the cook-off project	

What	When	Where	Who	Why	How	How Much
Cook-off	Mar. 31, 2017	Cainta Elementary School	» LEC group » LEC field preceptor » CES teachers » CES students » CES parents	To conduct a session wherein the students, teachers, and parents can enjoy, spend time together, and at the same time, learn about eating healthy meals. To address and clarify any misconceptions about feeding programs	The group conducted a cook-off contest and lectures for the participants.	P4,500
Project Evaluation and Data analysis	April 1, 2017 to May 25, 2017		» Cook-off participants (teachers, students, and parents)	To evaluate and assess the project conducted by the group and to analyze if the project addressed its objectives.	The group's project will be evaluated by the participants. The group will analyze the data gathered from the evaluation of the participants.	N/A
Data presentation and Year-end report	May 26, 2017	Cainta Elementary School	» LEC group » LEC preceptor » CES principal » CES OIC » Blue Plate representative	To present the data analysis findings from the cook-off To present the year-end report for CES and Blue Plate	The group will present to the key stakeholders the findings of their data gathering and analysis, as well as the year-end report for CES and ACED	N/A

Table 6. Estimated Budget Plan

Budget	Unit Price	Quantity	Total Peso Price
Cook-off Team Budget	P 500/ team	4	2,000
Butane cans	P 50/ can	6	300
Prizes	P 30/ kilogram	100	3,000
Certificates	P 6/ certificate	50	300
Utensils and other materials	P 400	1	400
Total			**6,000**

Table 7. Actual Budget

Budget	Unit Price	Quantity	Total Peso Price
Cook-off Team Budget	P 500/ team	3	1,500
Butane cans	P 50/ can	3	150
Prizes	P 30/ kilogram	75	2,250
Certificates	P 6/ certificate	50	300
Utensils and other materials	P 300	1	300
Total			**4,500**

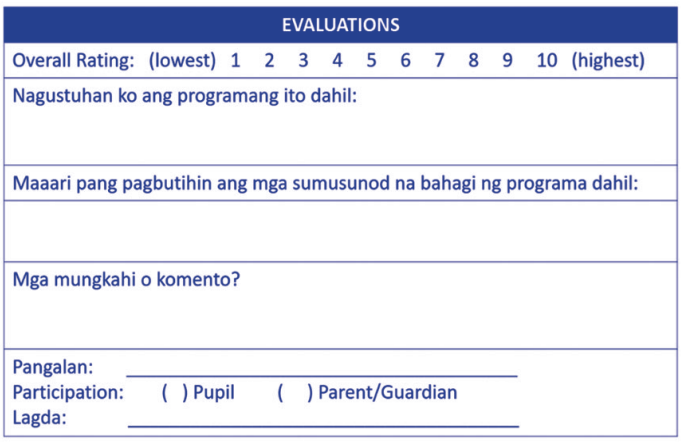
Table 6 shows the estimated budget plan for the Grand Cook-off. The budget was allotted for the following expenses: Cook-off team budget, butane cans, prizes, certificates, and utensils and other materials. The total estimated budget for the activity is P6,000.

Table 7 shows the actual budget for the cook-off that was held on March 31, 2017. The budget for the cook-off includes the budgets for the teams, butane cans, prizes, certificates, utensils and other materials. A total of P4,500 was spent for the activity; and from the estimated budget, a total of P1,500 was saved.

Project Evaluation

A feedback mechanism evaluated the success of the Grand Cook-off and assessed the participants' perception of the activity. A self-administered survey was used to identify the strong and weak points of the cook-off activity. The survey contained a Numerical Rating scale for the parents and teachers, and a Visual Analog scale for the students (shown in Figures 16 and 17, respectively). Sections for comments and suggestions were also provided on the evaluation sheets. With this evaluation, the strengths of the Cook-off activity can be identified and enhanced, while its weaknesses can be addressed and avoided in the future.`

Figure 16. Numerical Rating Scale for Parents



EVALUATIONS

Overall Rating: (lowest) 1 2 3 4 5 6 7 8 9 10 (highest)

Nagustuhan ko ang programang ito dahil:

Maaari pang pagbutihin ang mga sumusunod na bahagi ng programa dahil:

Mga mungkahi o komento?

Pangalan: _____

Participation: ( ) Pupil ( ) Parent/Guardian

Lagda: _____

Figure 17. Visual Analog Scale Used for Students' Evaluation.

Students were asked to mark the corresponding smiley to refer to their emotions regarding the Grand Cook-off.

The CES-Blue Plate Grand Cook-off received an average of 8.6/10 among the parents and faculty. It also received 70% "Happiest" and 30% "Happy" smileys from the pupils. Some of the evaluators' written comments are as follows:

» "This program made learning nutrition fun." - PS
» "I hope this program grows and extends further to other schools." - EB
» "Children learned the value of eating healthy. I hope this happens again." - ET

The performance indicator used to assess the success of the cook off had a score of at least 6.5 out of 10. Based on these evaluations, the proponents deem the project successful and above satisfactory in achieving its objectives.

To further analyze the long term impact of the program, Performance Milestones may be used (Table 8). Each milestone will be assessed based on the indicators specified by the group, determining the success of the project after the evaluation. Due to time constraints, the proponents were not able to perform this evaluation. This served as a limitation of the study. However, the evaluation of Performance Milestones may be endorsed to ACED as a supplement to their annual evaluation.

Table 8. Performance Milestones

Performance Milestones	Performance Indicators
Improvement in the Body Mass Index (BMI) and attendance	» Increase in BMI from severely wasted or wasted to a normal BMI for a given age group by 50% » 90% of beneficiaries should improve their BMI at the end of the school year » Improvement in academic grades as the BMI increases by 50%
Improved Quality of food	» More systematic employment of First-in First-out (FiFo) method to ensure freshness of food * Less food wastage from storage by 50% by properly labelling the food packs » Decrease in complaints regarding the unpalatability of vegetables as lunch meals by 50%
Decrease in Wastage of Food	» · Decrease in amount of leftover to about 50% » · Proper budgeting to decrease the amount of excess ingredients for the day and avoid shortage in the amount of meals prepared * Decrease in Ending Inventory by 75%
Accurate weight and height data collection	» Standardization of weight and height measurements of the students * Less incidences of mismatch in data/wrong data by 75% » Decrease in the number of missing data for the end of the year report * Less incidences of incomplete reports by 50%

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Fiery Fight to Save Lives and Properties

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Introduction

This paper aims to present topics about the Philippines' current fire prevention and suppression practices, as well as provide recommendations for improvement using applied management science quantitative methods. Multiple linear regression was utilized to forecast the number of fire incidents for the next three years (until 2020). For fire suppression, meanwhile, the group used Monte Carlo Simulation to determine how fire trucks/stations in Quezon City can improve their response time.

Philippines-news.info

Background

The Philippine Bureau of Fire Protection (BFP) has two main functions: Fire prevention and fire suppression. Fire prevention and suppression should be of great concern not only to the Bureau but also to the citizens as fires may cause loss or damage of properties and lives. In 2015 alone, the estimated property damage caused by fire was P3.62 billion; up by 9.7% from the recorded P3.3 billion the previous year (BFP, 2015, Table 1). Even worse, there was an escalation in the number of casualties from 263 (262 civilians, 1 firefighter) to 356 (all civilian), and in the number of injured persons from 798 to 838. While the number of injured civilians slightly decreased from 727 in 2014 to 725 in 2015, the number of injured firefighters grew by 42. These losses, if quantifiable, are already considered significant even with the exclusion of the families/persons negatively affected by the occurrence of fires (cost of displacement, rebuilding, etc.).

Table 1. Property Damage, Casualties and Injuries Caused by Fire Incidents

Budget	CY 2014	CY 2015
Number of Fire Casualties Nationwide	15,897	17,138
No. of Casualties		
Firefighter	1	-
Civilian	262	356
Total No. of Casualties	263	356
No. of Injured Persons		
Firefighter	71	113
Civilian	727	725
Total No. of Injured	798	838
Estimate Amount of Property Damage (In Billion Php)	3.30	3.62

Table 2. Causes of Fire CY 2005-2015[1]

YEAR	TOTAL	ELECTRICAL	OPEN FLAME/ COOKING	CIGARETTE BUTTS/ SMOKING	COMBUSTION / HEAT/ BONFIRE	FIREWORKS/ EXPLOSION/ SPARK/ CHEMICALS	LPG (TANKS, STOVE)	FLAMMABLE LIQUIDS	UNKNOWN/ OTHERS
2005	10,728	2,805	2,300	668	330	118	119	153	4,235
2006	8,823	2,714	1,839	256	285	15	84	85	3,545
2007	9,029	2,611	1,843	280	213	286	113	62	3,621
2008	7,726	2,803	1,611	416	197	82	176	374	2,067
2009	11,243	2,972	574	561	194	66	126	85	6,665
2010	10,773	3,174	1,796	949	182	82	80	64	4,446
2011	10,773	3,452	1,539	606	198	52	89	-	4,837
2012	8,798	3,328	1,301	581	175	76	98	-	3,239
2013	12,301	4,014	1,584	736	315	106	104	89	5,353
2014	15,897	4,611	2,859	1,338	291	162	168	102	6,366
2015	17,138	4,555	2,939	1,180	446	159	137	111	7,611

1 Data from Philippine Statistical Yearbook 2006-2015 (Table 17.7 Causes of Fire Incidence by Region: 2005-2013). Retrieved on May 31, 2017 from https://psa.gov.ph/tags/philippine-statistical-yearbook; except for 2014-2015 which were extracted from "CY 2015 Annual Accomplishment Report", Bureau of Fire Protection. Retrieved 31 May 2017 from http://bfp.gov.ph/wp-content/uploads/2016/03/Annual-Accomplishment-Report-CY-2015.pdf

Philippines Fire Fight Over the Years

Given that the BFP's first major goal is fire prevention, efforts have concentrated on prevention activities that reduce incidence of fire and avert loss of lives and damage to properties. However, statistics in Table 2 show that there is a 22% increase in the number of incidents as it rose from 8,823 in 2006 to 10,773 in 2011 (Philippine Statistics Authority[2]). Notably, there was a recorded decrease of 1,798 in 2012, and then a significant jump to an all-time high of 17,138 in 2015.

The Philippines' high levels of temperature, especially during the months of March and April, have made it prone to fire incidents. Likewise, the country's use of fireworks to celebrate festivities like Christmas and New Year's Eve could easily lead to fire incidents. However, statistics show that these two factors only contribute a combined average of 3% to the annual fire incidents in the Philippines for the last 11 years (2005-2015).

The top three causes of annual fire incidents are generally manageable. The top contributor is "faulty electrical connection" and it accounts to an average of 30% of annual fire incidents. In particular, faulty wiring, octopus and jumper connections, and/or electrical appliances and machineries make up this main contributor. The second highest cause is "open flame" and it contributes to an average of 17% of annual fire incidents. This is mostly from unattended stove, torch or sulo, and lighted candle or gasera.

Surprisingly, cigarette butts or smoking is the third cause of fire incidents with an average annual contribution of 6% or 688 incidents. Compared to 2013, fire incidents from smoking almost doubled in 2014 (from 736 to 1,338) and it remained at that level until 2015.

2 Philippine Statistical Yearbook 2006-2015 (Table 17.7 Causes of Fire Incidence by Region: 2005-2013). Retrieved on May 31, 2017 from https://psa.gov.ph/tags/philippine-statistical-yearbook

Quantitative Methods Used

The main quantitative methods used in this study are Multiple Linear Regression and Monte Carlo Simulation.

Multiple Linear Regression	Monte Carlo Simulation
Determine the factors affecting/ causing the fire incidents and forecast incidents in succeeding years for proper intervention, planning and management	Assess the current fire suppression capability of the Bureau and determine gaps to be addressed to minimize losses from fire incidents

Multiple Linear Regression

The annual fire incidents recorded from 2005 to 2015 were erratic. From 10,728 in 2005, it decreased to an all-time low of 7,726 in 2008. However, it escalated back to 11,243 in 2009 with a 46% year-on-year increase. While it declined to 8,798 in 2012, it rose back up again by 40% to 12,301 in 2013. It then continuously increased each year until 2015.

In order to properly plan for intervention activities that prevent fire, as well as assess the capability to suppress fire incidents, there is a need to forecast the number of incidents for the next five years. In order to do this, the group used multiple linear regression based on the projected values of factors that potentially trigger fire incidents. The output is presented below:

Fire Incidents and Related Factors

The total fire incidents considered in the regression includes only those with known causes. The fire incidents with unknown causes, which average to 42% annually, were excluded. Based on the results, which can be seen in Table 3, the total fire incidents will increase by 46% in 2020 from

the 9,527 incidents level in 2015. With an average annual increase of 8%, this poses a significant threat to life and property given the already high levels today. This information is relevant to the BFP and the government in order for them to plan and take intervening actions to counter these trends.

Electrical

Accounting to an annual average of 30%, electrical fault is the most common cause of fire. It is commonly triggered by incorrect connections and wiring that are parallel to the number of construction (Figure 1). The number of construction used in this study was based on the number of private building construction (residential and non-residential, excluding repairs) cited in the Philippine Statistical Yearbook 2015[3] Philippine Statistical Yearbook (National Statistical Coordination Board, 2012). The forecast for 2015-2020 was based on the average 5-year historical growth.

Open Flame/Electrical Cooking

The incidents caused by open flame cooking (or by electrical appliances) are potentially related to the number of households in the Philippines (Figure 2). Statistics for the number of households are computed based on the assumption that a household is composed of five members. This study utilized the number cited from the census of population conducted in 2007, 2010, and 2015. Figures for the intermediary years were extracted from the world meters (rounded up to thousands).

Figure 1. Fire Incidents vs. Construction

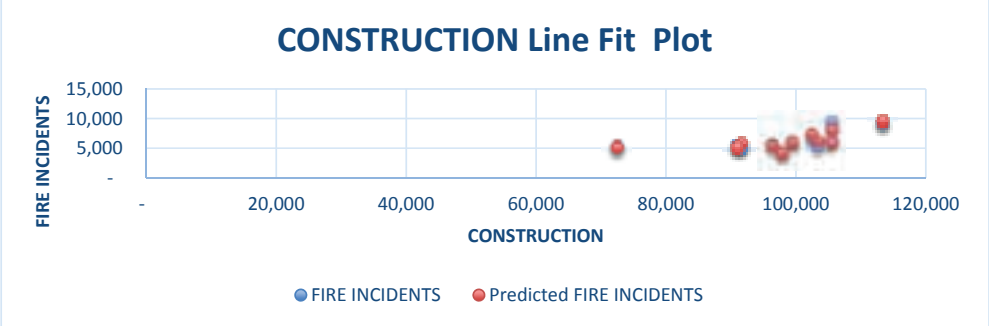
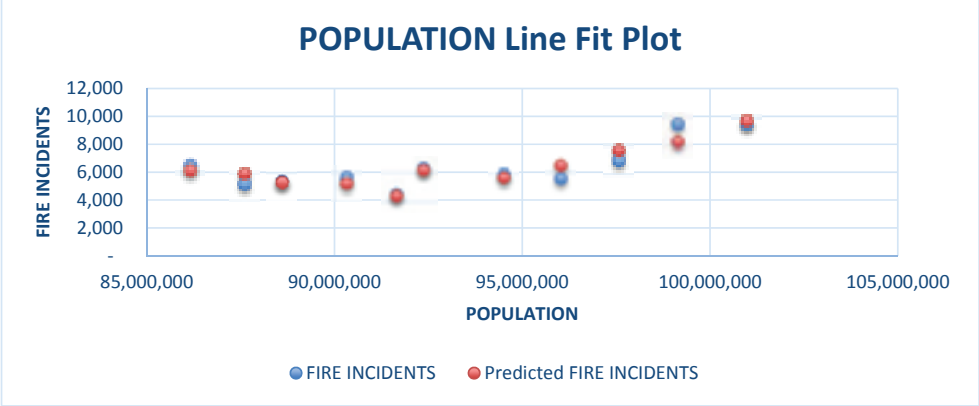


Figure 2. Fire Incidents vs. Population



[3] Philippine Statistical Yearbook 2015 (Table 6.3 Number, Floor Area, and Value of Private Building Construction by Type of Building: 1993-2014). Retrieved on May 31, 2017 from https://psa.gov.ph/sites/default/files/2015%20PSY%20PDF.pdf

Figure 3. Fire Incidents vs. Tobacco Consumption

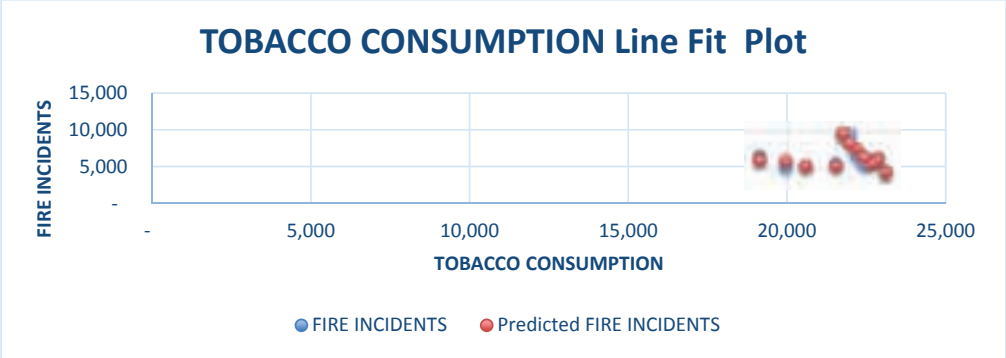
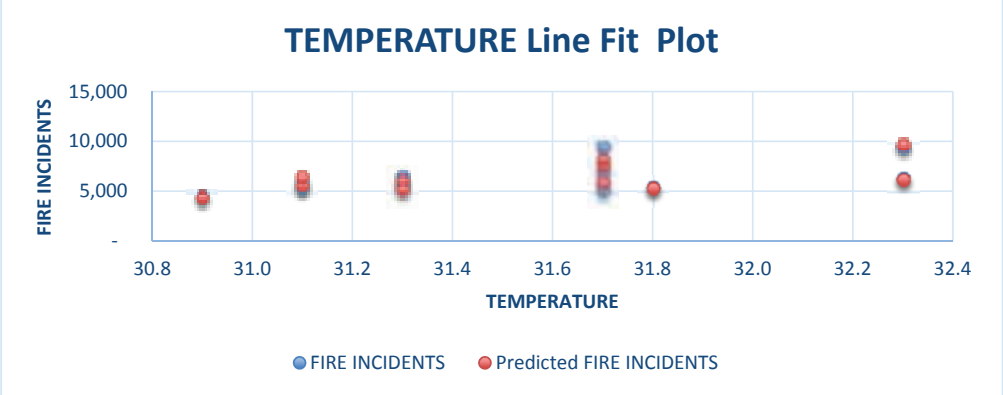


Figure 4. Fire Incidents vs Temperature



Cigarette Butts/Smoking

Statistics on tobacco consumption for the 2005-2009 period was based on the Philippine Statistical Association (PSA) personal consumption expenditure, as categorized by purpose and constant at 1985 prices. However, this statistic was discontinued in 2009. According to the Global Adult Tobacco Survey, the prevalence of tobacco use in the Philippines decreased from 29.7% in 2009 to 23.8% in 2015. The survey further revealed that 6% of this decline was due to the government's efforts to increase the price of tobacco and reduce public exposure to tobacco advertisements, promotions, and sponsorships. An annual decrease of 1% in tobacco consumption was thus calculated from 2009 to 2015. Uniformly, a 1% annual decrease was projected for the 2016-2020 period (Figure 3).

Combustion/Heat/Bonfire

Based on the PSA historical climate data, the average maximum temperature recorded in the Philippines ranged from 31.3°C in 2005 to 32.3°C in 2015 (Figure 4). According to the Department of Interior Local Government (DILG), this range is projected to increase by 0.9°C to 1.1°C in 2020 ("Climate Change in the Philippines," 2011).

The results of the application of Multiple Linear Regression are shown in Table 4.

Table 3. Summary of Fire Incidents and Related Factors/Statistics

1 YEAR	2 FIRE INCIDENTS[4]	3 CONSTRUCTION[5]	4 POPULATION[6]	5 TOBACCO CONSUMPTION[7]	6 TEMPERATURE[8]
2005	6,493	105,350	86,140,000	19,131	31.3
2006	5,278	91,512	87,590,000	19,946	31.7
2007	5,408	72,362	88,566,732	20,574	31.8
2008	5,659	90,914	90,300,000	21,519	31.3
2009	4,578	97,906	91,640,000	23,075	30.9
2010	6,327	99,422	92,337,852	22,844	32.3
2011	5,936	96,418	94,500,000	22,616	31.1
2012	5,559	103,298	96,020,000	22,390	31.1
2013	6,948	102,389	97,570,000	22,166	31.7
2014	9,531	105,392	99,140,000	21,944	31.7
2015	9,527	113,300	100,981,437	21,725	32.3
2016	10,537	116,398	102,250,133	21,508	32.5
2017	11,362	120,920	103,528,260	21,293	32.7
2018	12,172	124,832	104,822,363	21,080	32.9
2019	13,021	129,898	106,132,643	20,869	33.1
2020	13,888	135,462	107,459,301	20,660	33.3

[4] Table 17.7 Causes of Fire Incidence by Region: 2005-2013, Philippine Statistical Yearbook 2006-2015. Retrieved on May 31, 2017 from https://psa.gov.ph/tags/philippine-statistical-yearbook; except for 2014-2015 which were extracted from "CY 2015 Annual Accomplishment Report", Bureau of Fire Protection. Retrieved 31 May 2017 from http://bfp.gov.ph/wp-content/uploads/2016/03/Annual-Accomplishment-Report-CY-2015.pdf

[5] Table 6.3 Number, Floor Area, and Value of Private Building Construction by Type of Building: 1993-2015, Philippine Statistical Yearbook 2016. Retrieved on May 31, 2017 from https://psa.gov.ph/tags/philippine-statistical-yearbook (Chapter 6)

[6] Table 1.4 Population of the Philippines, Philippine Statistical Yearbook 2015-2016. Retrieved on May 31, 2017 from https://psa.gov.ph/tags/philippine-statistical-yearbook. Figures for the intermediary years were based on "Philippines Population". Retrieved 22 May 2017 from http://www.worldometers.info/world-population/philippines-population/

[7] Table 3.1 Personal Consumption Expenditure by Purpose: Tobacco (at Constant 1985 Prices) , Philippine Statistical Yearbook. Retrieved on May 31, 2017 from https://psa.gov.ph/tags/philippine-statistical-yearbook

[8] Table 4.26 Historical Climate Data: Average Maximum Temperature, Philippine Statistical Yearbook. Retrieved on May 31, 2017 from https://psa.gov.ph/tags/philippine-statistical-yearbook

Table 4. Multiple Regression Excel Output

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.92790713
R Square	0.86101164
Adjusted R Square	0.76835273
Standard Error	788.874384
Observations	11

> 75% = GOOD

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	4	23131167.42	5782791.854	9.292270679	0.009620249
Residual	6	3733936.766	622322.7943		
Total	10	26865104.18			

<.05 = GOOD

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95.0%*	*pper 95.0%*
Intercept	-38198.638	18573.94077	-2.056571564	0.08546104	-83647.43421	7250.157379	-83647.4	7250.157
CONSTRUCTION	0.03075633	0.030618428	1.004503975	0.353912154	-0.044164262	0.105676928	-0.04416	0.105677
POPULATION	0.00027785	8.97763E-05	3.094869062	0.021255242	5.81712E-05	0.000497521	5.82E-05	0.000498
TOBACCO CONSUMPTION	-0.6571701	0.276367397	-2.377885764	0.054926347	-1.333416759	0.01907656	-1.33342	0.019077
TEMPERATURE	950.153802	595.0026773	1.596889961	0.161403794	-505.7653002	2406.072905	-505.765	2406.073

RESIDUAL OUTPUT

Observation	*ed FIRE INCI*	*Residuals*	*tandard Residuals*
1	6142.68783	350.3121701	0.573286541
2	5964.42627	-686.4262728	-1.123337917
3	5329.13613	78.86387373	0.129060881
4	5285.20654	373.7934644	0.611713724
5	4469.95025	108.0497516	0.176823627
6	6192.49385	134.5061534	0.220119579
7	5710.4962	225.5038024	0.369037407
8	6492.94612	-933.9461181	-1.52840462
9	7612.94828	-664.9482825	-1.088189144
10	8287.41952	1243.580481	2.035121851
11	9756.28902	-229.2890229	-0.375231927

PROBABILITY OUTPUT

Percentile	*FIRE INCIDENTS*
4.545454545	4578
13.63636364	5278
22.72727273	5408
31.81818182	5559
40.90909091	5659
50	5936
59.09090909	6327
68.18181818	6493
77.27272727	6948
86.36363636	9527
95.45454545	9531

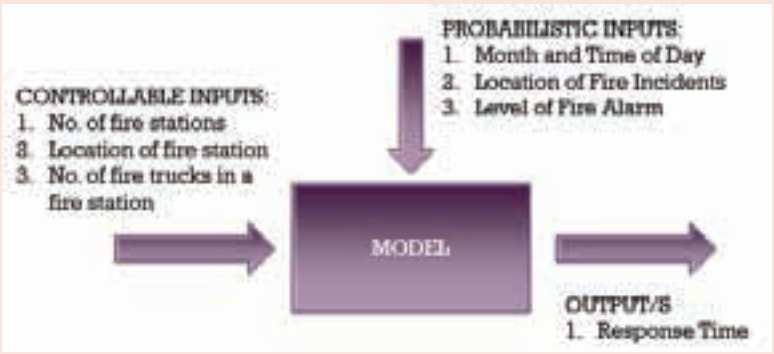
Monte Carlo Simulation

Fire incident is one of the biggest threats in life and property. Thus, when it occurs, it is important to minimize damages by mitigating the fire at the soonest possible time. Given a magnitude of fire alarm level, it is necessary to assign substations that can respond in the shortest possible time and in consideration of their travel time and distance from the scene.

Quezon City has 142 barangays and the Quezon City Fire Department (QCFD) has 25 fire stations and 32 fire trucks that are ready to respond in the event of fire. The distances for the shortest and fastest route from the fire station to the Barangay Hall were noted down; and travel time was categorized into two: rush hour and non-rush hour.

Rush hour runs from 6:01-10:00AM and 3:01-8:00PM, while non-rush hour extends from 12:01-6:00AM, 10:01AM to 3:00PM, and 8:01PM to 12:00AM. The speed of a fire truck during rush hour is around 30 kph, and it accelerates up to 60 kph during non-rush hour. The difference in speed is due to the high volume of traffic during rush hour. These considerations helped calculate the travel time for each substation and the arrival time to each barangay. The recorded travel times were then ranked to form a list consisting of the first responders up to last ones.

Figure 5. Monte Carlo Model Used



One of the goals of this study is to determine how the QCFD can act within their target response time granted that fire incidents happen randomly in different locations within the city. To simulate the data required to determine when and where a fire incident might happen, including its level of intensity, Monte Carlo Simulation was used.

Controllable and probabilistic inputs were used to compute for the values of the desired output. By using Monte Carlo, the group manipulated the controllable inputs in the model in order to come up with a recommendation that can be applied to a real situation (Figure 5).

Fire Station Information

Table 5 presents the current list of fire stations and fire substations in Quezon City.

Table 5. 2017 Fire Station Data as per QCFD

No.	FIRE STATION	ADDRESSS	STATION	DISTRICT	NO. OF FIRE TRUCKS
1	La Loma FS	Malaya St., corner Angelo St., La Loma, Q.C.	Station 1	District 1	2
2	Frisco FS	Roosevelt Ave., San Francisco, del Monte, Ave., Q.C.	Station 1	District 1	1
3	Project 6 FS	Road 7 cor. Road 8, Brgy. Project 6, Q.C.	Station 1	District 1	2
4	Bahay Toro FSS	Road 15, Brgy. Bahay Toro, Q.C.	Station 1	District 1	1
5	Agham FSS	Agham Road, Brgy. Bagong Pag-asa, Q.C.	Station 1	District 1	1
6	R. Magsaysay FSS	Cagayan cor. Aklan, Brgy. Hall, Q.C.	Station 1	District 1	1
7	Masambong FSS	Del Monte Ave., cor. Malac, Brgy. Masambong, Q.C.	Station 1	District 1	1
8	Congress FSS	Batasang Pambansa Complex, Brgy. Batasan Hills, Q.C.	Station 2	District 2	2
9	Commonwealth VFB	Barangay Hall, Brgy. Commonwealth	Station 2	District 2	1
10	Holy Spirit VFB	Barangay Hall, Brgy. Holy Spirit	Station 2	District 2	1
11	Marilag FSS	Lakandula St., cor. P. Tuazon St., Brgy. Marilag. Proj. 4, Cubao, Q.C.	Station 3	District 3	1

No.	FIRE STATION	ADDRESSS	STATION	DISTRICT	NO. OF FIRE TRUCKS
12	Eastwood FS	E. Rodriguez Jr. Ave., Libis, Q.C.	Station 3	District 3	2
13	Quirino 2A FS	Chico St. cor Kubli St., Quirino 2-A, Project 2, Q.C.	Station 3	District 3	1
14	Pinagkaisahan FSS	Ermin Garcia St., Brgy. Pinagkaisahan, Cubao, Q.C.	Station 4	District 4	1
15	Galas FSS	Unang Hakbang St., Galas, Q.C.	Station 4	District 4	1
16	Paligsahan FS	Scout Reyes, Brgy. Paligsahan, Q.C.	Station 4	District 4	2
17	Novaliches FSS	Dona Rosario, Subd., Brgy. Novaliches Proper, Novaliches Q.C.	Station 5	District 5	1
18	San Bartolome FSS	P. Dela Cruz St., San Bartolome, Novaliches, Q.C.	Station 5	District 5	1
19	Lagro FSS	Block 26, Lagro Subdivision, Q.C.	Station 5	District 5	1
20	Fairview FSS	Pearl St., Fairview, Q.C.	Station 5	District 5	1
21	Sta. Lucia FSS	Sta. Lucia Ave., cor. T. Alonzo St., Novaliches, Q.C.	Station 5	District 5	1
22	Baesa FSS	Quirino Hi-way, Brgy. Baesa, Q.C.	Station 6	District 6	1
23	Talipapa FSS	Quirino Hi-way, Talipapa, Q.C.	Station 6	District 6	1
24	New Era FSS	Brgy. Culiat, Tandang Sora Avenue, Q.C.	Station 6	District 6	1
25	Central FS	DRRMC Bldg, Kalayaan Ave. Q.C.			3
				TOTAL	**32**

Probabilistic Inputs

Month and Time of Day

Based on the data gathered in Quezon City, there are specific months during the year when higher number of fire incidents occur (Figures 6 and 7). March and April, in particular, have a high average of 145 reported fire incidents per month, or about 5-6 fire incidents per day. While the time of the fire incidents is evenly distributed throughout the day, it is highest from 12-3AM with 124 reported incidents.

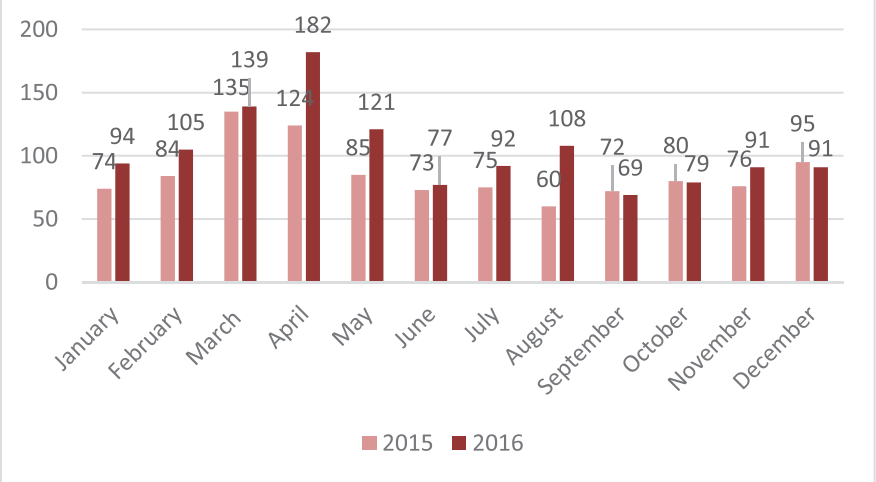
Location of Fire Incidents

In order to simulate the location of the next fire incident, probabilities were assigned using the 2015 Census data on population density and the number of informal settler families (ISFs). Data shows that more fire incidents occur in the densely populated areas where most ISFs are situated. One contributing factor is the ISFs' use of highly flammable materials to build their houses (Barrientos, 2011). In consideration of this, more weight was placed on the number of ISFs than on population density at 60% and 40%, respectively.

Level of Fire Alarm

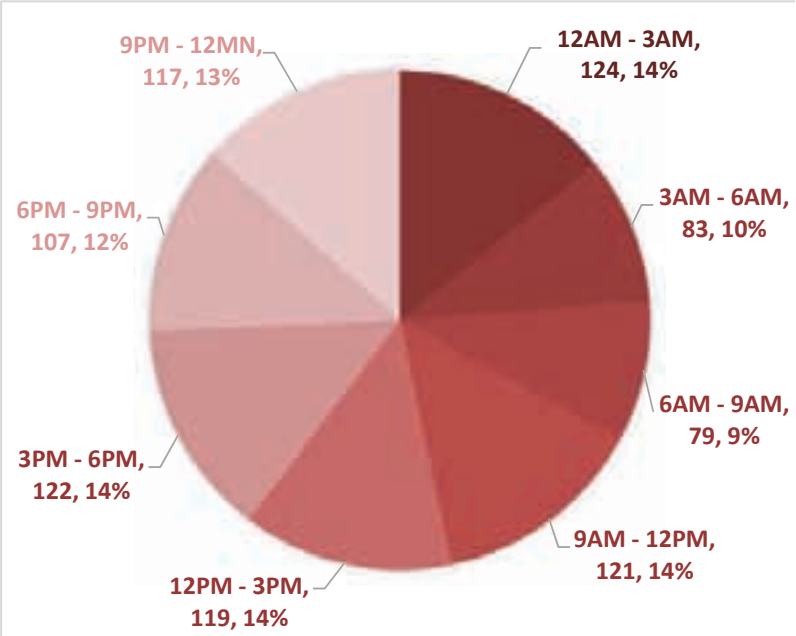
The levels of fire alarms consist of Minor or For Verification, 1st to 5th Levels, Task Force or TF Alpha, TF Bravo, TF Charlie, TF Delta, TF Echo, and General Alarm. For minor alarms, a minimum of three responding fire

Figure 6. Fire Incidents per Month in QC



trucks are required. If the alarm escalates to higher levels, three additional trucks are required per level increase. For example, a 5th level alarm requires 18 fire trucks. When the alarm reaches the task force (TF) level, the Tactical Operation Center (TOC) of Quezon City will call out for assistance from the neighboring municipality nearest to the fire scene. A TF level alarm is a large scale fire that could take more than a day to put out. Table 6 shows the number of fire trucks to be deployed and the average time needed to put out a fire per level of alarm as per QCFD data.

Figure 7. Fires by Time of Day



Steps in Responding to a Fire Call

In order to better structure the simulation model, this study reviewed the current process used in responding to a fire call. The step by step process is as follows:

1. The person calls the barangay, the Quezon City emergency number (112), or the nearest fire station.
2. The fire incident is immediately reported to the TOC.
3. TOC radios the assigned fire substation for the required minimum of three responding fire trucks.
4. The assigned fire station commander immediately notifies the fire fighters for dispatch.
5. The fire fighters, while monitoring their radios, suit up and wait for the dispatch order from the station commander.
6. The fire truck proceeds to the fire scene for verification.
7. The fire fighters notify the TOC about their arrival at the fire scene.

Each fire station has assigned areas of responsibility. When a reported fire incident falls within a certain area of responsibility, the fire fighters are able to determine whether they are the assigned responders. Table 7 shows the number of assigned barangays per fire station. In the current assignment, the barangays and fire stations are grouped per district. This means that regardless of the distance, the first responders belong to the same district as the barangay.

Table 6. Level of Fire Alarms / No. of Fire Trucks to Deploy / Time to Put Out

LEVEL OF ALARM	NO. OF FIRE TRUCKS TO DEPLOY	TIME TO PUT OUT
Minor or For Verification	3	1:00:00
1st	3	1:00:00
2nd	6	2:00:00
3rd	9	2:30:00
4th	12	3:00:00
5th	15	4:00:00
TF Alpha	18	5:00:00
TF Bravo	21	7:00:00
TF Charlie	24	12:00:00
TF Delta	27	24:00:00
TF Echo	30	96:00:00

Table 7. Number of Assigned Barangays per Fire Station per District

FIRE STATIONS	*DISTRICT*	District 1	District 2	District 3	District 4	District 5	District 6	Total
Agham FSS	1	4						4
Bahay Toro FSS	1	1						1
Frisco FS	1	4						4
La Loma FS	1	10						10
Masambong FSS	1	13						13
Project 6 FS	1	2						2
R. Magsaysay FSS	1	3						3
Commonwealth VFB	2		1					1
Congress FSS	2		2					2
Holy Spirit VFB	2		2					2
Eastwood FS	3			8				8
Marilag FSS	3			16				16
Quirino 2A FS	3			13				13
Galas FSS	4				10			10
Pinagkaisahan FSS	4				28			28
Fairview FSS	5					2		2
Lagro FSS	5					3		3
Novaliches FSS	5					6		6
San Bartolome FSS	5					2		2
Sta. Lucia FSS	5					1		1
New Era FSS	6						5	5
Baesa FSS	6						4	4
Talipapa FSS	6						2	2
Grand Total		**37**	**5**	**37**	**38**	**14**	**11**	**142**

Educated Assumptions

Given the uncertainties surrounding some of the factors included in this study, the following educated assumptions were made:

1. The average speed of fire trucks during rush hour is 30kph (based on an interview with Inspector Olimpio Aguisanda-Ret of QCFD, May 24, 2017)
2. The average speed of fire trucks during non-rush hour is 60kph (based on an interview with Inspector Olimpio Aguisanda-Ret of QCFD, May 24, 2017)
3. Other vehicles move to the road side when fire trucks need to pass.
4. Enough fire fighters are available and ready to be deployed within one minute's notice.
5. All fire trucks are in good and serviceable condition.
6. Multiple fire trucks coming from one location can be deployed to the same fire incident.
7. Fire trucks can easily access the location of the fire incident.
8. Water supply is not a constraint.

Study limitation

QCFD was only able to provide a list containing the first fire station to respond to a barangay in case of a fire incident. Thus, this study is limited to the extent that only the response time of the first responder was considered.

Methodology

Depending on the shortest route distance calculated by Google Maps, the estimated response time was obtained for each combination of barangay and fire station. Figure 8 presents an example. The Barangay Hall was used as the location point for the barangay. To get an estimated travel time, the calculated distance was divided by the estimated speed of traffic during rush hour and non-rush hour. For example, if there is a fire incident in Barangay Alicia, the Ramon Magsaysay Fire Station, which is 650m away, will be the first responder (Table 8).

After random numbers were generated through Monte Carlo, a series of Location x Time of Day combination was produced. The first responders' corresponding estimated travel time is presented in Table 9. The results of the Monte Carlo Simulation that ran for at least 1000 times is an average of 3:06 minutes for the first fire truck travel time. As for the hit rate, the first fire truck's travel time is less than 4 minutes 72% of the time. International standards call for fire engines to respond within five minutes of an alarm 90% of the time, to turnout in 60 seconds, and to arrive within four minutes (Barrientos, 2011).

Options for Improving Fire Truck Travel Time

Option 1: Re-assignment of Fire Stations to the Nearest Barangay

Instead of the assigned fire stations per district, the nearest fire station as per the calculated shortest route will be called to respond to the fire incident. If the same process mentioned above was repeated, the result will be as shown in Table 10. Comparing the best time and the highest hit rate, this recommendation will lead to 25.2% improvement on the average travel time and 20.8% increase on hit rate.

Figure 8. Finding the Shortest Route in Google Maps

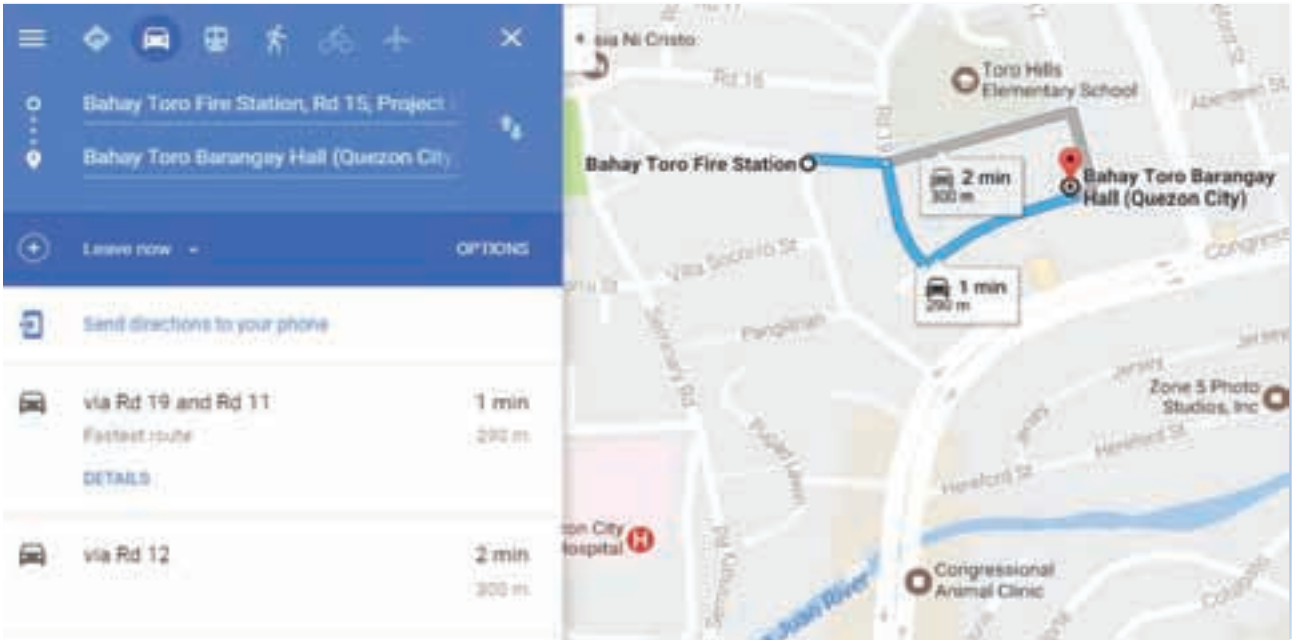


Table 8. Responding Fire Truck Based on Area of Responsibility

NO.	DISTRICT	BARANGAYS	AREA OF RESPONSIBILIT	AREA OF RESPONSIBILITY	BASED ON AREA OF RESPONSIBILITY	Time of the Day
1	District 1	Alicia	36, 30	R. Magsaysay FSS	0.65	Non-Rush Hour
1	District 1	Alicia	36, 30	R. Magsaysay FSS	1.3	Rush Hour
2	District 1	Bagong Pag-asa including	34, 30	Agham FSS	0.65	Non-Rush Hour
2	District 1	Bagong Pag-asa including	34, 30	Agham FSS	1.3	Rush Hour
3	District 1	Bahay Toro	30	Bahay Toro FSS	2	Non-Rush Hour
3	District 1	Bahay Toro	30	Bahay Toro FSS	4	Rush Hour
4	District 1	Balingasa	40	Masambong FSS	2.7	Non-Rush Hour
4	District 1	Balingasa	40	Masambong FSS	5.4	Rush Hour
5	District 1	Bungad	23	Frisco FS	4.10	Non-Rush Hour

Table 9. Fire Truck Travel Time Based on Area of Responsibility

SN	RN	LOCATION	RN	TIME OF FIRE	Rush Hour or Non-Rush Hour	Time of First Responder
1	55.42	Krus na Ligas	69	16:00:00	Rush Hour	0:08:36
2	62.38	Santo Niño	86	20:00:00	Non-Rush Hour	0:02:21
5	67.80	Valencia	52	13:00:00	Non-Rush Hour	0:05:00
3	62.12	San Vicente	47	12:00:00	Non-Rush Hour	0:09:06
4	44.50	Pansol	95	22:00:00	Non-Rush Hour	0:06:18
6	11.19	Paltok	97	23:00:00	Non-Rush Hour	0:03:42
7	67.16	U. P. Campus	32	8:00:00	Rush Hour	0:15:12
8	20.09	Batasan Hills	36	9:00:00	Rush Hour	0:05:36
9	74.33	Gulod	52	13:00:00	Non-Rush Hour	0:03:06
10	99.58	Unang Sigaw	6	1:00:00	Non-Rush Hour	0:04:24

Table 10. 1st Fire Truck Average Travel Time and Hit Rate Based on Shortest Route/Distance

Average Travel Time of First Fire Truck	2:19 minutes
Hit Rate of Travel Time (< 4 minutes)	87% of the time

Option 2: Addition of Fire Truck for Improvement of Fire Truck #2 and #3 Travel Time

According to BFP, at the first instance of a reported fire incident, a minimum of three fire trucks should report in the place of incident. As per the National Fire Protection Association (NFPA) 1710, the objective of the full first-alarm assignment is eight minutes for at least 90% of all fire calls. This means that the other two fire trucks should have a travel time of less than seven minutes.

The queuing or end to end response time of fire stations/fire trucks was included in this study's analysis. Different hours during the day from January to August were laid out on a spreadsheet to simulate the likelihood that one fire station will have to respond to multiple barangays at almost the same time. This simulation was created on the off chance that multiple fire incidents occurring at the same time are in close proximity to the same fire station. For example, as shown in Table 11, fire broke out at almost the same time in two different locations in Barangay Amihan, Quezon City. By distance, Quirino 2A Fire Station is assigned to respond to the fire incident.

The time back in the fire station was calculated by adding the fire reported time, twice the travel time, the time needed to put out the fire, and another two minutes for the fire fighters' turnout time. The waiting

Table 11. Quirino 2A FS Response Time to Barangay Amihan (with Waiting Time)

DATE	LOCATION	FIRE REPORTED TIME	FIRE TRUCK #1	TRAVEL TIME #1	DEPARTURE TIME	ARRIVAL TIME #1	TIME BACK IN FS #1
25-Apr	Amihan	6:00:00	Quirino 2A FS	0:02:48	4/25/17 6:02 AM	6:04:48	4/25/17 7:07 AM
25-Apr	Amihan	7:00:00	Quirino 2A FS	0:02:48	4/25/17 7:02 AM	7:04:48	4/25/17 8:07 AM

Table 12. Re-Assignment as per Next Available Fire Truck/Station

DATE	LOCATION	FIRE REPORTED TIME	FIRE TRUCK #1	TRAVEL TIME #1	FIRE TRUCK #2	TRAVEL TIME #2	FIRE TRUCK #3	TRAVEL TIME #3
25-Apr	Amihan	6:00:00	Quirino 2A FS	0:02:48	Pinagkaisahan FSS	0:06:24	Marilag FSS	0:07:24
25-Apr	Amihan	7:00:00	Central FS1	0:09:12	Central FS2	0:09:13	Central FS3	0:09:14

time for the first fire truck in this situation is about five minutes. The arrival time for the succeeding fire trucks could be longer. In this study, instead of waiting for the closest fire truck/station to finish putting out the fire, the next closest available fire trucks/stations will also be used. Following this suggestion, the above situation will result in the deployments shown in Table 12.

Using the revised mapping of Option 1, and upon the generation of entries for almost 1,000 times, the results shown in Table 13 were obtained.

Table 13. Average Travel Time and Hit Rate After Considering End to End Deployment of Fire Trucks

	FIRE TRUCK #1	FIRE TRUCK #2	FIRE TRUCK #3
Goal	< 4 minutes	< 7 minutes	< 7 minutes
Average Travel Time	0:02:19	0:03:51	0:04:32
Hit Rate	85.5%	91.2%	86.3%

Since Fire Truck #2 is already meeting the goal, the focus of this study is to improve the hit rate of Fire Truck #3. To do this, the following steps were performed:

1. Identify the fire trucks/stations that correspond to the third nearest fire station that is less than seven minutes away from the fire incident (barangay). The results are shown in Table 14.

2. Check the effect on the average travel time and hit rate of each fire station if a fire truck is added to their fire stations. The results are shown in Table 15.

Table 14. Top 4 Fire Stations that Appeared the Most Number of Times

	Fire Truck #1	Fire Truck #2	TOTAL
Holy Spirit Fire Station	32	16	48
Quirino 2A Fire Station	25	4	29
New Era Fire Station	3	25	28
Marilag Fire Station	2	22	24

Table 15. Effect to the Average Travel Time and Hit Rate of Fire Truck #3

Fire Truck #3	Average Travel Time	Hit Rate
Baseline	0:04:32	86.3%
Holy Spirit Fire Station	0:04:27	87.9%
Quirino 2A Fire Station	0:04:30	86.5%
New Era Fire Station	0:04:28	86.3%
Marilag Fire Station	0:04:26	87.9%

As per the Monte Carlo simulation, the Holy Spirit Fire Station received more calls

than the Marilag Fire Station even though they have similar Hit Rate percentage. It is, therefore, recommended that priority be given to adding a fire truck in Holy Spirit, with the assumption that the local government can only provide one. However, if the local government has budget for two fire trucks, placing one in Holy Spirit and another one in Marilag will yield an average time of 4:21 minutes and 89.5% hit rate. Consequently, adding two more – one in Quirino 2A and one in New Era – results to a reduced time of 4:14 minutes and a new hit rate of 89.7%.

Option 3: Addition of Fire Station in a New Location/Barangay

Given that the goal of the first fire truck is to have a travel time less than four minutes 90% of the time, another alternative is to build a fire station in a new location/ barangay in Quezon City. To determine the optimum location where another fire station can be built, the barangays with response time slower than four minutes were listed down. Based on the simulation, the top three barangays are Matandang Balara, Payatas, and Pasong Tamo.

By doing a similar exercise as Option 2, it was found that putting a fire station in Matandang Balara will result to fire truck #1 highest improvement at 89.5% during non-rush hours. Payatas comes second at 88.8%, followed by Pasong Tamo at 88.3% hit rate. Results further show that installing new fire stations at Matandang Balara and Payatas will yield 91.3% hit rate, while adding a third one at Pasong Tamo will not make a difference. Therefore, if the budget is limited, this study recommends that the construction of new fire stations in Matandang Balara and Payatas be prioritized.

Cost-Benefit Analysis

Fires and Estimated Damages

In 2016, the recorded number of fires in Quezon City was 1,248, with an estimated total cost of damage at P123 million (Figure 9).

According to NFPA 1710, the response time should meet the following criteria: 60 seconds turnout, four minutes for the first fire truck to arrive, and eight minutes for the full first-alarm assignment for at least 90% of the calls (Hensler, 2008). The rationale behind this is the fact that a room fire will reach a critical stage in fire development (point of flashover) in about 7-10 minutes. Refer to the Fire Propagation Chart in Figure 10. At the flashover stage, occupants and firefighters are at risk of death or serious injury. Beyond the flashover stage, the fire is temporarily out of control and will require considerable effort to extinguish safely. Consequently, property losses will be higher.

Figure 9. Number of Fires in QC per Month per Fire Alarm Type (With Total Estimated Damages)

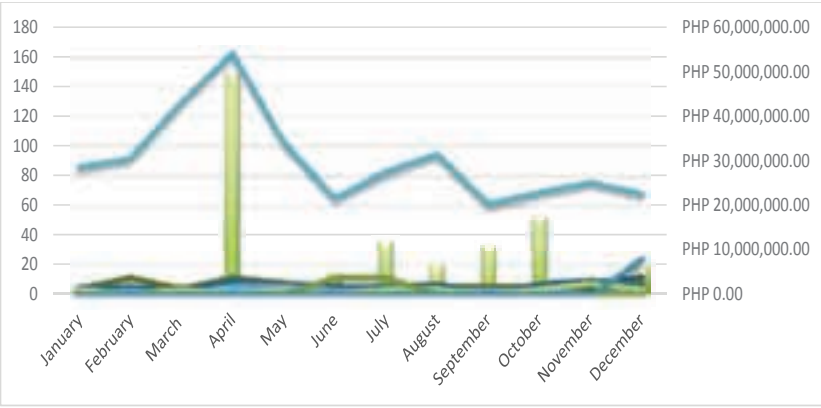
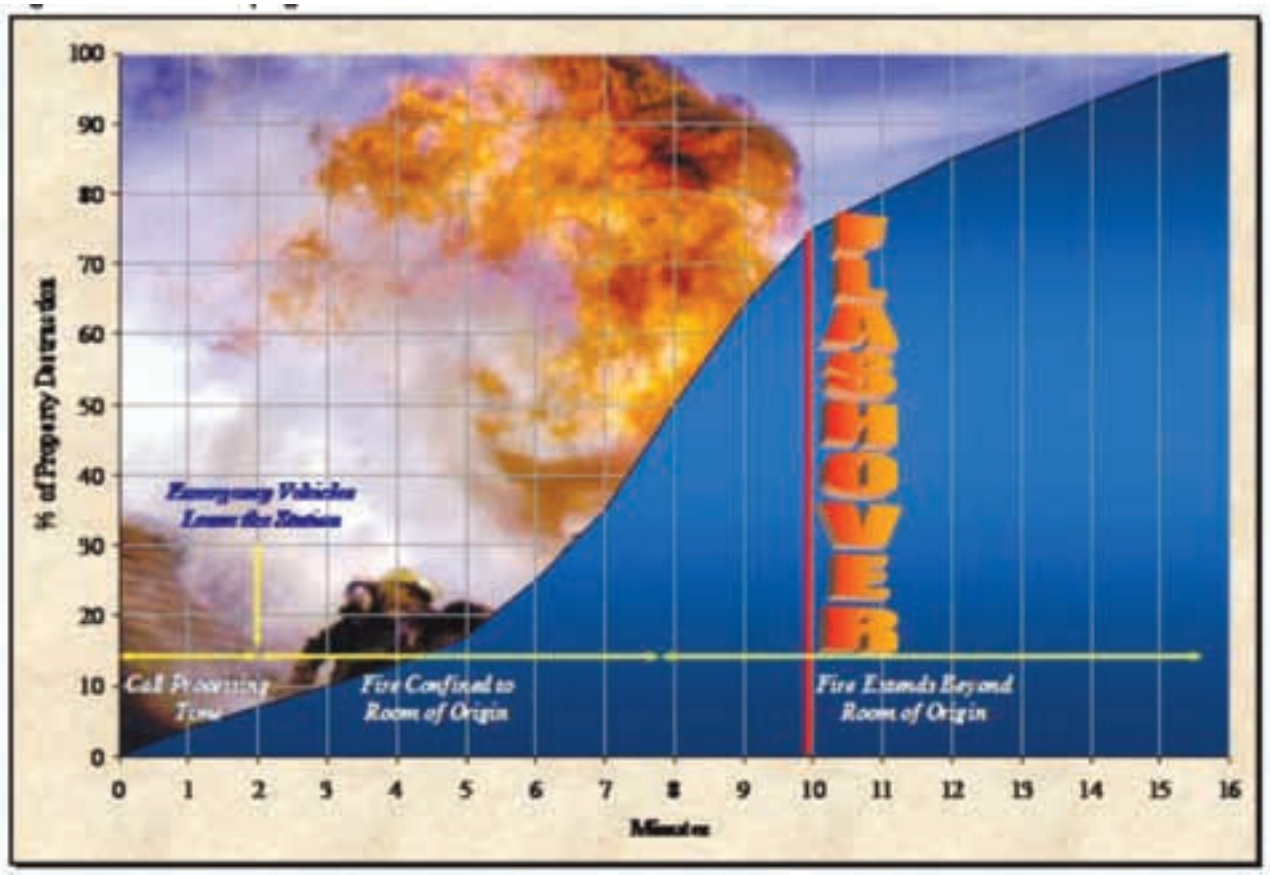


Figure 10. Fire Propagation Curve



The Mansfield Fire Fighters website described flashover as being critical for two reasons:

> First, no unprotected living thing in a room where flashover occurs will survive and the chance of saving lives drops dramatically. Second, flashover creates a huge jump in the rate of combustion, and a significantly greater amount of water is needed to reduce the burning material below its ignition temperature. A post-flashover fire burns hotter and moves faster, requires more resources for fire attack, and compounds the problems of search and rescue, exposure protection, and containment. ("Fire Growth and Flashover," n.d., para. 6)

If the estimated fire damages in 2016 will be broken down per month, day, and alarm level, the average cost per hour is calculated at P81,744 (the highest can go up to P249,000 per hour). Using the Fire Propagation Curve, the cost of damages can be estimated for every minute the fire is not put out (Table 16).

Table 16. Estimated Cost of Fire Per Minute

Minutes	% of Property Destruction or Cost	Average as per 2016 data	Highest as per 2016 data
1	5%	PHP 4,087.20	PHP 12,452.23
2	8%	PHP 6,539.52	PHP 19,923.57
3	10%	PHP 8,174.40	PHP 24,904.46
4	14%	PHP 11,444.16	PHP 34,866.24
5	17%	PHP 13,896.48	PHP 42,337.58
6	25%	PHP 20,436.00	PHP 62,261.15
7	35%	PHP 28,610.40	PHP 87,165.61
8	50%	PHP 40,872.00	PHP 124,522.30
9	64%	PHP 52,316.16	PHP 159,388.54
10	75%	PHP 61,308.00	PHP 186,783.45
11	80%	PHP 65,395.20	PHP 199,235.68
12	85%	PHP 69,482.40	PHP 211,687.91
13	89%	PHP 72,752.16	PHP 221,649.70
14	93%	PHP 76,021.92	PHP 231,611.48
15	98%	PHP 80,109.12	PHP 244,063.71
16	100%	PHP 81,744.00	PHP 249,044.60

Table 17. Cost Analysis Table

	STATUS QUO	OPTION 1	OPTION 2	OPTION 3
Hit Rate	72%	87%	87.9% (1) 89.5% (2) 89.7% (3)	89.5% (1) 91.3% (2)
Cost or Penalty per month*	P2.26M	P1.05M	P0.98M (1) P0.85M (2) P0.83M (3)	P0.85M (1) P0.70M (2)

**Sample calculation for cost or penalty/month: (1 – 0.72) x 119 fire incidents/month x P67,847 = P2,260,662*

Assuming that all other variables are ideal in the setup, and that there is a 60-second turnout time for the firefighters, the cost as shown in Table 17 is generated.

The basis of the calculation is as follows:

1. Average Number of Fire Incidents in a Month: 119 (all minor or 1st alarm)
2. Average Cost of Property Damage per Hour: P81,744
3. All reported fire incidents are either Minor Incidents or 1st Alarm Level
4. Hit Rate: Number of times that the fire truck arrives at the fire scene within the first five minutes
5. Option 2: Possible Additional Cost after eight minutes: P81,744 – P40,872 = P40,872
6. Option 1 and 3: Possible Additional Cost after five minutes: P81,744 – P13,897 = P67,847

The project cost for the construction of a fire station the size of the Agham Fire Station is estimated to be at P29 million (BFP, 2010), while the cost of a fire truck can range from P7-P9.9 million per unit (with average life span of 12-15 years) (Felipe, 2014). Using this information and Table 17, a cost-benefit analysis is generated in Table 18.

Table 18. Cost-Benefit Analysis

	STATUS QUO	OPTION 1	OPTION 2	OPTION 3
Cost	P0	P0	P7M per fire truck	P29M per fire station + P7M per fire truck
Benefit or Savings	P0	P1.21M*	P0.77M (1)** P0.85M (2) P0.86M (3)	P1.41M (1)* P1.56M (2)
Return	n/a	n/a	9 months (1) 1.4 years (2) 2.0 years (3)	2.1 years (1) 3.8 years (2

**Sample calculation for benefit/savings: (0.87 – 0.72) x 119 fire incidents/month x P67,847 = P1,211,069*

***Sample calculation for benefit/savings per fire truck: (0.879 – 0.72) x 119 fire incidents/month x P40,872 = P773,339*

Conclusion/Recommendation

After the application of the Monte Carlo Simulation on fire incidents/fire trucks in Quezon City, the important takeaway is that there could be significant improvement in travel time if fire station assignments per barangay are re-arranged according to the shortest distance. As for Options 2 and 3, the government budget is normally limited. Hence, the cost-benefit analysis table is helpful in determining which project should be prioritized.

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Barangay Maparaan Health Center

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Cher Marie **Tuason**

Overview

Barangay Maparaan Health Center (BMHC) is a health facility under the local government of San Juan City. In terms of oversight and performing regulatory functions, the Department of Health (DOH) is responsible for giving technical assistance and creating standards and guidelines for the health facility. It also has non-government partners who assist them in providing services to the community members (Barangay Maparaan, 2015).

Mission-Vision

BMHC's mission statement is *"To develop quality health care services for the people of Barangay Maparaan."* Meanwhile, its vision statement, which has not yet been updated as of late, is "Healthy population by the year 2016."

Layout

The health center is a two-story building but only the first floor is being utilized for operations. This floor has an open waiting area, three comfort rooms, two consultation rooms, one dental room, family planning room, supply room, laboratory room, records room, breastfeeding room, and a common kitchen for the employees (Figure 1). The area is relatively small considering the number of clients it caters to during clinic hours. Generally, it is in poor condition with damaged ceilings and faulty electric connections. Just adjacent to the building, there is a vacant lot owned by the local government unit (LGU). It is the supposed site for the Integrated Directly Observed Treatment Short Course (iDOTS) clinic of the health center.

Figure 1. Layout of the Clinic

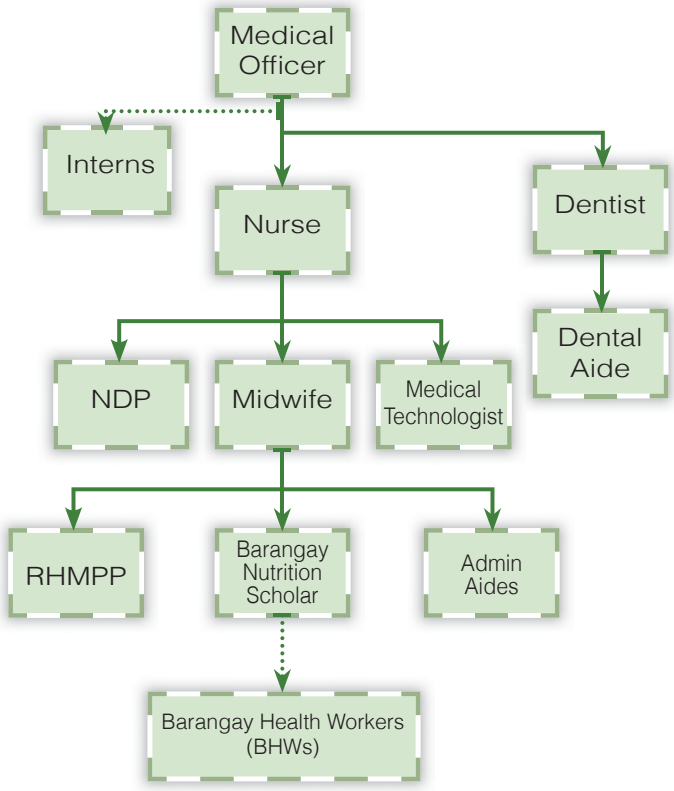
Staff

The organization is composed of one medical officer, one dentist, one dental aide, one staff nurse, two nurses from the nursing deployment program, one medical technologist, one midwife, one barangay nutrition scholar, two administrative aides, 12 barangay health workers, and interns from various medical schools (Figure 2, San Juan City Government, n.d.). The LGU is in charge of providing the organization with manpower, while DOH provides research seminars and trainings that aim to integrate optimum quality care to the system of the health center. Currently, the center has no formal employee performance evaluation and internal reward system (Barangay Maparaan, 2015).

Clientele

Based on the 2015 barangay data, BMHC caters to the needs of 16,000 individuals and 3,100 households (Barangay Maparaan, 2015). Most of the center's patients belong to economic class D and E, with their annual income ranging from P62,000 to P191,000 per household. Most employment activities are under the service category (Pinoy Money Talk, 2017).

Figure 2. Organizational Chart of Maparaan Health Center



NDP: Nurse Deployment Program; RHMPP: Rural Health Midwife Placement Program

Services and Products

The health facility provides services through the following programs: Family Planning/ Responsible Parenthood Program (provision of injections, IUD, pills, fetal sterilization); Maternal Care Program; Mother's Class Program; Breastfeeding Program; Health and Nutrition Program for Children (e.g. Operation Timbang, Micronutrient Supplement, Food Supplement Program, and Feeding Program); Immunization Program (vaccines against diphtheria, pertussis, and tetanus [DPT], polio, pneumonia, measles); Disease Control Program (prevents leptospirosis, tuberculosis, dengue, rabies); Healthy Lifestyle Program (e.g. aerobics, zumba), and others (Barangay Maparaan, 2015).

DMHC also provides patients with free medications. Medications come from two sources: DOH and the local government. DOH provides medications based on their national programs, while the local government's supply is based on the demand of the health center (i.e. the needs and previous cases in the health center). The requests for medication are forwarded to the local government during their yearly budget meetings, and the supply is delivered quarterly. The health center's supply chain for medication is shown in Figure 3. The center, however, does not have an established inventory system for their supply, nor a system to determine the community's demand for specific kinds of medication. These result to problems with their supply of free medications.

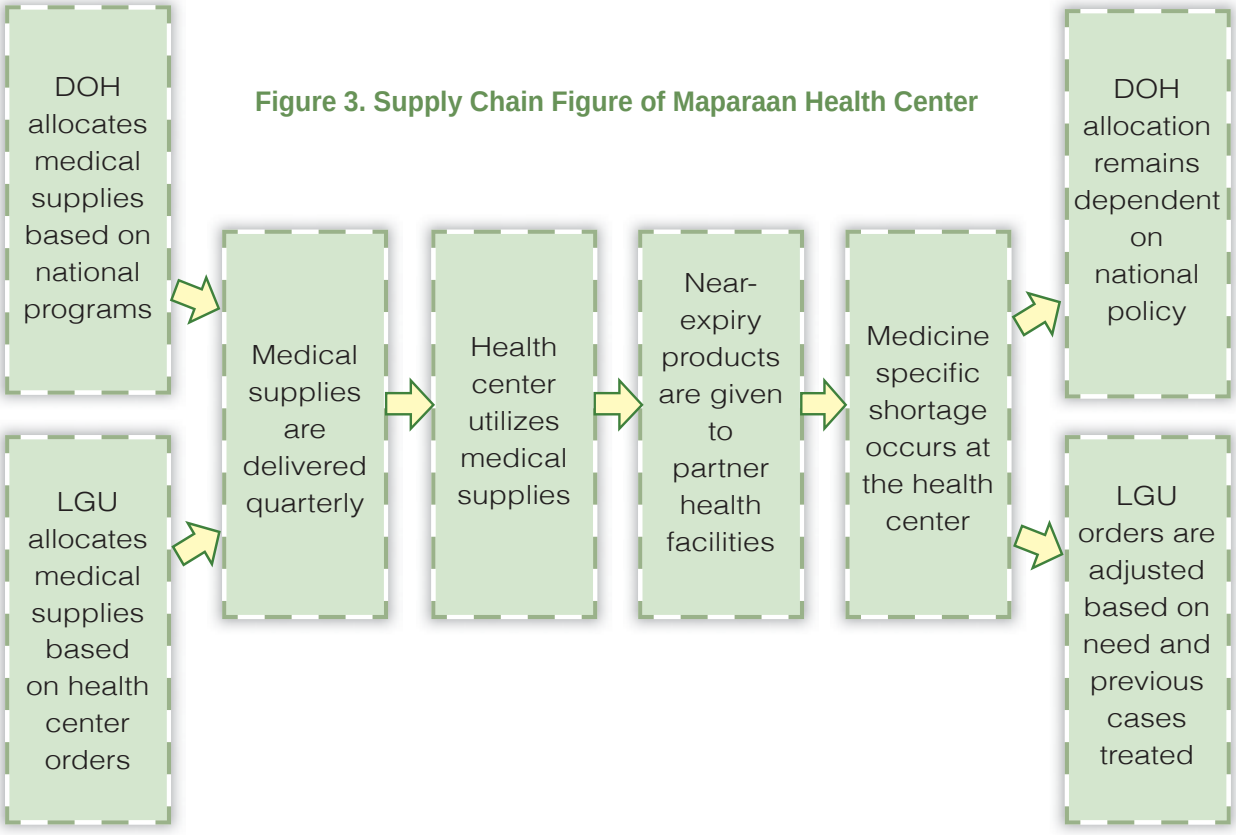


Figure 3. Supply Chain Figure of Maparaan Health Center

Process Workflow and Service Blueprint

Upon a patient's arrival, the Barangay Health Worker (BHW) adds the patient's name in the waiting list and asks whether he/she has been a patient of the center before. A new patient will have to pay P10 for a new record form, but if the patient already has an existing record with the center, the BHW will proceed to look for it in the records room. After creating a new record or retrieving an old one, the BHW then gets the patient's vital signs, age, and anthropometric measures. The patient measures his own height and weight. Currently, patients' information is collected and collated manually. Patients aged 60 and above are placed in the priority lane, while those who are younger than 60 are asked to fall in line in the regular lane. The administrative aide then gets the patient's temperature and asks about his/her chief complaint and medical history. It is during this part that patients are identified as either a priority case or not. If a patient is a priority case, he/she is asked to go directly to the doctor for necessary management. But if the patient is not a priority, he/she is asked to stay in line before being directed by the nurse to the appropriate health care professional (i.e., doctor, dentist, or midwife). However, it was observed that the health center's system of prioritizing patients based on needs and age is not followed. Names on the waiting list are also sometimes skipped.

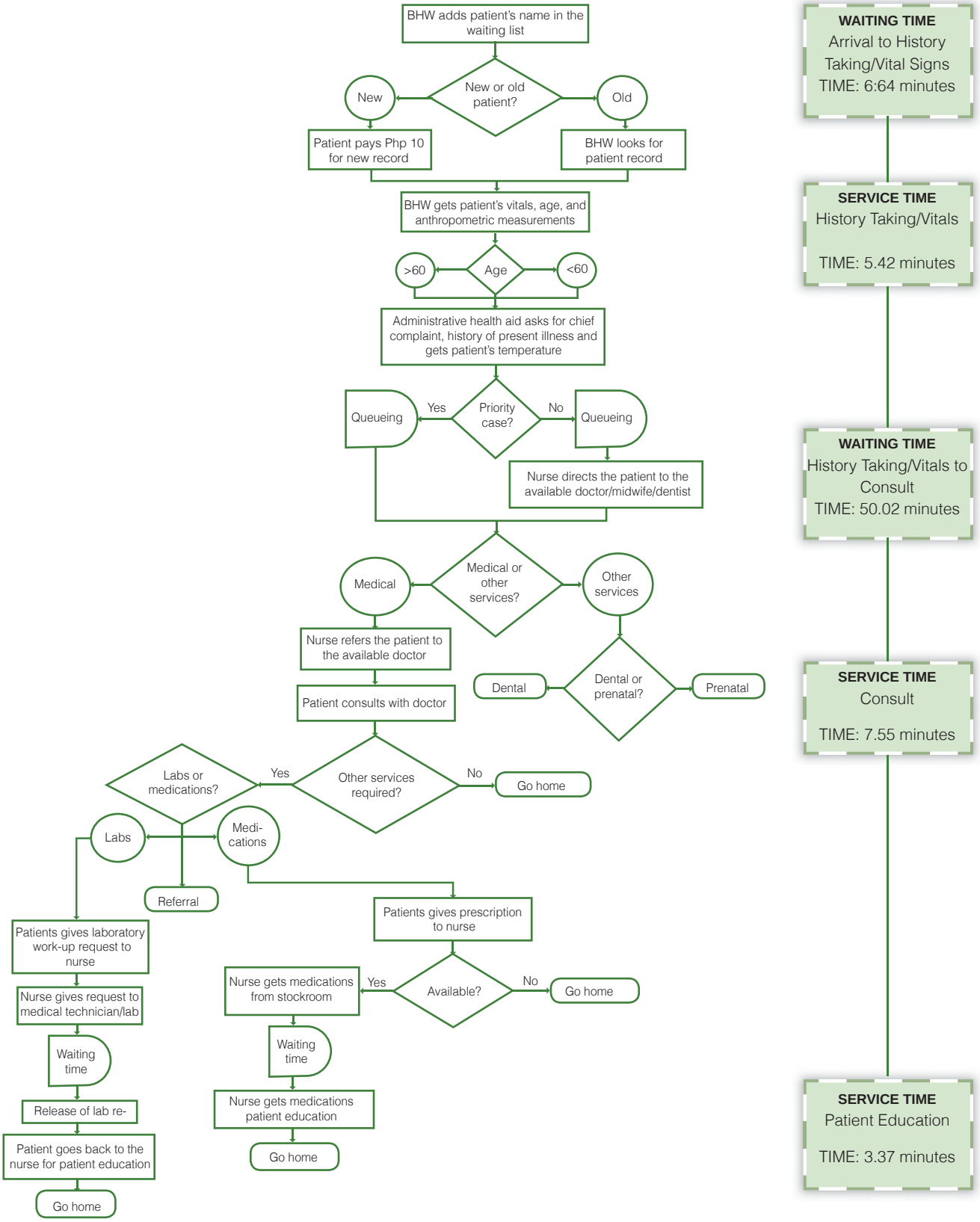
When it is the patient's turn, he/she is directed to an available doctor for consultation. If the patient no longer requires other services, he/she is sent home. However, if further services are necessary, the nurse would accordingly either direct the patient to the laboratory, give him/her medicine as prescribed by the doctor, or refer him/her to the appropriate institution based on the doctor's assessment.

In the laboratory, the patient gives the request to the nurse who then refers him/her to the laboratory technician. The patient waits until the laboratory tests are done and he/she is released. The patient then returns to the nurse for further instructions before being sent home.

In terms of medication, the patient hands over the prescription to the nurse, who then checks the availability of the drug. If the medicine is unavailable, the nurse gives the patient the necessary instructions for it before directing him/her to buy it from the nearest pharmacy. If the medicine is available, the nurse retrieves it from the stockroom and gives the patient the necessary instructions for it. If the patient requires dental or prenatal services, he/she is referred to the health care professional in charge of the appropriate health management.

The different service and waiting times were collected at pertinent points during the workflow. From patient arrival and associated waiting time to be called for the taking of medical history and vital signs, this step takes an average of 6.64 minutes to complete. The actual process of taking the patient's medical history and vital signs takes an average of 5.42 minutes, while waiting time to be called for consultation with the physician takes an average of 50.06 minutes. Consultation approximately takes 7.55 minutes, and the process of educating the patient after he/she has availed the necessary services takes an average of 3.37 minutes. Figure 4 shows the process workflow.

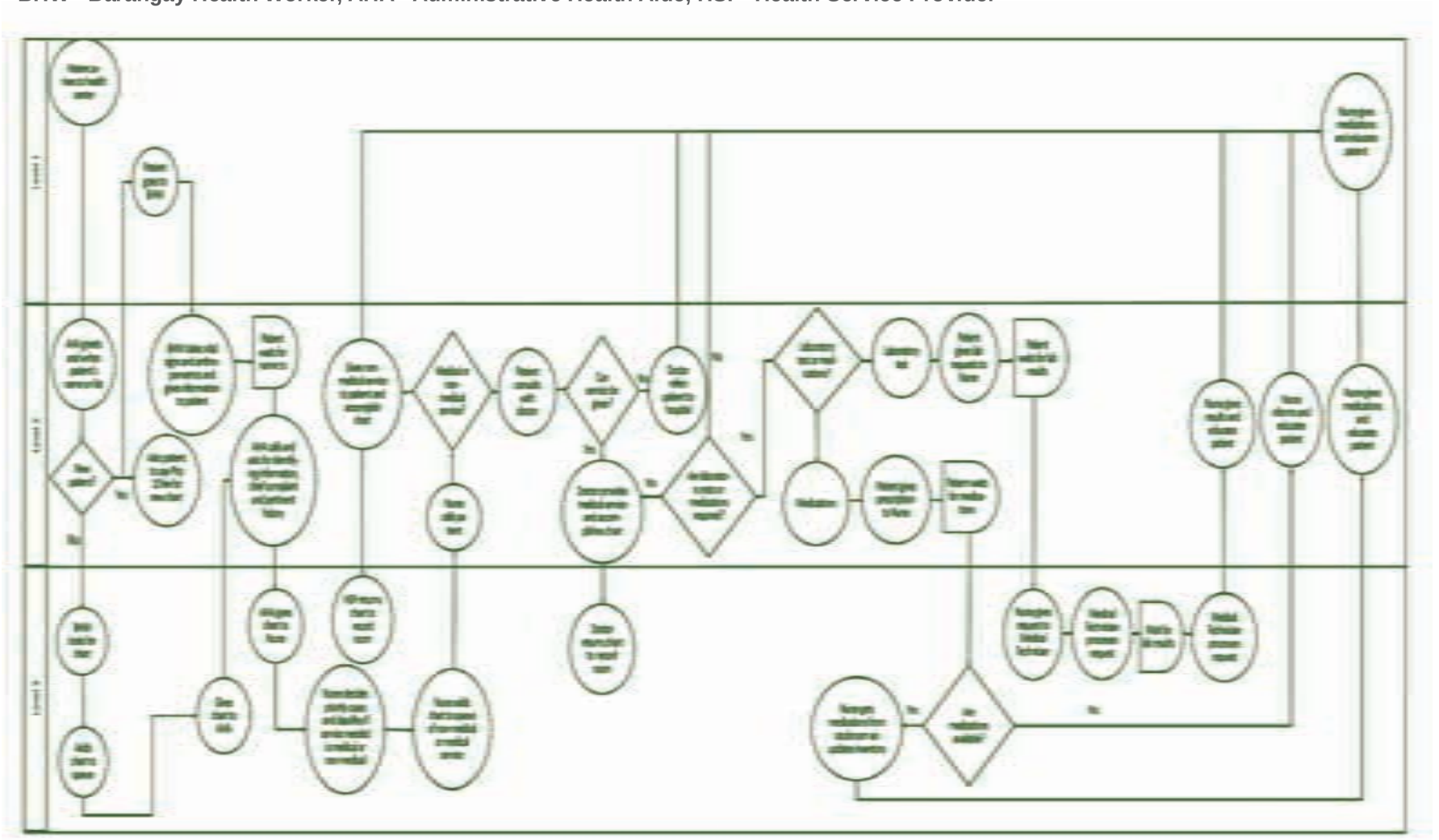
Figure 4. Process Workflow



Meanwhile, based on the service blueprint (Figure 5), BMHC's main functions are divided into patient registration, patient evaluation, patient diagnosis, and patient management education. Level 1 activities include patient actions, Level 2 activities include front-of-stage interactions where both patients and employees interact, and Level 3 activities include back of stage activities which include employee action.

Figure 5. Service Blueprint

BHW - Barangay Health Worker, AHA - Administrative Health Aide, HSP- Health Service Provider



Analysis of the Problem: Ishikawa Diagram

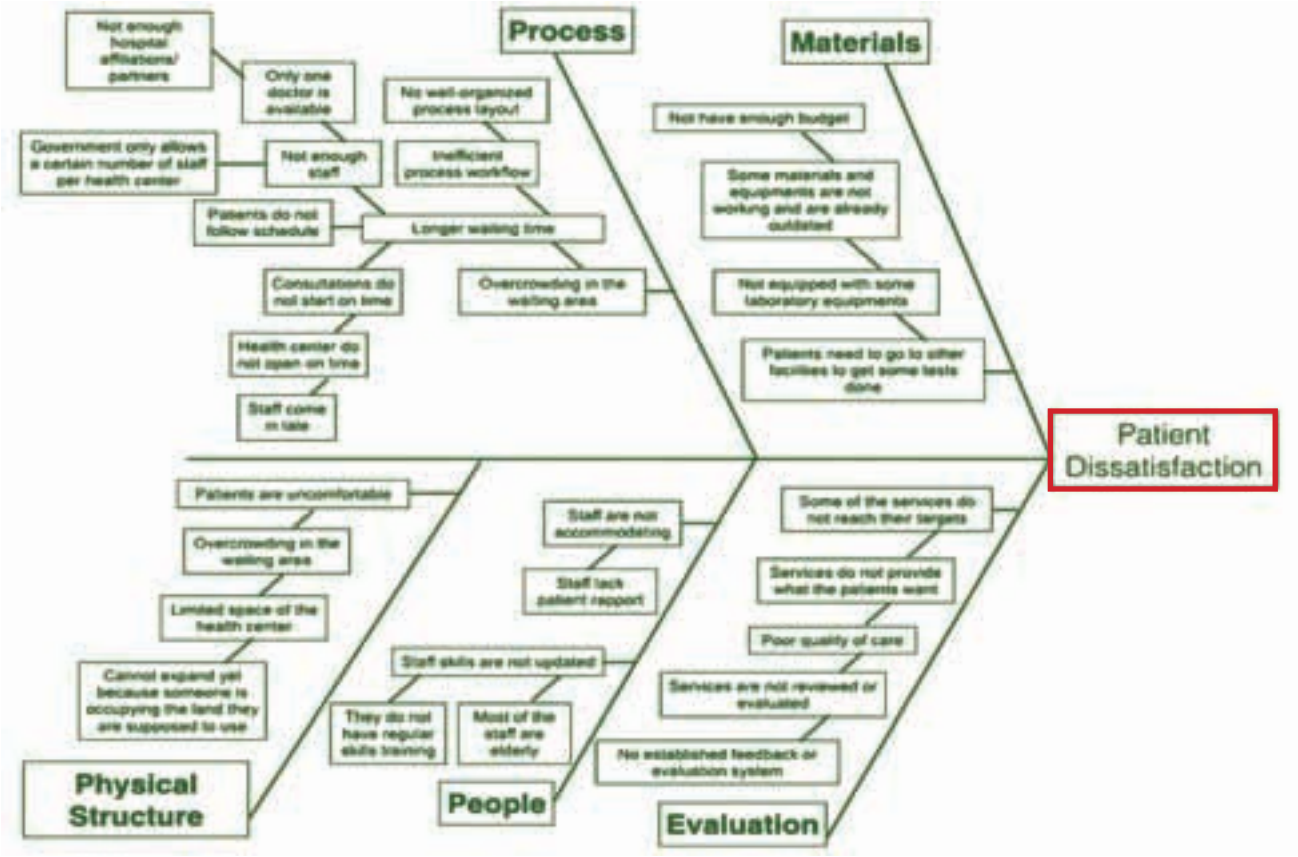
After interviewing patients and staff and observing the health center's workflow process, an Ishikawa Diagram (Figure 6) was constructed. The diagram illustrates the factors contributing to the center's main problem, which is the patients' dissatisfaction with their overall experience.

Process

When a patient arrives at the health center, he/she goes through the patient flow illustrated in Figure 3. However, as there are no signs posted in the health center, the patient flow directions are only verbally set by the staff assigned to the medical history/vitals station. This lack of concrete written directions results to confusion among patients. They frequently have to ask where they need to go next and others also cut lines because of the unclear queueing system. These lead to overcrowding in the waiting area and a bottleneck in the process flow, causing prolonged waiting time and discomfort for the patients. Interviews with them support these claims as they expressed their dissatisfaction with the center's services. The patients also shared their frustration in having to wait for hours, preventing them from maximizing their time (i.e., doing work and household chores).

Another issue with regards to longer waiting time is the schedule of medical services. Some services are only available on certain days of the week. However, some patients are unaware of the schedule and still go to the health center even if they cannot be accommodated. They then add on to the queue as they still get asked about their main complaint and medical history. The center's

Figure 6. Ishikawa diagram for Barangay Maparaan Health Center



inconsistent opening hours also contribute to the longer waiting time. Staff members are required to start their service hours by signing in via biometrics in the Municipal Hall, which is quite far from the center. The time it takes to travel back and forth, along with the time spent in traffic, usually leads to the late start of the consultations. This has been an ongoing concern for the staff as they view the policy as impractical and as they experience having to send home undiagnosed patients due to lack of time.

Materials

Patients go to BMHC to consult health professionals about their health concerns. In order for health professionals to properly advise their patients, they would need not only clinical knowledge which they already have, but also diagnostic materials to confirm their findings. However, due to limited resources and budgetary restrictions, the health center still has to ask the patients to go to other facilities for the medical tests they need. Moreover, it was noted that they use worn out equipment that no longer work properly (e.g., automated blood pressure apparatus, electronic thermometer). This forces the BHWs to use the manual blood pressure apparatus (aneroid sphygmomanometer) even though they are not as adept in using it.

Physical Structure

Aside from the lack of visual cues to guide patients on what to do in the facility, the limited floor area and the inefficient patient flow also contribute to overcrowding and possible spread of diseases, the latter being a health concern commonly raised by patients. There have been talks of using the lot beside the health center for iDOTS patients so they would not be in the same area as the regular patients. However, the property is currently occupied by a local police unit, thus preventing the center from utilizing it.

Staff

The staff plays a big role in providing patient satisfaction. However, based on the interviews with patients, some lack rapport and are not accommodating. This behavior is possibly due to their being overworked. The staff needs to regularly and continually cater to a large number of patients despite being undermanned. Staff skills are also not updated, which not only cover basic skills such as obtaining vital signs, but also soft skills which include rapport-building. The medical officer noted that while there are training sessions available for the staff, there is still a need for skill mastery in order to provide the community with quality care.

Evaluation

Based on historical data, BMHC was not able to reach DOH's target for certain medical services. There is a disconnect between how the center communicates its services to the community, and how the latter responds. This results to lack of regular evaluation of the services offered by the center. Although the center is reviewed by a local government representative at least once a year, the health center staff has yet to establish an internal evaluation system that will allow them to receive feedback from patients. This prevents them from addressing the dissatisfaction of their patients, which consequently leads to low quality service.

Gap Analysis

Based on the services provided by the health center, and the causes of patient dissatisfaction, a gaps model of service quality was developed (Figure 7). The gaps identified in the model include:

Gap 1: Lack of materials and equipment for different types of condition — Patients go to the health center only to be referred to other institutions due to lack of materials or equipment

Gap 2: Inconsistent attendance of health care professionals — The other obligations of health care professionals interfere with the ones they have to the health center

Gap 3: Inconsistent operating hours — These are due to the inconsistent opening times of the health center that eventually lead to long waiting lines

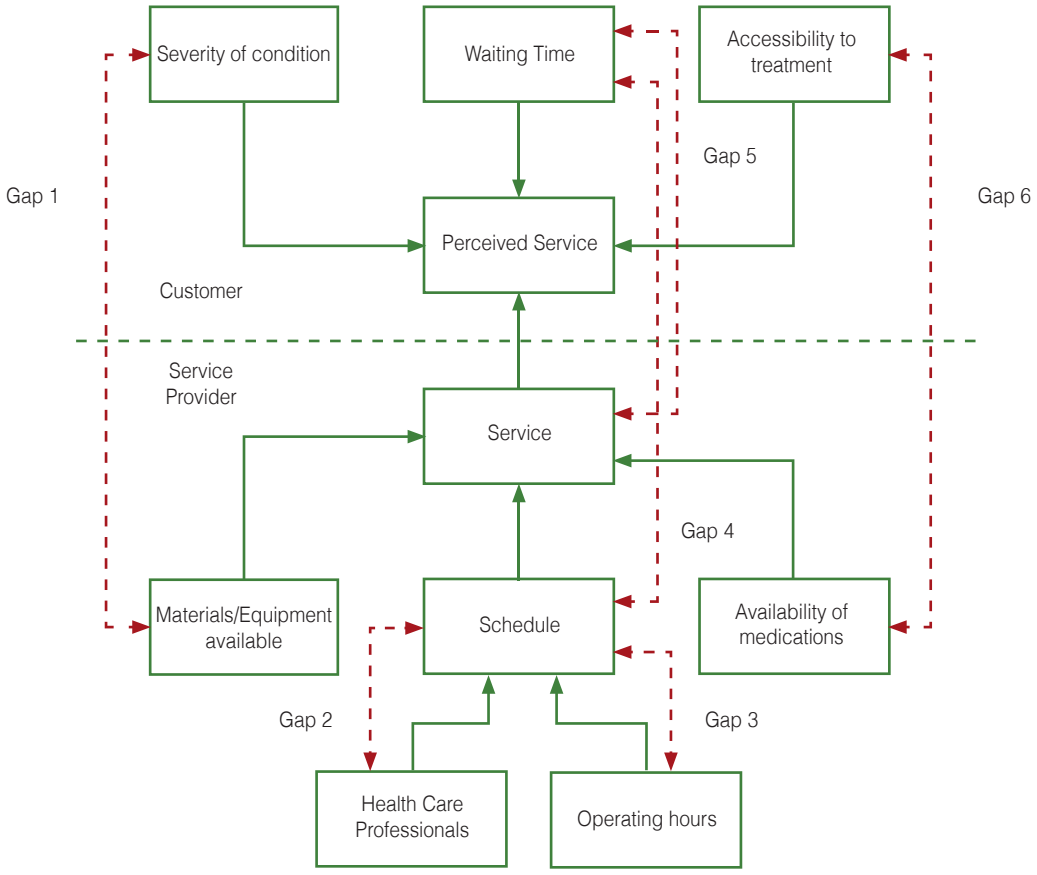
Gap 4: Discrepancy between patients' knowledge of the schedule and the actual schedule — Patients are not informed of the changes in schedule until after they have arrived at the health center

Gap 5: Long waiting times due to inefficient process flows — Bottlenecks are formed when patients are not attended to immediately due to inefficient patient process flows

Gap 6: Unavailable medications for patients — Patients are forced to look for medications elsewhere because the health center does not have stock or access to some medications

Since the health center's actions are influenced by DOH, some of the gaps noted above are no longer within their control. For example, the center cannot control the availability of medications because they

Figure 7. Gaps Model of Service Quality for Barangay Maparaan Health Center



only get their supplies from the government. Therefore, the center should make an effort to solve the gaps they have control over.

In relation to the main problem of patient dissatisfaction, the implication is on the patients' misguided choice to no longer seek care at the health center and just self-medicate, consult faith healers, or not seek care at all. Any of these options would lead to the patients' poorer health outcomes, and ultimately, the health center's failure in achieving its mission to provide quality health care services to the people of Barangay Maparaan.

House of Quality

Having identified patient dissatisfaction as the main problem in BMHC, a House of Quality tool was utilized to determine what patients want. Seven factors were identified as patient requirements – qualities demanded based on the correspondence with 41 patients and staff in the health center. In response, nine quality characteristics or functional requirements were provided to address the patient requirements. The House of Quality (Figure 8) shows the degree of relationship between patient and functional requirements, the importance of these relationships, and the correlation of the functional requirements.

Available free medication was deemed most important as it addresses one of the most notable problems of the health center. In interviews, patients would cite instances when they had to buy their prescribed medicines because the health center ran out of stock. Aside from this problem of unavailable medications, BMHC also deals with the oversupply of certain medications that they would then have to distribute to neighboring health units. This can be attributed to the DOH and local government's failure to deliver the particular medications the communities need. This is despite the health center's conveyance of their medication needs to the local government.

Shorter waiting time was ranked as the second most important. Waiting time in the health center would often reach an average of one hour. This is one of the more prominent aspects of operations, especially if the patient spends time waiting in the system. Clear patient direction was third most important. Despite having a designated waiting area, patients would often sit wherever they want without any reminder from the staff to sit in the appropriate area. Thus, the operations of the health center become disorganized and the new patients who enter the system becomes confused with the process flow. Another possible contributory factor to the disorganized process flow is the lack of visual aids that can direct patients about the system of operations.

The relationships between patient requirements and functional requirements show which patient requirements are affected by the most number of functional requirements, regardless of the degree of relationship. The patient requirement, available free medications, is the least addressed by the functional requirements. Notably, it has a strong relationship with having updated records of used medications and supplies due to the center's intent to lobby DOH for more budget. Since the center is wholly dependent on the administrative orders and budget allocations of DOH, only the government can address the problem. It also has a weak relationship with the promotion of health services in the community since a list of available medications allows the patient to be aware of them, and thus have the option to forego the health center if the medicine he/she needs is unavailable. Shorter waiting time and clear patient direction are two patient requirements addressed the most by the functional requirements. Shorter waiting time has a strong relationship with partnerships with teaching hospitals, having a patient flow system, and having an earlier opening time. This indicates that waiting time can be improved by increasing personnel, having an efficient flow system, and increasing service hours.

Meanwhile, clear patient direction has a strong relationship with having a patient flow system and with the promotion of health services in the community. A patient flow system directly addresses this patient requirement by establishing a stepwise process flow. The promotion of services allows patients to go to the health center on days when their desired service is available. This will prevent overcrowding in the health center, thereby creating a better patient flow. Among the correlations of functional requirements, the most noticeable is the lack of negative correlations among the functional requirements.

Overall, having a patient flow system had the highest importance rating, indicating that the pursuit of this functional requirement will have the most effect in satisfying patient requirements. This considers the assigned importance or weight per patient requirement. Based on the weights, patient flow system has a strong positive relationship with two of the most weighted patient requirements: Shorter waiting time and clear patient direction. This indicates that it can significantly increase patient satisfaction. The second highest in importance rating is having partnerships with teaching hospitals. This functional requirement is also related to having shorter waiting time and having consistent staff attendance. Lastly, the third highest in importance rating is the improvement and expansion of facilities. In terms of their importance rating, there is a significant disparity between the second and third functional requirements. This indicates that improving and expanding facilities will not have much effect on improving patient satisfaction.

The top three functional requirements with the highest importance rating show that the health center needs to be able to make comprehensive changes that address the different aspects of the organization. These include sufficient number and adequacy of health personnel, an established patient flow system, and better facilities. However, in terms of feasibility, it is important to consider the context of the health center. As a government-sanctioned health care unit, addressing the most important patient requirement (i.e., available free medication) will entail government initiatives. The government needs to be involved in large scale efforts to satisfy this patient requirement. That being said, it is beyond the limit of this paper and will not be taken into consideration as part of the solution. The functional requirement, having a patient flow system, satisfies the patient requirements shorter waiting time and clear patient direction, which rank second and third in importance. This is the best functional requirement to fulfill as it is more feasible and has the most effect on the enumerated patient requirements.

Based on the situation and the house of quality functional requirements, BMHC is presented with three alternatives to address the problems and satisfy the patient requirements. The first is maintaining the status quo, while the remaining two focus on internal and external development.

Figure 8. House of Quality for Barangay Maparaan Health Center

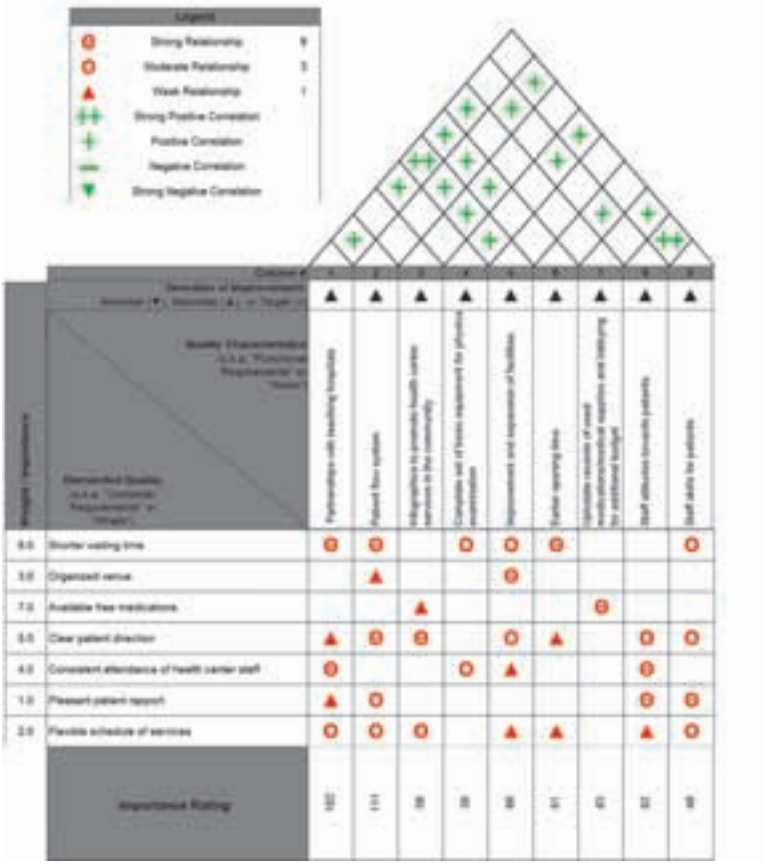
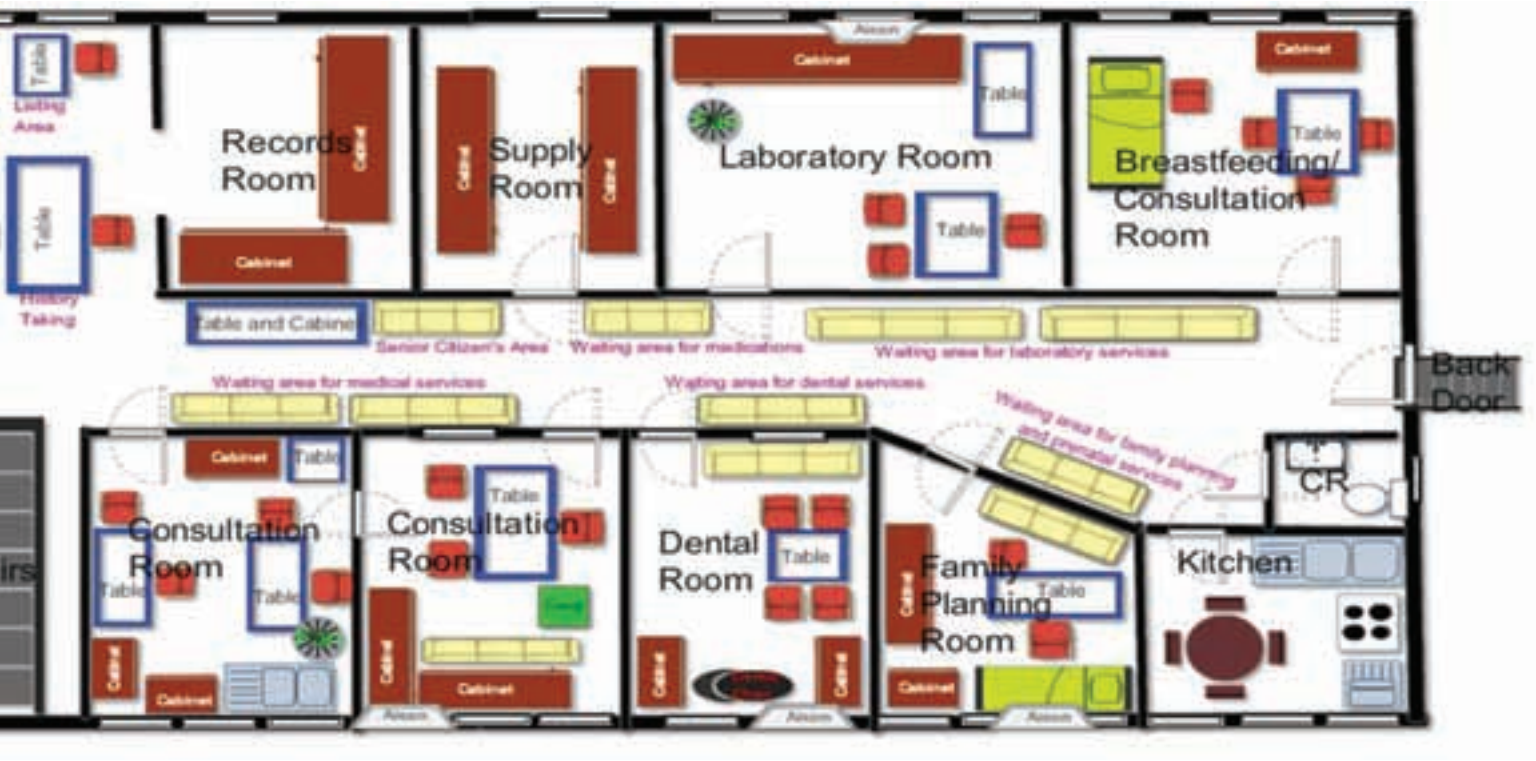


Figure 9. Suggested Layout of the Clinic (Created with http://www.smallblueprinter.com)



Status Quo

Maintaining status quo is a sensible choice given that the health center is able to meet the needs of the community with its current system. Continuing their current operations will not lead to their decline or dissolution since they are a government-sustained health unit with steady funding.

External Development

Another option is to focus on external development, which involves establishing liaisons with individuals or organizations outside of the health center. BMHC can develop more partnerships with teaching hospitals to increase the number of its health care personnel. As indicated in the House of Quality, this functional requirement has the most importance as it satisfies the highest weighted patient requirements.

Promotion of health services by posting infographics that increase the awareness of the schedule and types of services offered by the health center. This prevents unnecessary trips for patients who require certain services that might be unavailable or scheduled for another day.

The acquisition of more medical equipment would entail sending out requests to DOH. The follow through for this is highly unlikely given the current set up in DOH where resources are given based on administrative decisions. This implies that the supplies and medications provided may not reflect the needs of the community and health center personnel. This results to surplus of unnecessary medications and lack of adequate medical equipment.

The improvement and expansion of facilities is another solution that is difficult to execute. BMHC's second floor is supposed to be a lying-in clinic for patients in labor. However, due to lack of equipment and beds, it is still empty and unutilized. Likewise, there is an available but unused room next to the barangay which could have expanded floor space for better service flow.

Internal Development

Internal development involves efforts to make changes within BMHC, particularly with the staff and system of operations. These efforts are not overly reliant on external parties and can be executed by the health center staff. One of the solutions is to improve the patient flow system. The patient flow is currently disorganized and often disrupted by patients who do not sit in the designated waiting areas. This increases waiting time and decreases efficiency in service provision. In conjunction with other solutions, another possible solution is the earlier opening time to accommodate more patients.

BMHC currently does manual inventory of their medications and medical supplies. This increases service time for the patient because the nurses will have to manually check the availability of the medication or supply. An updated record system is necessary to efficiently provide service to patient and decrease the waiting and service time. Records can be efficiently updated by adapting an electronic system or changing the protocol to improve the current system.

Staff skills and attitude can be points for improvement. Better patient rapport and a pleasant attitude can increase patient satisfaction. Skills improvement can decrease patient waiting and service time, and consequently increase patient satisfaction. An internal evaluation system can be established to monitor performance and ensure consistency in provision of services and patient satisfaction. This system can be incentivized to motivate and empower the staff to work harder.

Plan

Given these myriad of problems, retaining the Status Quo of operations would retain patient dissatisfaction and hinder the health center from fully realizing their purpose to provide services that address the health needs of the barangay residents. Moving forward, a mixed approach towards internal and external development should be applied to resolve

these issues. In particular, a two-phased approach in the form of interventions.

The first phase includes short-term interventions that would create immediate impact in improving patient dissatisfaction. The main intervention in this phase would involve a staff-driven strategy. As such, this intervention would focus on internal development as these are the functions within the immediate control of the center.

A formal, efficient patient flow system would be the intervention mainly implemented for

Figure 10. Revised Process Flow

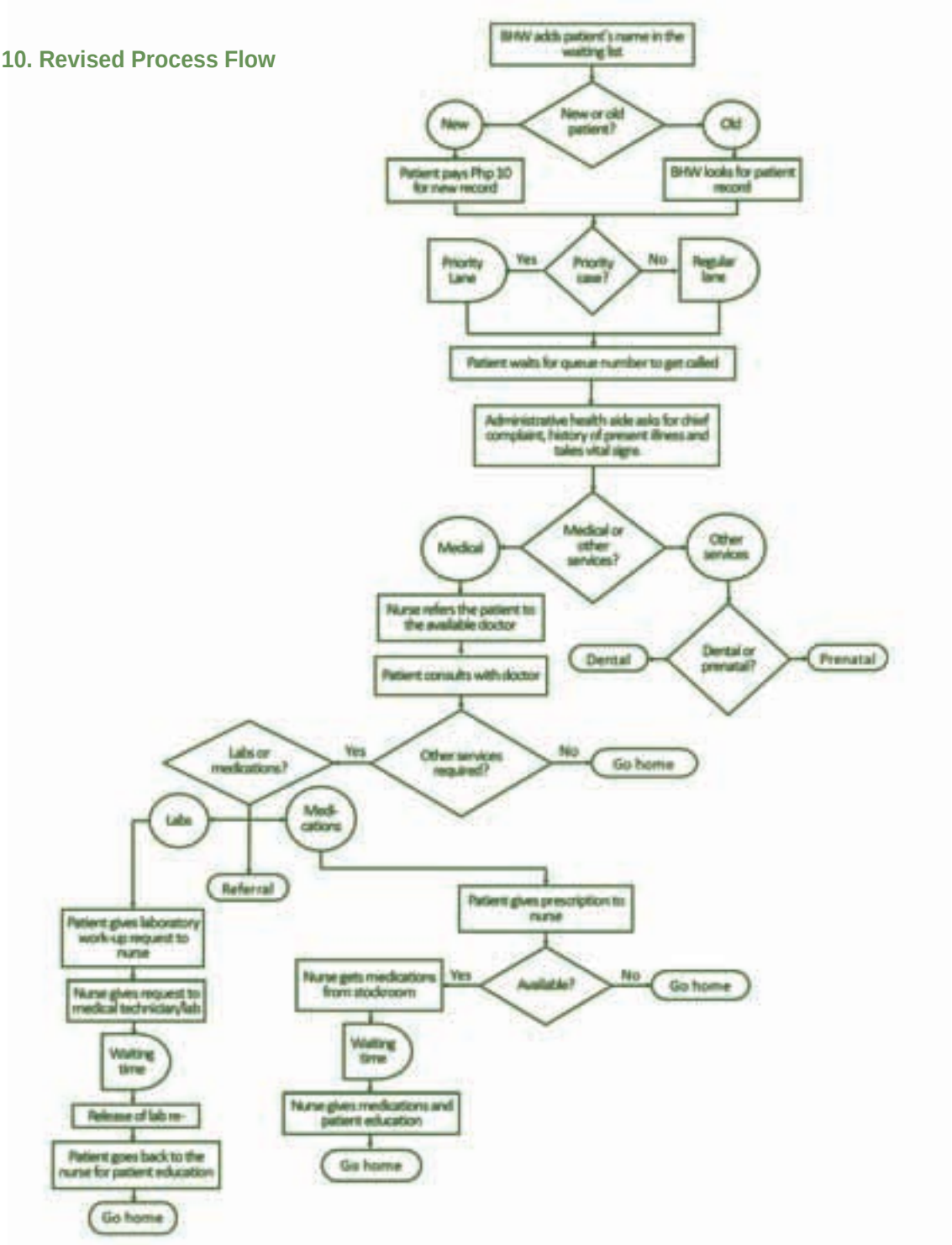
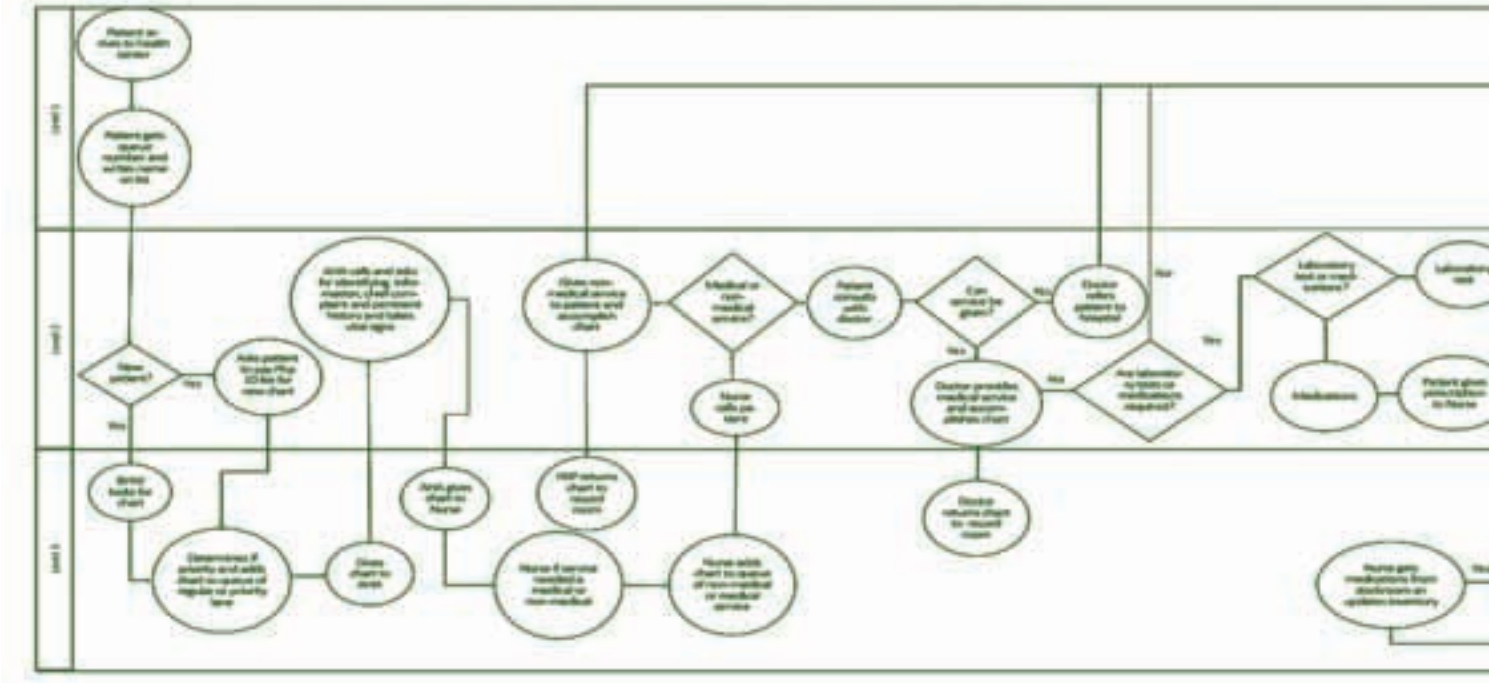


Figure 11. Revised Service Blueprint; BHW - Barangay Health Worker

AHA - Administrative Health Aide, HSP- Health Service Provider

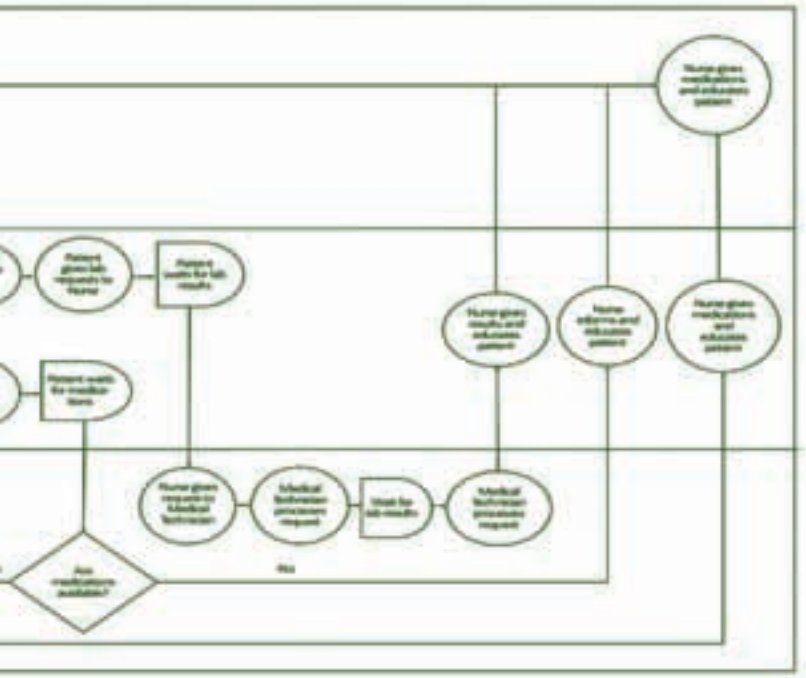


the first phase since it addresses the most important factor identified in the house of quality – shorter waiting time for patients. As shown in the house of quality, there is a strong relationship between shorter waiting time and an improved patient flow system. A more organized and efficient process can shorten the waiting time for patients; and relative to other possible solutions, it can be achieved in a short amount of time. Ultimately, it would address patient dissatisfaction, improve service flow, resolve overcrowding, and shorten longer waiting time (Figure 10).

This intervention is crucial given the shortage of manpower, particularly the head doctor, rotating interns, and dentist. Only these health professionals can diagnose and prescribe medication for the patients so it is imperative to maximize their availability. A shorter waiting time would maximize their time in the center by allowing them to see more patients. Implementing a formal, efficient patient flow system is in line with the center's mission to develop quality health services for the barangay residents, as well as with their vision of a healthy population for the barangay.

The second phase, meanwhile, mainly consists of long-term interventions that focus on external development, particularly the center's engagement with external entities to decrease patient dissatisfaction. One of the strategies is to establish partnerships with teaching hospitals to increase manpower in the center, thereby addressing the issue of frequent unavailability of doctors and dentists.

The problem of having incomplete or outdated health center equipment can be addressed through stronger engagement with the national and local government. They are the main providers of the center's budget and BMHC should communicate to them their equipment needs. These two interventions are the primary concerns of the second phase, mainly because house of quality identified them as the two most important interventions related to addressing patients' waiting time. Also, based on the Ishikawa diagram (Figure 6), they would have widespread effects in addressing patient



dissatisfaction.

Partnerships with teaching hospitals would address the patients' need for shorter waiting time, consistent attendance of health professionals, and flexible schedule of services. Providing a complete set of equipment, on the other hand, would address the patients' concerns about waiting time and availability of health professionals. These two interventions and the improvement of the patient flow system (First phase) are the top three most important interventions identified in the house of quality. If these interventions are implemented, there would be major progress towards the resolution of patient dissatisfaction. Another possible long-term intervention is the structural expansion to the adjacent property. Skills training and attitude improvement for the staff, as well as establishing an internal evaluation system to improve quality of service, can also be done.

The 12Rs framework (Kamauff, 2010) is used as lens to analyze the proposed plan (Table 1).

Table 1. 12Rs Framework

Factor	Solution Plan
Relevance to vision, mission, and objectives	Addressing patient dissatisfaction is in line with the vision and mission of the health center as it aims to increase the number of patients served by decreasing the queuing time, increasing the health center staff, and improving the equipments used for consultations. This would provide the health center more opportunities to care for patients and thus treat more patients, promote good health practices to the community, and administer preventive health services.
Revenues	Given that the health center is a non-profit organization, measures of success are based on improvements in health outcomes.
Returns	
Responsiveness to customers	Plans to address patient dissatisfaction were based on interviews with patients and observation of the operations of the center. Therefore, these plans directly address the problems and issues raised by patients of the health center.
Reinforcement of existing strategies	Plans were formulated to improve existing operations and reinstate the health center as a capable primary health care provider in the area.
Resonance with Values	Patient-centered care is the main focus of the suggested plans and will therefore be congruent with the existing values of the health center.
Reach	Implementation of the plans will increase quality of services in terms of waiting time, equipment used, and staff availability. This will lead to more patients served, and eventually, a wider reach of the health center.
Range	The plans will not provide patients a wider range of services but would improve the current services offered by the center.

Factor	Solution Plan
Revolutionary Impact	These plans will produce significant impact as the application of these interventions to a government health center is not yet the norm for improving services.
Relative Ease of Implementation	Plans are feasible provided that the proponents and stakeholders have the initiative and political will to implement them. Phase one of the plans may take months before they become optimized. On the other hand, phase two plans may take years before they are fully realized because they need coordination with different stakeholders (i.e., government and community members).
Resources Required	This is relatively low, as shown in the budget. With the support of the local government, the budget should be easily achieved, especially given its potential impact on the community.
Risks	The health center will not incur much substantial risk as it is not relying on any other entity to execute the plan, nor will it take out loans or any such liability.

In summary, the focus of this paper is the short-term goal of providing a formal patient flow system. While the second phase's general strategy of engaging with external entities is already beyond the scope of this paper, these recommendations will still be forwarded to the center as a possible guide for their long-term operations.

Action Plan

With the use of the Ishikawa Diagram, the following were identified to be the causes of patient dissatisfaction: Overcrowding in the health center, inefficient process and patient flow, lack of staff, late start of consultations, and patients' unawareness of the health center's schedule.

In consideration of these findings, the inherent resource constraints in the health center's system, and the House of Quality's highest scoring strategy, phase one of internal development shall focus on formalizing a patient flow system. This development of a systematic patient flow that is more effectively communicated to the center's clients will also include improvements in the health center layout.

Health Center Layout

Figure 1 illustrates the current layout of the health center's functional floor where all the client-related processes take place. Considering the previously presented patient flow, the placement of certain stations adds to the patient traffic during peak hours, as well as to the overcrowding in the health center. For example, when a patient enters the center through the main entrance, the patient first registers at the front desk by the record room, which is also the same area where the patient's medical history is taken. After which, the patient proceeds to the station by the entrance where blood pressure (BP), weight and height measurements are taken. Without clear instructions on where to wait, the patient is free to go around the center, looking for an empty seat that is close to a window or an electric fan. The patient then waits for his/her name to be called by the BHW stationed at the front desk. After this step, the patient once again looks for a vacant seat and waits until the nurse calls him/her for the consultation.

With the average waiting and service time of 62.12 minutes until consultation, some patients opt to leave the center without informing the health staff, and then come back when they feel that it is almost their turn to be called. Such instances were observed to be common practice, and it disrupts the queue as the health center staff has no established way of monitoring the patients who leave the line. Likewise, the patients have no way of tracking their turn unless they take the initiative to inquire. One strategy that can address these gaps in the system is to build an improved and more intuitive health center

layout. This is proposed in Figures 9 and 10.

In the new layout, a queuing system is incorporated. There is a waiting area to allow patients to wait until the listing area calls their number. The waiting and listing areas are placed near each other, and the chairs, tables, and different stations are properly arranged. The listing area is strategically placed near the records room, which will be manned by an employee who will call out the queue number and distinguish the patients accordingly (i.e., old or new, >60 or <60 years old). The same person is also tasked to either create a new record for the patient or look for the old one. = The patient's record is then transferred to the history taking area. The history taking area is also beside the listing area to facilitate easy transfer of records. To avoid traffic, a space is provided to allow people to easily pass from the listing area to the vital signs and anthropometric measures areas. These areas are also placed close to each other given that they take the patients' measures consecutively.

A waiting area for history taking is also added and placed strategically in order to avoid unnecessary crowding and disorganized patient flow. There is enough space to allow movement from this area to the history taking area, which is placed near the listing area for the convenient transfer and stacking of records. This area is also placed near the specialized rooms designated for specific services in order to hasten patient transfer to specific waiting areas. Specific waiting areas are created for a more organized system and to allow employees to easily find the patients for specific services. In order to avoid overcrowding and unnecessary traffic in the area, these waiting areas are strategically placed near the specific room they are assigned to. It is suggested that patients enter only through the main entrance and exit only through the back door to avoid crowding in the area.

Visual Control

It is proposed that the layout changes be accompanied by visual control in order to instruct BMHC's clients on what to do upon entering the system. Clear signages in Filipino that indicate the steps are posted in strategic areas in the center's lobby. Stations and designated waiting areas are labeled to clearly distinguish priority lanes. Also, a poster of the center's schedule is posted by the entrance of the center so that patients who cannot be catered to for the day no longer need to wait in line.

Queuing System

The proposed system includes two main additions to the patient flow: 1) queue numbers and 2) a priority lane. The queue numbers are available at the entrance of the health center. There are 100 queue numbers. There are, on average, 100 patients being treated per day so the center will not run out of queue numbers. Upon entry of a patient, he/she gets a queue number and waits in the designated waiting area for his/her number to be called. Once called, his/her information is taken and classified as either a priority or non-priority case. Priority cases include senior citizens, PWDs, and pregnant women. If identified as a priority case, he/she is led to the priority lane where patients are served first. Non-priority patients are served with a 2:1 ratio (i.e., for every two priority patients served, one non-priority patient is served). In order to aid the nurse and BHW in distinguishing priority and non-priority patients, a smaller version of the queue number is attached to the patient's record in correspondence with that patient's queue number in the listing area. Once the consultation is done, the patient returns the queue number to the queue box by the nurse's station where it can be used by incoming patients. The nurse also returns the queue numbers from the records to the listing area. Patients who miss their turn when their numbers are called will be served immediately after the current patient is done.

Quality Management

In order to ensure the quality of services provided by BMHC, the 5Ss can be employed as a checklist to promote an orderly and efficient working environment (Table 3).

Table 2. Action Plan of Quality Management using the 5S Tool

5S Component	Why?	How?	Who?
Sort	To remove what is not needed and keep what is; to reduce hazards, avoid clutter and optimize use of space in the center; to decrease overcrowding	Health center staff and stakeholders meeting with ASMPH LEC Group to discuss areas of concern and come up with a Sorting Checklist that identifies items and their respective degree of need, frequency of use, and appropriate storage method	Medical Health Officer, health center staff and volunteers, ASMPH LEC Group
Systematize	*Patient Records:* To shorten retrieval time and encourage willingness among the staff to be assigned to the station *Inventory:* To avoid shortage and wastage of medicines and medical supplies; to gather data that can be used as supporting documents in requesting for resources from the LGU; to promote a more effective and efficient workflow	Patient Records: Designate and label sections for patient records (i.e., regular patients, 4Ps members, dental patients, or unsorted); ensure that all records are returned to the record room from the clinics at the end of the day (i.e. use of color-coded record trays); arrange alphabetically before operations start the following day Inventory: Designate and label sections for medications and medical supplies; apply first-in-first-out method in arranging the inventory and reflecting changes in stocks in the appropriate logbook/ computer program at the end of each day; submit and compile weekly inventory reports that can be used as reference in filing requests to LGU; label cabinets and review materials for sorting; reevaluate need for other supplies and resources	Medical Health Officer, health center staff and volunteers
Sweep/Shine	To keep working areas clean and orderly, lessen the cluttered appearance of the health center	Assign each employee to be in charge of maintaining the cleanliness of their assigned areas/stations; identify areas that need regular sanitization and ventilation, and assigning people to be in charge of these areas; schedule general cleaning sessions every two weeks and applying a rotation schedule; review the current processes in waste disposal and collection methods	Medical Health Officer, health center staff and volunteers
Standardize	For all health staff workers to level-off and formalize procedures, and set the direction or objectives of the facility to improve patient satisfaction while providing quality service	Conduct an orientation to formalize procedures and practices, and to call for monthly staff meetings for continuous feedback and reassessment of the health center's processes; Create, print, and post audit checklists for the Record Room, Inventory, and each station and clinic	Medical Health Officer, health center staff and volunteers, ASMPH LEC Group

5S Component	Why?	How?	Who?
Sustain	To promote habit formation and discipline, leading to improved patient satisfaction	Utilize audit checklists that shall be collected monthly; Conduct scheduled and surprise reassessments; Consider giving incentives to the health staff workers who consistently abide with the practices	Medical Health Officer, health center staff and volunteers, ASMPH LEC Group

Table 3. Sorting Checklist

Degree of Need	Items	Frequency of Use	Storage Method
Low	First Floor: Expired medication, scratch paper, old and unused documents Second Floor: Broken tables, weighing scales	Not used in the past year Used once in 6-12 months	Throw out or sell as junk Store at a distance
Medium	First Floor: Unused tables, outdated infographics, underutilized cabinets Second Floor: Extra tables, chairs, fans, weighing scales, beds	Used once in 1-6 months	Store in central place in the workplace
High	First Floor: Monoblock chairs, plastic benches, cabinets used for medicine and medical supply storage, BP apparatus	Used once a week Used daily Used hourly	Store near work site =

Sort

To sort the materials and resources in the health center, keep items that are needed and dispose of those that are not. It is best to call for a meeting among the staff to discuss and decide on the items' degree of need, frequency of use, and appropriate storage method. The goals for this strategy are to reduce hazards in the facility, avoid clutter and optimize use of space, and decrease overcrowding.

Table 3 may be utilized to give stakeholders a clearer view on the suggested storage methods for particular items. Changes in the Items column may be made as deemed fit by the health staff.

Currently, numerous cabinets are placed on the first floor of the facility (Figure 12). As observed, these cabinets take up space, add on to the center's cluttered and overcrowded appearance, and function more as tabletops than storage materials. The contents of these cabinets should be reviewed to retain the ones that have a higher degree of need and then store the rest on the second floor of the facility. The expired medications and medical supplies, as well as the old and unused documents, also need to be assessed and sorted.

Systematize

Another area of concern is the Record Room (Figure 13) which stores patient records. Although the health staff claimed that the records are arranged neatly and

in alphabetical order, the shelves appear intimidating and do not have labels. This poses a challenge when certain records are searched for, especially since these shelves also contain the documents for 4Ps members and dental patients. In order to facilitate easier and faster retrieval of files, as well as encourage staff to be assigned to that station, the Record Room should be systematized by clearly designating and labelling sections for specific patient records (i.e. regular, 4Ps members, dental patients, unsorted). To implement this, all the records should be returned to the Records Room at the end of the day, and all the files should be arranged in alphabetical order before operations begin the following day.

Regarding the health center's inventory (Figure 14), a more systematic approach can be utilized to avoid shortage and wastage of medicines and medical supply. This could be achieved by designating and labeling sections for these items and by applying the first-in-first-out (FIFO) method in arranging the inventory. It is also important that changes in the resource stocks are reflected in the appropriate logbook/computer program at the end of each day. Weekly inventory reports may also be submitted to the medical health officer and these can serve as supporting documents in requesting for additional resources from LGUs or other partners. By applying these proposed systems, a more effective and efficient workflow in the health center can be expected.

Sweep/Shine

This strategy aims to keep working areas (Figure 15) clean and orderly while lessening the cluttered appearance of the facility. This can be done by putting each employee in charge of maintaining the cleanliness of their assigned stations, identifying areas that need regular sanitation (i.e., hallway that serves as waiting area for TB patients), scheduling general cleaning sessions every two weeks, and applying a rotation schedule of persons responsible. It would also help if processes in waste collection and disposal are reevaluated to ensure that they are complying with government regulations.

effective and efficient workflow in the health center can be expected.

Standardize

As these strategies require commitment from the health staff and share the objective of improving patient satisfaction while providing quality service, new procedures will have to be formalized. This can be done by conducting an orientation that will allow the staff to level-off and formalize procedures and practices. Monthly staff meetings can be an avenue for continuous feedback and

Figure 12. Disorganized Cabinets in the Consultation Room.

Figure 13. Filing System in the Records Room with No Obvious System of Organization.

reassessment of BMHC's processes, as well as for the creation, printing, and posting of audit checklists for the Record Room, inventory, stations, and clinic.

Sustain

The last strategy for this tool focuses on the sustainability of the implemented procedures with the end goal of promoting discipline among the health staff. This can be done through audit checklists that can be collected monthly and the administration of scheduled and surprise reassessments. To empower the staff, the medical health officer may also consider giving incentives to those who consistently abide with the quality management practices.

Execution Plan

In order to facilitate the improvement of the patient flow, health center layout, and quality management, an execution plan was made using the 5W and 2H tool (Table 4).

Figure 14. Health Center Medicine Cabinet

Figure 15. Pediatric Anthropometric Measurement Area (identified as needing regularly cleaning due to its constant contact with various patients

Table 4. Execution Plan for the Improvement of the Patient Process Flow

WHAT?	WHERE?	WHEN?	WHO?	WHY?	HOW?	HOW MUCH?
Review current workflow, layout, and quality management practices	Barangay Health Center	October to December 2016	Medical Health Officer, health center staff and volunteers, patients, ASMPH LEC Group	To establish baseline processes, identify concerns from the perspectives of patients and health staff; to identify current inventory utilized in the processes	Through ocular visits and observation of the health center's processes; through patient interviews, staff interviews, FGDs with the BHWs; by analyzing waiting and service times	N/A
Analysis of current systems/ processes utilized by the health center	Barangay Health Center	December 2016 to March 2017	Medical Health Officer, Field Preceptor, ASMPH LEC Group	To identify lags and bottlenecks in the system that can be optimized to reduce waiting time and improve patient satisfaction	By employing techniques in Waiting Time Analysis and holding consultations with the Medical Health Officer and the Field Preceptor	N/A

WHAT?	WHERE?	WHEN?	WHO?	WHY?	HOW?	HOW MUCH?
Presentation of findings	Barangay Health Center	April to June 2017	Medical Health Officer, Field Preceptor, health center staff, ASMPH LEC Group	To present the proposal, identify concerns, set the objectives of the project and target measures; to receive feedback and points for improvement for the planned strategies; to emphasize the need for controlling measures and to consider the need for an internal evaluation system	By conducting staff meetings with the Municipal Health Officer, Field Preceptor, and the health center staff	N/A
Propose the new layout and orientation of the health staff	Barangay Health Center	July 2017	Medical Health Officer, Field Preceptor, health center staff and volunteers, ASMPH LEC Group	To apply analysis from the gathered data, and inform the project staff who aim to improve patient flow to increase patient satisfaction; to get the support and commitment of the health staff in trying out the proposed system	By conducting a staff meeting and FGDs	N/A
Pre-test of proposed layout, queueing system and quality management processes	Barangay Health Center	August 2017	Medical Health Officer, Field Preceptor, health center staff and volunteers, ASMPH LEC Group	To have an idea of the staff and patients' reception to the proposal	By running the proposed system and noting the good points and gaps; preparing queue numbers	Printing queue numbers and lamination services 6 queue nos. x 5 sheets x P15 = P450
Collect and analyze staff and patient feedback	Barangay Health Center	August 2017	Health center staff and volunteers, patients, ASMPH LEC Group	To identify gaps in the proposal that can be improved	By conducting FGDs and personal interviews	Snacks and drinks for staff and patients 30 people x P15 per meal = P450
Refinement of the processes	Barangay Health Center	September 2017	Medical Health Officer, Field Preceptor, health center staff and volunteers, ASMPH LEC Group	To apply solutions to previously found gaps, to improve the system	By holding staff meetings/FGDs; printing and posting signs for the patients to facilitate visual control (i.e. steps, schedule, priority list)	Printing costs, mounting tape, scissors (7 sheets x P5) + (2 posters x P40) + P15 = P130
Launch of the new layout, queueing system and quality management processes	Barangay Health Center	October to December 2017	Medical Health Officer, Field Preceptor, health center staff and volunteers, ASMPH LEC Group	To affect change and hopefully increase patient satisfaction, to improve patient waiting time	By orienting the staff and patients about the purpose of the activity	N/A

WHAT?	WHERE?	WHEN?	WHO?	WHY?	HOW?	HOW MUCH?
Collect and analyze staff and patient feedback	Barangay Health Center	December 2017	Medical Health Officer, Field Preceptor, health center staff and volunteers, patients ASMPH LEC Group	For controlling measures	By conducting FGDs and personal interviews	Snacks and drinks for staff and patients 30 people x P15 per meal = P450
TOTAL BUDGET						**P1,480**

Performance Measure and Evaluation

Measures of control for Phase 1 can be seen in Table 5. Each task in Phase 1 has a list of performance milestones, time checkpoints, and budget controls. This will ensure that the implementation of the project will be effective, timely, and affordable.

Table 5. Measures of Control for Phase 1

Task	Performance Milestone	Time Checkpoints	Budget Control
Review current workflow, patient flow, materials included in the system, and layout	Identification of variables pertinent to the system	Meeting has been set before the middle of 1st and 2nd week	N/A
Analyze current queuing system	Establish assessment of current system	Initial data collected by the 2nd week	N/A
Identify target measures	Target measures are specific, measurable, attainable, relevant, and timely (SMART)	Meeting has been set by the middle of the 4th and 5th week	N/A
Design the new layout and reorient the staff	Blueprint of layout and clear instructions for the staff	Already met at least once by the middle of the 5th and 6th week	N/A
Pretesting the proposed layout and queuing system	Faster queuing on pretest	Already pretested before the middle of the 7th and 8th week	Price per queue number does not go beyond P30.00
Collect and analyze staff and patient feedback	List of key areas for improvement and maintenance	Collected some data before the middle of the 8th and 9th week	Price per meal should not go beyond P30.00
Refine the layout	Updated blueprint	Made changes by the middle of the 9th and 10th week	Total amount should not exceed P30.00
Launch the new layout and queuing system	Sustainable queuing with faster patient turnover	Launched by the middle of the 10th week of Q3 to maximize initial implementation of system	N/A
Collect and analyze staff and patient feedback	List of key areas for improvement and maintenance	Must have met by the middle of the 2nd week of Q4	Price per meal should not go beyond P30.00

Task 1: Review current workflow, patient flow, materials in the system, and layout

The important performance milestone for this task is to identify the variables pertinent to the functions of the system. Thorough reviewing of the system should lead to pertinent variables that can be adjusted to make the system work better. The time checkpoint set requires that a meeting be set before the middle of the 1st and 2nd week. This meeting will facilitate the discussion of the variables that need to be identified. Budget controls are not applicable since it does not require any expenses.

Task 2: Analyze current queuing system

The important performance milestone for the second task is to establish an assessment of the current system. After identifying variables, an assessment will help the health center establish the current status of its operations. The time checkpoint set requires the center to arrive at an assessment by the 2nd week. Budget controls are not applicable since it does not require any expenses.

Task 3: Identify target measures

The important performance milestone for the third task is to set target measures that are specific, measurable, attainable, relevant, and timely (SMART). With these measures, it will be easier to monitor the system's performance. The time checkpoint set requires a meeting by the middle of the 4th and 5th week. Budget controls are not applicable since it does not require any expenses.

Task 4: Design the new layout and reorient the staff

The important performance milestone for this task is to have a blueprint of the system's layout, as well as provide the staff clear instructions for its implementation. This will require the staff to think of ideas that can improve the system based on the identified variables and measures. The time checkpoint set requires it to be made by the middle of the 5th and 6th week. By this time, the staff should have already met once to talk about the proposal for changes in the system. Budget controls are not applicable since it does not require any expenses.

Task 5: Pre-testing the proposed layout and queuing system

The important performance milestone for this task is to have faster queuing on pre-test than the original system. This will provide a quantitative measure of the improved efficiency of the system. The time checkpoint set requires that the center administer the pretest before the middle of the 7th and 8th week. Budget controls require that the price per queue number does not go beyond P30.

Task 6: Collect and analyze staff and patient feedback

The important performance milestone for this task is to have a list of key areas for improvement and key areas to maintain in the system. This also serves as the feedback mechanism for the project. This will ensure that improvements are based on actual observations from the pre-implementation of the system. The time checkpoint set requires that data collection start before the middle of the 8th and 9th week. For the volunteers of the survey, the price per meal should not go beyond P30.

Task 7: Refine the layout

The important performance milestone for this task is to create an updated blueprint based on the collected feedback. This will prepare the system for its official implementation. The time checkpoint set requires the changes to the blueprint be made by the middle of the 9th and 10th week. Total amount should not exceed P30 for the updated blueprint.

Task 8: Launch the new layout and queuing system

The important performance milestone for this task is to manage a sustainable queuing system with a faster turnover of patients. This will reflect the efficacy of the new system. The time checkpoint set requires the system to be launched by the middle of the 10th week of Q3 in order to maximize initial system implementation. Budget controls are

not applicable since it does not require any expenses.

Task 9: Collect and analyze staff and patient feedback

The important performance milestone for this task is to have a list of key areas for improvement and maintenance. This has the same function as the feedback mechanism set in task 6. The time checkpoint set requires that the volunteers meet by the middle of the 2nd week of Q4. For the volunteers of the survey, the rice per meal should not go beyond P30.

Summary and Conclusion

As shown in the analysis of this organization's problem, patient dissatisfaction stems from a variety of root causes such as long waiting times, limited staff, and physical structure of the health center. The House of Quality showed that among the different patient requirements and wants, available free medications, shorter waiting time, and clear patient direction were the ones given the most importance by the interviewed patients. The House of Quality also showed that the two initiatives that would best address these concerns require setting up an improved patient flow system and augmenting partnerships with teaching hospitals.

A two-phase approach would address the identified issues, with the first phase focusing on internal development, and the second phase focusing on long-term external development. Due to limitations, the discussion mostly focused on staff-driven interventions in the first phase. The interventions covered address the health center layout, queuing system, and implementation of a quality management tool. These interventions, in addition to the second phase, would enable the organization to further develop and achieve its mission of developing quality health care services for the people of Barangay Maparaan.

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Addressing Amadeo Coffee Farmers' Plight

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Introduction

Coffee is one of the most valuable agricultural commodities in the world. It is the world's second most consumed beverage next to water and the second most traded commodity after petroleum. In world trade, coffee is the fifth most important agricultural product. In 2016, worldwide coffee consumption stood about 151.3 million 60kg-bags or 9,078 million kilograms of coffee ("Global Coffee production," October 2016).

According to the International Coffee Organization, an intergovernmental group with 77 members representing 98% of world coffee production and 83% of world consumption, it is imperative to continuously have healthy discussions with other countries to address the growing needs of the coffee industry, and consequently to establish appropriate rules to regulate trading practices ("Mission," n.d.). These so-called healthy discussions are geared towards sustaining the supply for the worldwide coffee demand.

Among coffee producing nations, Brazil is the highest in terms of production. It is followed by Vietnam and then Colombia, whose coffee is deemed as the most popular among coffee drinking nations. The Philippines, likewise, is a part of the exporting nations of the International Coffee Organization. However, it sits low in the world ranking with its 31st spot, merely contributing 12,000 tons in the world market per year ("Top coffee producing countries," 2016).

The coffee industry landscape in the Philippines

With the rise of the middle income earners in the Philippines, there is an observable change in the landscape of coffee drinking culture. According to a report from Euromonitor, "positive economic conditions and increased purchasing power continues to aid the growth of Philippine coffee." Instant coffee, in particular, dominates as the competition among its key

players continues to increase. This is led by Nestle's Nescafe with 44% retail value share ("Coffee in the Philippines," 2016).

In an interview with Inquirer, Nicholas Matti of the Philippine Coffee Board said that the annual local demand for coffee already amounts to 100,000 MT in 2012. However, only a quarter or 25,000 of this annual demand is being catered to locally, while the rest are being imported from other coffee-producing nations (Valencia, 2016). The declining local coffee production is due to certain factors such as low buying price, outdated production practices, unproductive coffee trees, diversification into other crops, lack of post-harvest processing facilities, and ultimately, farmers leaving their farms to pursue other professions (Honrada, personal communication, November 4, 2016).

Background

Coffee farming

There are four kinds of coffee being produced in the Philippines: Robusta, Arabica, Liberica, and Excelsa. Among the four, Robusta is the variety being most commonly produced at 71.1% share of the total coffee production. According to the Department of Agriculture, these are being grown in plantations and in smallholder farms, 1-2 hectares in size, specifically owned by farmers ("Coffee market ends," n.d.).

Aside from well-known coffee provinces like Batangas, Cavite is a coffee-producing province not that known to many. The town of Amadeo, in particular, is the leading crop producer with 44.85% contribution to the province's total production. Amadeo is touted as "the coffee capital of the Philippines," while the towns of Silang and Alfonso (also in Cavite), closely follow with 17.77% and 11.64% contributions, respectively. Cavite contributes a total of 28% to the Philippines' total production, while the town of Amadeo contributes a significant 13% at about 3,400MT per year ("Coffee in the Philippines," 2016). Only three varieties of the four, however, are being produced here — Robusta, Excelsa, and Arabica.

Coffee trees are initially planted in nursery beds. These can live and bear fruits for 30 to 50 years. However, as the trees age, the quality of the berries they produce diminishes, hence, the need for either planting of new trees or implementing of the process called "rejuvenation." This process revives the coffee trees' capacity to produce quality fruits through the trimming of coffee tree branches (Honrada, personal communication, November 4, 2016).

Once good quality coffee berries are produced, they undergo a coffee processing method that will turn them into coffee beans, and eventually, into a ground and brew-able state. This, however, is a tedious and costly process, requiring the use of specific post-coffee harvest infrastructure.

The post-coffee harvest procedures may be summarized in a few steps. After harvesting, the coffee berries go through the drying process which is done either manually by exposing the berries to the sun, or mechanically through the use of a machine (also known as a dryer). After drying, the pulps of the coffee berries are removed through the process of de-hulling. De-hulling is tedious and costly if done manually, but it can also be done through a machine called a de-huller.

Once the hulls of the coffee berries have been removed, they go through grading and sorting, which are segregation processes that determine the quality of beans based on size, weight, color, and other possible imperfections. After grading and sorting, the coffee beans are then placed in a coffee roaster where they are continuously rotated in about 550° F to ensure that they do not get

burnt. The roasting machine is responsible for turning the colors of the coffee beans from green to brown ("10 Steps from seed to cup," n.d.). While the green coffee beans could already be sold in its raw state, the roasted beans may be sold for thrice as much. Hence, most coffee farmers and traders prefer to roast their beans prior to selling them (Honrada, personal communication, November 4, 2016).

The coffee farmers' plight

According to Senator Francis Pangilinan (as cited in Alave, 2012), the average annual income of a Filipino farmer is approximately Php23,000. That leaves them a mere Php2,000 a month, an amount way below the Php6,329 minimum amount needed for food sustenance for a family of five (Philippine Statistics Authority, 2016). This margin grows even bigger if non-food necessities are considered, which will then require a minimum monthly income of Php9,064 ("Poverty incidence among Filipinos," October 2016). Alave (2012) views these discrepancies as the primary reason for farmers' decision to leave their farms. The same scenario is evident in Amadeo where most farmers have opted to take other professions or jobs because their meager income from farming is not enough (Honrada, personal communication, November 4, 2016).

Amadeo coffee farmers mostly grow Robusta beans which they sell to instant coffee industry food giants such as Nestle and URC. Typically, Amadeo farmers sell their crops to these industry giants at farm gate prices, which are much lower than the world market prices. As a result, the farmers are not able to earn enough to sustain their families. Table 1 reflects the farm gate prices on an annual basis since 2011.

There are about 4,000 coffee farmers in the touted coffee capital. However, they only have one roaster which is owned by the cooperative, Café Amadeo. Given the roaster's limited capacity, some of the farmers travel to Silang to have their beans roasted by the local coffee bean roasting company, which fortunately owns a wide array of post-harvest infrastructure. Once the beans are roasted, they are sold at farm gate prices to traders, who then sell them to the commercial giants (Honrada, personal communication, November 4, 2016).

As a form of intervention to the trading practices of Amadeo farmers, this paper proposes the establishment of a cooperative. By definition, a cooperative "is a duly registered association of persons with a common bond of interest, who have voluntarily joined together to achieve a lawful common social or economic end" ("Introduction to cooperatives," n.d., para.1). In consideration of the Amadeo farmers' plight, this paper proposes to build a cooperative that will help to 1) cater the supply of coffee to lessen the gap in local demand; 2) alleviate the poverty of farmers through programs that help increase income (i.e., purchasing of post-harvest infrastructure, farming training programs, implementation of standard trading prices); and, 3) formulate an ideal cooperative model that is beneficial to farmers and could potentially be replicated in other localities.

Through the use of quantitative methods, the following will be tackled in the succeeding section: Establishment of a cooperative (PERT/CPM), buying or outsourcing decision making and maximization of profit through identification of product mix (Linear Programming), and projection of possible earnings of farmers (Monte Carlo with Probability).

Quantitative Method Applications

Quantitative Tool #1: Program Evaluation and Review Technique (PERT) and Critical Path Method (CPM)

As the establishment of a new cooperative in Amadeo would require several activities such as business case study, mandatory registrations, and marketing activities before it can start its operations, the use of the Program Evaluation and Review Technique (PERT) is useful to expedite the process. Given that one of the constraints is scarcity of resources, there is a need for careful planning, scheduling, and controlling of costs for undertaking these activities. Also, since the cooperative needs to be fully-operational two months prior to the harvest period (December to February), the duration of activities would have to be shortened by increasing labor hours either through overtime or additional Full Time Equivalent (FTE). Another strategy for some of the projects would be to outsource them to firms specializing in business case studies, registrations, marketing, and due diligence. A careful analysis of time and costs should be observed once these activities are "crashed" or shortened.

The activities for establishing a new, fully-operational cooperative will require 284 days to finish. If the projects start on January 2, 2017, the estimated time of their completion through the normal program would be February 1, 2018. This date is beyond the target start date of operations where the generation of revenues is already anticipated through the commissions on sales of coffee beans, which is typically done at least 2 months before the harvest period.

Table 1.Coffee Farmgate Prices in Cavite, in Peso/kg

	2011	2012	2013	2014	2015
Coffee Robusta, dry beans	93.64	*	87.56	89.73	77.7

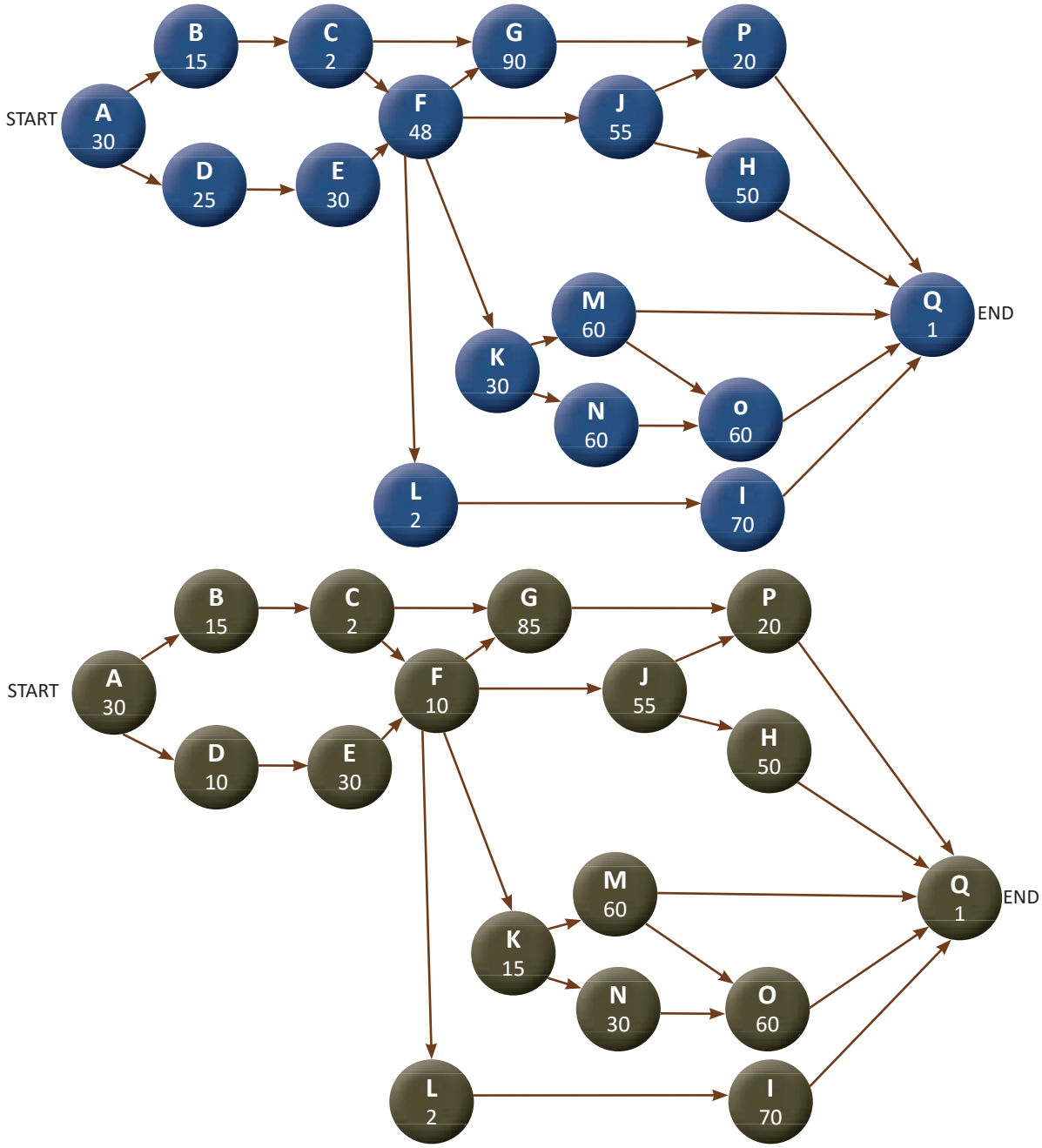
*2012 Not available
Latest update: 2016-11-14 11:23
Source: Philippine Statistics Authority

Table 2. List of Activities

Activity	Description	Immediate Predecessors	None Estimated Days of Processing
A	Conduct market survey and focus group discussions	None	30
B	Develop business case for the cooperative	A	15
C	Open bank account	B	2
D	Secure business permits and registration from the Department of Trade and Industry (DTI), Local Government Units (LGUs)	A	25
E	Register with the Bureau of Internal Revenue (BIR) and complete other compliance requirements of the bureau	D	30
F	Prepare requirements for registration and register with the Cooperative Development Authority (CDA)	C,E	48
G	Procure equipment and machineries necessary for coffee processing	C,F	90
H	Formulate, review, and approve Operations Manual	J	50
I	Recruit and train farmers through active awareness campaign	L	70
J	Interview, select, and hire on-board office personnel/s	F	55
K	Develop a marketing plan	F	30
L	Elect Board of Directors and officers	F	2

Activity	Description	Immediate Predecessors	None Estimated Days of Processing
M	Build and maintain relationship with the traders	K	60
N	Convince food conglomerates (i.e., Nescafe and Universal Robina Corporation) to buy directly from the newly established cooperative	K	60
O	Negotiate and sign Memorandum of Agreement (MOA) with the food conglomerates	N	60
P	Conduct machine-user acceptance testing	G, J	20
Q	Start Business Operations	H,I, M, O, P	1

Figure 1. Network Diagrams for the Regular and Crash Programs



Project Costs

The details of the project costs under the regular and crash programs are included in Table 3. The number of days under each program is based on the days required to complete the project. When certain activities have to be crashed, the additional costs to be incurred (i.e. labor, meals, facilitation fee) are all considered. Outsourcing is also an option that would require professional skills, expertise, and specialization.

Table 3. Project Costs

Description		Days Required		Cost in Pesos		*Comments*
		Regular Program	Crash Program	Regular Program	Crash Program	
A	Conduct market survey and focus group discussions	30	20	50,000	80,000	*To crash, additional manpower is required to increase number of surveys accomplished and leaner schedule for focus groups thus more manpower required to moderate multiple additional discussions.*
B	Develop business case of the cooperative	15	8	2,000	10,000	
C	Open bank account	2	1	1,000	2,000	*Ensure that all documents are prepared beforehand thus increasing cost.*
D	Secure business permits and registration to DTI, LGUs	25	10	10,000	20,000	
E	Register with the Bureau of Internal Revenue (BIR) and complete other compliance requirements of the bureau	30	10	10,000	30,000	*Professional fees and facilitation fees included*
F	Prepare requirements for registration and register with the Cooperative Development Authority (CDA)	48	10	10,000	30,000	*Professional fees and facilitation fees included*
G	Procure equipment and machineries necessary for coffee processing	90	30	30,000	45,000	*Additional manhours required (overtime) or outsource*
H	Formule, review and approve Operations Manual	50	15	15,000	30,000	*Additional manhours required (overtime) or additional manpower supply*
I	Recruit and train farmers through active awareness campaign	70	35	325,000	475,000	*Increased budget by 50% for additional incentives to convince farmers to join the cooperative*
J	Interview, select, hire, on-board office personnel/s	55	45	15,000	20,000	*Crashing Requires additional manpower for higher interview and selection process output*
K	Develop a marketing plan	30	15	15,000	20,000	*In order to decrease to 15 days, more frequent meetings must be done to finalize thus increasing overall cost of the process.*
L	Elect Board of Directors and officers	2	1	10,000	20,000	
M	Build and maintain relationship with the traders	60	45	45,000	60,000	*Meetings and Courtesy visits to multiple traders to produce a relationship and start to maintain it.*

Description		Days Required		Cost in Pesos		Comments
		Regular Program	Crash Program	Regular Program	Crash Program	
N	Convince food conglomerates Nescafe and Universal Robina Corporation to buy directly from the newly established cooperative	60	30	10,000	20,000	*Meetings and Courtesy visits to both conglomerates to produce a relationship and start to maintain it.*
O	Negotiate and sign Memorandum of Agreement (MOA) with the food conglomerates	60	40	20,000	50,000	
P	Conduct machine-user acceptance testing	20	15	15,000	22,000	*Overtime of the staff*
Q	Start Business Operations	1	1	18,000	18,000	*Not crashable. Launch of operations is done on a specific date.*
				601,000	**952,000**	

Determination of Critical Path

There are 13 paths identified in the network diagram, as shown in Table 4. The critical path, ADEFKNOQ, requires 284 days to complete and it includes activities such as market survey, business case, and registration with BIR, SEC, and MOA. After determining the critical path, the activities to be crashed should be diligently identified to shorten the number of days from 284 to 186. This is vital because the number of days required for the normal program would result to a loss in potential revenues. It should also be noted that the cooperative is expected to generate initial revenues from its commission on sales of coffee beans, which amounts to P100,000 per month. Furthermore, it is a good strategy for the cooperative to start operations before the harvest and selling season.

The target number of days to finish the project is 186 days. In order to identify the activities most advantageous for crashing, the incremental cost of crashing an activity on a daily basis should be considered. Once the costs are determined, the next step is to identify exactly which activities are to be crashed. By identifying the critical path after each crashing effort, the activities that encompass that path are the options; and the best option accumulates the lowest cost. This practice ensures that once the crashing effort has met the set goal, it is accomplished with the lowest possible cost.

Table 4. Project Paths

PATHS	TOTAL DAYS
ABCFJHQ	201
ABCFJPQ	171
ABCGPQ	158
ABCGPQ	158
ABCFGPQ	206
ABCFKNOQ	246
ABCFKMQ	186
ABCFLIQ	168
ADEFJHQ	239
ADEFJPQ	209
ADEFGPQ	244
ADEFKNOQ	284
ADEFKMQ	224
ADEFLIQ	206

Trade-off Costs and Crashing

With a total of 284 days, the critical path was identified as ADEFKNOQ. Among the activities that compose this path, activity N is deductible by 30 days with a cost of only P333/day. While activity K has the same cost, it only crashes by 15 days, half the number of deductible days as compared to activity N.

After crashing activity N and reducing 30 days, the critical path is cut down to 254 days. This brings it closer to path ADEFGPQ, which takes 244 days to complete. As such, the critical path needs to be reduced by 10 more days. Given that activity K also costs P333/day, it is the next activity to be crashed, after which 10 days are deducted from path ADEFKNOQ. This results to path ADEFGPQ also becoming a critical path since both paths now require 244 days to complete. Refer to Table 5.

By comparing these two critical paths, it can be identified that Activity F, which is in both paths, has the lowest cost to crash per day at P526. Since the target is 186 days, the critical paths still require a cumulative crash of 58 days. Activity F can be crashed to a maximum of 38 days, thus bringing down both critical paths to 206 days. Since the next longest duration path is ADEFJHQ with 201 days, the two critical paths must now be lowered by five days to match it. For critical path ADEFGPQ, activity G will be crashed by five days with a cost of P250/day. Critical path ADEFKNOQ, meanwhile, will also be crashed by five days with a cost of P333/day. After crashing has been completed, paths ADEFKNOQ, ADEFGPQ, and ADEFJHQ will each have 201 days as their regular completion duration.

The three paths now have to be crashed by 15 days. In order to do this, activity D, which is common among the three paths, must be reduced since it has the lowest crash cost of P666/day. This reduces all three critical paths to the overall target of 186 days, with an additional cost of only P46,250.

After crashing all the activities within the critical path and meeting the 186-day target, the net benefit will be P353,750. The cooperative will get a total of at least P400,000 additional revenue from commission income from the sales of coffee beans from September 18, 2017 to February 1, 2018.

Table 5. Net Benefit Calculation

Paths	Days	Crash N 30x	Crash K 10x	Crash F 38x	Crash G&K 5x	Crash D 15x	
ABCFJHQ	201	201	201	163	163	163	
ABCFJPQ	171	171	171	133	133	133	
ABCGPQ	158	158	158	158	153	153	
ABCFGPQ	206	206	206	168	163	163	
ABCFKNOQ	246	216	206	168	163	163	
ABCFKMQ	186	186	176	138	133	133	
ABCFLIQ	168	168	168	130	130	130	
ADEFJHQ	239	239	239	201	201	186	
ADEFJPQ	209	209	209	171	171	156	
ADEFGPQ	244	244	244	206	201	186	
ADEFKNOQ	284	254	244	206	201	186	
ADEFKMQ	224	224	214	176	171	156	
ADEFLIQ	206	206	206	168	168	153	
Completion Time = 290 days							
Original Cost, Pesos	601,000						601,000
Additional Cost, Pesos	0	10,000	3,333	20,000	2,917	10,000	46,250
Resulting Cost, Pesos	601,000	611,000	614,333	634,333	637,250	647,250	647,250
Crash cost per day		333	333	526	583	667	

Paths	Days	Crash N 30x	Crash K 10x	Crash F 38x	Crash G&K 5x	Crash D 15x	
Options							
A		3,000	3,000	3,000	3,000	3,000	
D		666	666	666	666	666	
E		1,000	1,000	1,000	1,000	1,000	
F		526	526	526			
K		333	333				
N		333					
G,K					583		
Total crash cost, Pesos							**46,250**
Benefit: Commission for October to December, Pesos							**400,000**
Net benefit of crashing, Pesos							**353,750**

Quantitative Tool #2: Linear Programming

In order to maximize the income potential of the Cooperative, it will apply for a grant with the Philippine Rural Development Project (PRDP) of the Department of Agriculture.

PRDP is a six-year project designed to establish the government platform for a modern, climate-smart, and market-oriented agriculture and fishery sector. PRDP partners with the LGUs and the private sector in providing key infrastructures, facilities, technology, and information that will raise incomes, productivity, and competitiveness in the countryside ("Towards inclusive growth," n.d.).

The Cooperative will propose for a P12 million grant with the following objectives: 1) Upscale its operations through improved production facilities; 2) Provide training to Amadeo farmers to equip them with better farming techniques; and, 4) Pursue aggressive marketing efforts to boost its revenues.

Binary Linear Programming

Binary Linear Programming was used to determine the optimal investment option the Cooperative should take to maximize the grant. Out of the P12 million grant, P2.5 million will go to the fixed investment and working capital costs, as follows:

Purchase of land	P1,000,000
Construction of office	500,000
Marketing and training costs	500,000
Working capital requirement for 1 year	500,000
Total	P2,500,000

The remaining amount to be allocated is P9.5 million.

Coefficients

The Net Present Values (NPV) of investment options were used as coefficient. These represent the net cash inflows and outflows that each investment option contributes during their estimated useful life.

The following were used in estimating cash flows:

- Initial investment = Purchase price of the machinery/investment based on market price or quoted price of supplier
- Working Capital required = Estimated working capital for the first six months of operations
- Overhaul = Estimated cost of major repairs
- Regular Maintenance = Estimated cost of required maintenance of machineries
- Net cash inflow = Expected revenue generated by the machinery (number of kg multiplied by price/kg)

Presented in Table 6 are the NPVs of each investment option. The Cooperative also has options to outsource certain processes, if necessary. Table 7 shows the costs to outsource for each investment option:

Table 6. NPVs of Each Investment Option, in Pesos

M1 - Roaster				
	Year	Cashflow	6% Factor	Present Value
Initial Investment	0	- 3,130,000	1.00000	- 3,130,000
Working Capital Required	0	- 500,000	1.00000	- 500,000
Working Capital Release	7	500,000	0.66506	332,530
Overhaul (yr 3)	3	- 200,000	0.83962	- 167,924
Overhaul (yr 5)	5	- 300,000	0.74726	- 224,178
Regular Maintenance	1-7	- 52,000	5.58238	- 290,284
Net Cash Inflow	1-7	20,000,000	5.58238	111,647,600
NPV:				**107,667,744**

M2 - Dryer		
Cashflow	6% Factor	Present Value
- 4,500,000	1.00000	- 4,500,000
- 300,000	1.00000	- 300,000
300,000	0.66506	199,518
- 200,000	0.83962	- 167,924
- 400,000	0.74726	- 298,904
- 52,000	5.58238	- 290,284
9,636,000	5.58238	53,791,814
		48,434,220

M3 - Dehuller				
	Year	Cashflow	6% Factor	Present Value
Initial Investment	0	- 1,375,000	1.00000	- 1,375,000
Working Capital Required	0	- 500,000	1.00000	- 500,000
Working Capital Release	7	500,000	0.66506	332,530
Overhaul (yr 3)	3	- 100,000	0.83962	- 83,962
Overhaul (yr 5)	5	- 100,000	0.74726	- 74,726
Regular Maintenance	1-7	- 104,000	5.58238	- 580,568
Net Cash Inflow	1-7	4,380,000	5.58238	24,450,824
NPV:				**22,169,099**

M4 - Grinder		
Cashflow	6% Factor	Present Value
- 256,000	1.00000	- 256,000
- 20,000	1.00000	- 20,000
20,000	0.66506	13,301
- 10,000	0.83962	- 8,396
- 20,000	0.74726	- 14,945
- 5,000	5.58238	- 27,912
70,000	5.58238	390,767
		76,814

M5 - Packaging Green Beans				
	Year	Cashflow	6% Factor	Present Value
Initial Investment	0	- 3,700,000	1.00000	- 3,700,000
Working Capital Required	0	- 500,000	1.00000	- 500,000
Working Capital Release	7	500,000	0.66506	332,530
Overhaul (yr 3)	3	- 300,000	0.83962	- 251,886
Overhaul (yr 5)	5	- 300,000	0.74726	- 224,178
Regular Maintenance	1-7	- 52,000	5.58238	- 290,284
Net Cash Inflow	1-7	876,000	5.58238	4,890,165
NPV:				**256,347**

		M6 - Storage 50sqm		
	Year	Cashflow	6% Factor	Present Value
Initial Investment	0	- 325,000	1.00000	- 325,000
Working Capital Required	0	- 10,000	1.00000	- 10,000
Working Capital Release	7	10,000	0.66506	6,651
Reroofing (yr 5)	3	- 30,000	0.74726	- 22,418
Regular Maintenance	5	- 5,200	5.58238	- 29,028
Net Cash Inflow	1-7	24,000	5.58238	133,977
NPV:				**- 245,818**

M7 - Storage 100sqm		
Cashflow	6% Factor	Present Value
- 650,000	1.00000	- 650,000
- 10,000	1.00000	- 10,000
10,000	0.66506	6,651
- 60,000	0.74726	- 44,836
- 10,400	5.58238	- 58,057
90,000	5.58238	502,414
		- 253,828

		M8 - Storage 150sqm		
	Year	Cashflow	6% Factor	Present Value
Initial Investment	0	- 975,000	1.00000	- 975,000
Working Capital Required	0	- 20,000	1.00000	- 20,000
Working Capital Release	7	20,000	0.66506	13,301
Reroofing (yr 5)	3	- 90,000	0.74726	- 67,253
Regular Maintenance	5	- 15,600	5.58238	- 87,085
Net Cash Inflow	1-7	196,000	5.58238	1,094,146
NPV:				**- 41,891**

		M9 - Forklift		
	Year	Cashflow	6% Factor	Present Value
Initial Investment	0	- 500,000	1.00000	- 500,000
Working Capital Required	0	- 50,000	1.00000	- 50,000
Working Capital Release	7	50,000	0.66506	33,253
Overhaul (yr 3)	3	- 208,000	5.58238	- 1,161,135
Overhaul (yr 5)	5	- 50,000	0.83962	- 41,981
Regular Maintenance	1-7	- 70,000	0.74726	- 52,308
Net Cash Inflow	1-7	- 20,000	5.58238	- 111,648
NPV:				**- 1,883,819**

M10 - Mixer		
Cashflow	6% Factor	Present Value
- 280,000	1.00000	- 280,000
- 20,000	1.00000	- 20,000
20,000	0.66506	13,301
- 10,000	0.83962	- 8,396
- 20,000	0.74726	- 14,945
- 5,000	5.58238	- 27,912
-	-	-
		- 337,952

Table 7. NPVs for Each Outsourcing Option, in Pesos

N1 - Outsource Roasting				
	Year	Cashflow	6% Factor	Present Value
Net Cost	1-7	- 1,320,000	5.58238	- 7,368,742
Net Cash Inflow	1-7	10,000,000	5.58238	55,823,800
NPV:				**48,455,058**

N2 - Outsource Drying		
Cashflow	6% Factor	Present Value
- 130,000	5.58238	- 725,709
1,752,000	5.58238	9,780,330
		9,054,620

N3 - Outsourced Dehulling				
	Year	Cashflow	6% Factor	Present Value
Net Cost	1-7	- 5,970,816	5.58238	- 33,331,364
Net Cash Inflow	1-7	4,380,000	5.58238	24,450,824
NPV:				**- 8,880,539**

N4 - Outsourced Grinding		
Cashflow	6% Factor	Present Value
- 100,000	5.58238	- 558,238
-	5.58238	-
		- 558,238

N5 - Outsourced Packing				
	Year	Cashflow	6% Factor	Present Value
Net Cost	1-7	- 390,000	5.58238	- 2,177,128
Net Cash Inflow	1-7	876,000	5.58238	4,890,165
NPV:				**2,713,037**

N6 - Outsourced Storage 50sqm		
Cashflow	6% Factor	Present Value
- 60,000	5.58238	- 334,943
24,000	5.58238	133,977
		- 200,966

N7 - Outsourced Storage 100sqm				
	Year	Cashflow	6% Factor	Present Value
Net Cost	1-7	- 120,000	5.58238	- 669,886
Net Cash Inflow	1-7	90,000	5.58238	502,414
NPV:				**- 167,471**

N8 - Outsourced Storage 150 sqm		
Cashflow	6% Factor	Present Value
- 180,000	5.58238	- 1,004,828
196,000	5.58238	1,094,146
		89,318

N9 - Manual Lifting				
	Year	Cashflow	6% Factor	Present Value
Net Cost	1-7	- 260,000	5.58238	- 1,451,419
Net Cash Inflow	1-7	-	5.58238	-
NPV:				**- 1,451,419**

N10 - Manual Mixing		
Cashflow	6% Factor	Present Value
- 65,000	5.58238	- 362,855
-	5.58238	-
		- 362,855

Variables

Since Binary Linear Programming was used, the variables represent the decision to be made for each investment option. Therefore:

Let:

M1 = To buy or not to buy Roaster
M2 = To buy or not to buy Dryer
M3 = To buy or not to buy Dehuller/ sifter
M4 = To buy or not to buy Grinder
M5 = To buy or not to buy Packaging Machine (for final packaging)
M6 = To buy or not to buy Storage 50sqm
M7 = To buy or not to buy Storage 100sqm
M8 = To buy or not to buy Storage 150sqm
M9 = To buy or not to buy Forklift
M10 = To buy or not to buy Mixer
N1 = To outsource or not Roasting
N2 = To outsource or not Drying
N3 = To outsource or not Dehulling
N4 = To outsource or not Grinding
N5 = To outsource or not Packing
N6 = To outsource or not Storing at 50sqm
N7 = To outsource or not Storing at 100sqm
N8 = To outsource or not Storing at 150sqm
N9 = To buy or not to buy Manual Lifting
N10 = To buy or not to buy Manual Mixing

Constraints

Space = Maximum of 300sqm based on the allotted space for machines. For outsourced machines, the space requirements apply to the storage and handling of the processed beans for each stage.

$$30M1 + 30M2 + 30M3 + M4 + 50M5 + 50M6 + 100M7 + 150M8 + 4M9 + M10 + 4N1 + 4N2 + 4N3 + N4 + N5 <= 300$$

Budget = Minimum of P9 million and maximum of P9.5 million

3,130,000M1 + 4,500,000M2 +1,375,000M3 + 256,000M4 + 3,700,000M5 + 325,000M6 + 650,000M7 + 975,000M8 + 500,000M9 + 280,000M10 + 0N1+ 0N2 + 0N3 + 0N4 + 0N5 + 0N6 + 0N7 + 0N8 + 0N9 + 0N10 >= P9,000,000

3,130,000M1 + 4,500,000M2 +1,375,000M3 + 256,000M4 + 3,700,000M5 + 325,000M6 + 650,000M7 + 975,000M8 + 500,000M9 + 280,000M10 + 0N1+ 0N2 + 0N3 + 0N4 + 0N5 + 0N6 + 0N7 + 0N8 + 0N9 + 0N10 <= P9,500,000

Labor = Maximum of 12 headcount for operations

M1 + M2 + 3M3 + 0.5M4 + M5 + 0.25M6 + 0.5M7 + M8 + M9 + 0.50M10 + 0.25N1 + 0.25N2 + 0.25N3 + 0.25N4 + 3N5 + 3N9 + 0.25N10 <=12

Mutually Exclusive Condition = Only one (either buy a machine or outsource/manually complete task)

M1 + N1 = 1,
M2 + N2 = 1,
M3 + N3 = 1,
M4 + N4 = 1,
M5 + N5 = 1,
M9 + N9 = 1,
M10 + N10 = 1,

Storage Minimum and Maximum = Minimum of 50 sqm storage and maximum of 200 sqm storage

50M6 + 100M7 + 150M8 + 50N6 + 100N7 + 150N8 >= 50
50M6 + 100M7 + 150M8 + 50N6 + 100N7 + 150N8 <= 200

Only one storage (among each of the three options under build or outsource)

M6 + M7 + M8 + N6 + N7 + N8 = 1

LP Objective

Maximize expected NPV = 107,667,744M1 + 48,434,220M2 + 22,169,099M3 + 76,814M4 + 256,347M5 - 245,818M6 - 253,828M7 - 41,891M8 -1,883,819M9 - 337,452M10 + 48,455,058N1 + 9,054,620N2 - 8,880,539N3 – 558,238N4 + 2,713,037N5 - 200,966N6 - 167,471N7 + 89,318N8 - 1,451,419N9 – 362,855N10

The Binary Linear Programming, as shown in Table 8, resulted to purchase of Roaster, Dryer, Dehuller/Sifter and Grinder, Manual Packing, Outsource Storage 150sqm, Manual Lifting, and Outsource Mixing for a total NPV of P179,335,958.

Table 8. LP Plotted for Investment Selection

	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	N1	N2	N3	N4	N5	N6	N7	N8	N9	N10			
	Purchase Roaster	Purchase Dryer	Purchase Dehuller/ sifter	Purchase Grinder	Purchase Packaging Green	Build Storage 50	Build Storage 100	Build Storage 150	Purchase Forklift	Purchase Mixer	Outsource Roasting	Outsource Drying	Outsource Dehulling	Outsource Grinding	Manual Packing	Outsource Storage 50	Outsource Storage 100	Outsource Storage 150	Manual Labor Lifting	Outsourc e Mixing			
Decision Variables	1	1	1	1	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	1			
Coefficients	107,667,744	48,434,220	22,169,099	76,814	256,347	- 245,818	- 253,828	- 41,891	- 1,883,819	- 337,452	48,455,058	9,054,620	- 8,880,539	- 558,238	2,713,037	- 200,966	- 167,471	89,318	- 1,451,419	- 362,855			
Objective Function																							
Maximize Expected NPV	179,335,958.00																						
Subject to:																							
Space Constraint	30	30	30	1	50	50	100	150	4	1	4	4	4	1	1	0	0	0	0	0	92.00	max	300.00
Budget Maximum	3,130,000	4,500,000	1,375,000	#####	3,700,000	325,000	650,000	975,000	500,000	280,000	0	0	0	0	0	0	0	0	0	0	9,261,000.00	max	9,500,000.00
Budget Minimum	3,130,000	4,500,000	1,375,000	#####	3,700,000	325,000	650,000	975,000	500,000	280,000	0	0	0	0	0	0	0	0	0	0	9,261,000.00	min	9,000,000.00
Labor Constraint	1	1	3	0.5	1	0.25	0.5	1	1	0.5	0.25	0.25	0.25	0.25	3	0	0	0	3	0.25	11.75	max	12
Only 1 Roasting	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1.00	max	1
Only 1 Drying	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1.00	max	1
Only 1 Dehuller	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1.00	max	1
Only 1 Grinding	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1.00	max	1
Only 1 Packing	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1.00	max	1
Only 1 Storage	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	1	1	1	0	0	1.00	max	1
Oly 1 Lifting	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	1.00	max	1
Only 1 Mixing	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	1.00	max	1
Min Storage	0	0	0	0	0	50	100	150	0	0	0	0	0	0	0	50	100	150	0	0	150.00	min	50
Max storage	0	0	0	0	0	50	100	150	0	0	0	0	0	0	0	50	100	150	0	0	150.00	max	200

Linear Programming to Maximize Net Margin

After identifying which machine to invest in, Linear Programming was used to determine the optimal product mix that will yield maximum profit for the Cooperative.

Coefficients

Net Margins of inputs for each machine were used as coefficient, as shown in Table 9.

Prices were derived from the market prices of coffee that has undergone each process. Yield is the estimated percentage of output after each process is completed. Revenue is computed as price multiplied by yield. Cost is composed of cost of input to the machine plus incidental expenses such as fertilizer, cost to process/outsource, etc.

Variables

Let:

B1 = Number of kg of input to Roaster

B2 = Number of kg of input to Dryer

B3 = Number of kg of input to Dehuller/ Sifter

B4 = Number of kg of input to Grinder

B5 = Number of kg of input to Outsource Mixer

Constraints

The constraints are described in Table 10.

Table 9. Coefficients on a per kg basis

Machine		Price	Yield	Revenue	Cost	Margin
Roaster	B1	300	83%	249	103	146
Dryer	B2	98	49%	48.02	37.5	10.52
Dehuller	B3	103	88%	90.64	76.56	14.08
Grinder	B4	300	100%	300	310	-10
Outsource Mixer	B5	300	100%	300	300	0

Table 10. Constraints, in Kg/year

			Remarks
			These are the calculated machine capacity based on 5 day workweek/ 52 weeks/year:
Capacity	B1 <= 117,000	Roaster	30kg/batch, 15 batch per day
	B2 <= 2,600,000	Dryer	625kg/batch, 16 batches per day
	B3 <= 1,040,000	Dehuller	500kg/hr, 8 hrs per day
	B4 <= 124,800	Grinder	60kg/hr, 8 hrs a day
	B5 <= 20,000	Mixer	
Demand	B1 <= 150,000	Roaster	This is the assumed demand for retail Roasted, Ground, and Mixed coffee
	B4 >= 100,000	Grinder	
	B5 >= 20,000	Mixer	
Supply	B1 <= 876,000	Roaster	These are the coffee beans that have undergone drying and dehulling. Quantity was derived from Monte-Carlo simulated output per hectare multiplied by the number of hectare per

			Remarks
	B2 <= 2,031,540	Dryer	This is the expected input of coffee fruit. See calculation
	B3 <= 995,455	Dehuller/ Sifter	This is the expected input of dried coffee fruit. See calculation below.
	B4 <= 100,000	Grinder	Assumed maximum roasted bean allocated for grinding
	B5 <= 20,000	Mixer	

Supply	Input, kg	% of Input	Machine	Output, kg	To
Fruit	2,031,540	49%	Dryer	995,455	Parchment
Parchment	995,455	88%	Dehuller	876,000	Green beans
Green beans	876,000	100%	Roaster		

LP Objective

Maximize net profit = 146B1 + 10.52B2 + 14.08B3 – 10B4 + 0B5

Results

The optimal Input Mix as determined by Linear Programming (Table 11) are:

117,000kg Green Beans in Purchased Roaster

2,011,540kg Fruit in Purchased Dryer

995,455kg Parchment in Purchased Dehuller/Sifter

100,000kg Roasted beans in Purchased Grinder

The expected Net Contribution is P51,259,406 per annum.

Table 11. LP Plotted for Optimal Product Mix with the Corresponding Answer Report and Sensitivity Report

	B1	B2	B3	B4	B5			
	Roaster Input in KG	Dryer Input in KG	Dehuller/sifter Input in KG	Grinder Input in KG	Outsource Mixer Input in KG			
Decision Variables (kg)	**117,000**	**2,011,540**	**995,455**	**100,000**	**20,000**			
Coefficients	146	10.52	14.08	-10	0			
Objective Function								
Maximize Profit	**51,259,406.03**							
Subject to:								
Capacity B1	1	0	0	0	0	**117,000**	max	117,000
Capacity B2	0	1	0	0	1	**2,031,540**	max	2,600,000
Capacity B3	0	0	1	0	0	**995,455**	max	1,040,000
Capacity B4	0	0	0	1	0	**100,000**	max	124,800
Capacity B5	0	0	0	0	1	**20,000**	max	20,000
Supply B1	1	0	0	0	0	**117,000**	max	876,000
Supply B2	0	1	0	0	1	**2,031,540**	max	2,031,540
Supply B3	0	0	1	0	0	**995,455**	max	995,455
Supply B4	0	0	0	1	0	**100,000**	max	100,000
Supply B5	0	0	0	0	1	**20,000**	max	20,000
Demand B1	1	0	0	0	0	**117,000**	max	150,000
Demand B4	0	0	0	1	0	**100,000**	min	100,000
Demand B5	0	0	0	0	1	**20,000**	min	20,000

Microsoft Excel 15.23 Answer Report
Worksheet: [FINAL PROJECT LP 11.16_REVISED_7.25.xlsx]LP2 Max Profit
Report Created: 7/26/17 9:14:14 PM
Result: Solver found a solution. All constraints and optimality conditions are satisfied.
Solver Engine
Engine: Simplex LP
Solution Time: 1.069474 Seconds.
Iterations: 5 Subproblems: 0
Solver Options
Max Time Unlimited, Iterations Unlimited, Precision 0.000001, Use Automatic Scaling
Max Subproblems Unlimited, Max Integer Sols Unlimited, Integer Tolerance 1%, Assume NonNegative

Objective Cell (Max)

Cell	Name	Original Value	Final Value
$B$10	Maximize Profit Roaster Input in KG	51,259,406.03	51,259,406.03

Variable Cells

Cell	Name	Original Value	Final Value	Integer
$B$5	Decision Variables (kg) Roaster Input in KG	117,000	117,000	Contin
$C$5	Decision Variables (kg) Dryer Input in KG	2,011,540	2,011,540	Contin
$D$5	Decision Variables (kg) Dehuller/sifter Input in KG	995,455	995,455	Contin
$E$5	Decision Variables (kg) Grinder Input in KG	100,000	100,000	Contin
$F$5	Decision Variables (kg) Outsource Mixer Input in KG	20,000	20,000	Contin

Constraints

Cell	Name	Cell Value	Formula	Status	Slack
$G$14	Capacity B1	117,000	$G$14<=$I$14	Binding	0
$G$15	Capacity B2	2,031,540	$G$15<=$I$15	Not Binding	568460.1113
$G$16	Capacity B3	995,455	$G$16<=$I$16	Not Binding	44545
$G$17	Capacity B4	100,000	$G$17<=$I$17	Not Binding	24800
$G$18	Capacity B5	20,000	$G$18<=$I$18	Binding	0
$G$19	Supply B1	117,000	$G$19<=$I$19	Not Binding	759000
$G$20	Supply B2	2,031,540	$G$20<=$I$20	Binding	0
$G$21	Supply B3	995,455	$G$21<=$I$21	Binding	0
$G$22	Supply B4	100,000	$G$22<=$I$22	Binding	0
$G$23	Supply B5	20,000	$G$23<=$I$23	Binding	0
$G$24	Demand B1	117,000	$G$24<=$I$24	Not Binding	33000
$G$25	Demand B4	100,000	$G$25>=$I$25	Binding	-
$G$26	Demand B5	20,000	$G$26>=20000	Binding	-

Post-optimality Analysis

If Roaster capacity is increased by 33,000kg, the cooperative can earn an additional profit of Php146/kg of roasted green bean. Net additional margin is computed in Table 12. Also, as shown in Table 13, if the supply of coffee fruit from the farmers is increased, the cooperative can earn an additional Php10.52 for every kg of dried fruit, and after drying, can earn Php14.08 for every kg of parchment de-hulled.

Table 12. Sensitivity of Increasing Roaster Capacity

		# of kg	Margin/kg	Total
Additional Margin				
	Roaster	33,000	146	4,818,000
Less: Additional cost				
	Electricity			4 40,000
	Staff overtime (73.33 days @900/day)			66,000
				5 06,000
Net increase in profit				4,312,000

Table 13. Sensitivity of Increasing Supply of Coffee Fruit

	Additional Supply	Yield	Margin/kg	Total
Drying	569,000.00	49%	10.52	2,933,081
Dehulling	252,000.00	88%	14.08	3,122,381
Less:				
Cost to get additional supply				1 00,000
Net Margin				5,955,462

Quantitative Tool # 3: Monte Carlo Simulation

The low income of farmers is one of the major hindrances faced by the agricultural sector. This is the main reason for the dwindling number of farmers as most prefer to have office jobs instead to secure higher earnings.

To simulate the earnings per farmer, Monte Carlo simulation was done using the Crystal Ball application. Three different years were used to paint a picture of the farmers' profit, where Year 0 is what they are currently earning, Year 1 is upon their entry to the cooperative which will give them an avenue to sell their harvest at market price, and Year 5 is after the cooperative gets the grant and the processing facility is set in place.

To formulate the profit of each farmer, the following equation is used:

Average profit per farmer per year = (Hectares of Land) * [(Expected Yield per Hectare * Expected Selling Price) – Costs Incurred per Hectare]

Data was obtained from the Department of Agriculture statistics, which showed that there are 4,000 farmers versus the 3,540 hectares of coffee plantation in the municipality (Honrada, personal communication, November 4, 2016). This gives an average of 0.885 hectare of coffee plantation per farmer. For the expected yield, the Department of Agriculture provided the data for the annual yield of green beans per hectare from 2000-2015, as shown in Table 14. The resulting probability distribution is presented in Table 15.

Table 14. Annual Yield of Green Beans, Kg/Hectare

Year	Yield	Year	Yield
2000	1100	2008	800
2001	1000	2009	900
2002	850	2010	800
2003	850	2011	1000
2004	1000	2012	800
2005	800	2013	800
2006	850	2014	900
2007	800	2015	800

Source: DA Historical Data

Table 15. Yield Probability Distribution

Yield	Probability
800	0.4375
850	0.1875
900	0.1250
1000	0.1875
1100	0.0625

Expected selling price was determined using the average price data (based on available data obtained from Department of Agriculture, Amadeo Branch) from 2011 to present, as shown in Table 16. The resulting probability distribution is presented in Table 17.

Table 16. Green Beans Price Data

Prices				
85.5	88	90.5	87.5	84.5
83.5	83.5	96	87.5	74.5
85.5	93.5	100	87.5	81.5
88.5	83	95	84	77
91	80	89.5	89.5	84
87.5	76.5	83.5	86	74.5
89	80.5	86	93.5	72.5
93.5	80.5	82.5	84	77
89.5	86	86	91	85.5
87	78.5	84	88	89.5
90	86	89.5	84.5	94
88	81	86.5	82	91
82.5	90	82.5	82	98.5
85	83	85.5	79	109.5

Table 17. Price Probability Distribution

Price	Probability
76.19	0.114
81.5	0.143
84.28	0.229
87.07	0.214
90.7	0.214
98.83	0.086

Costs incurred per hectare were also obtained from the Department of Agriculture, who noted that they are basically just the cost of fertilizer. Cavite currently has no irrigation system so farmers solely rely on rainfall to water their coffee trees.

Based on the discussion, farmers currently use pure chemical fertilizers (Year 0). It is the cooperative's target that once the farmers join them (Year 1), their fertilizer use will be changed to 75% chemical and 25% organic mix. The cooperative intends to do this through training and by providing information on alternative practices that will not only lower costs, but also address the health risks from chemical fertilizers. Consequently, when the grant and processing operations are in place (Year 5), the cooperative targets the use of a fertilizer mix at 25% chemical and 75% organic. However, organic fertilizers take longer to take effect. Thus, the fertilizer mix has to be changed gradually from purely chemical to purely organic in order to avoid disturbing the harvest yield.

A bag of chemical fertilizers currently sells for Php1,200, while organic fertilizers cost Php300 only. 24 bags are needed per hectare per annum. Base case costs for year 0, 1, and 5 are as shown in Table 18. Based on the Department of Agriculture, prices do not fluctuate drastically. The historical probability of the market price fluctuations is shown in Table 19.

Table 18. Base Case Cost

Year	Base Case Current Cost (per annum)
Year 0	28,800
Year 1	23,400
Year 5	12,600

Table 19. Probabilities of Different Price Levels

Year 0 Cost per Hectare	
Cost, Pesos	Probability
26,400	0.10
28,800	**0.70**
31,200	0.15
33,600	0.05

Year 1 Cost per Hectare	
Cost, Pesos	Probability
21,450	0.10
23,400	**0.70**
25,350	0.15
27,300	0.05

Year 5 Cost per Hectare	
Cost, Pesos	Probability
11,550	0.10
12,600	**0.70**
13,650	0.15
14,700	0.05

Year 0

Farmers have no direct way of doing business with big buyers like Nestle, and so they resort to selling their products to visiting traders at prices lower than market value. Their selling price of green beans per kilogram is pegged at only 70% of the market value. Furthermore, they use purely chemical fertilizer which costs more per hectare.

Average profit per farmer per year = (Hectares of Land) * [(Expected Yield per Hectare * Expected Selling Price*0.70) – Costs Incurred per Hectare]

The data was loaded into Crystal Ball and the result of the simulation is summarized in Table 20. It shows that the average annual income of a farmer is P21,084.63, and while this is the average, some may earn as little as P8,023.76 per year. The maximum annual earnings of a farmer is only at P43,983.70. Figure 2 also shows that only 28.1% of Amadeo coffee farmers earn more than P24,000 a month. While this number seems low, further research verifies this as the norm in the farming industry with each Filipino farmer having an average annual income of P23,000 only (as cited in Alave, 2012). Moreover, in Figure 3, it shows that only an alarming 0.42% of farmers earn more than P40,000 a year. It does not come as a surprise then that many farmers opt to enter office jobs than labor and toil all day but still not have enough to feed their family.

Table 20. Simulation Results Summary at Year 0

Statistic	Forecast values
Trials	50,000
Base Case	0.00
Mean	21,084.63
Median	19,462.92
Mode	16,281.17
Standard Deviation	6,101.75
Variance	37,231,364.78
Skewness	0.7394
Kurtosis	3.20
Coeff. of Variation	0.2894
Minimum	8,023.76
Maximum	43,983.70
Mean Std. Error	27.29

Figure 2. Monte Carlo Simulation using Crystal Ball

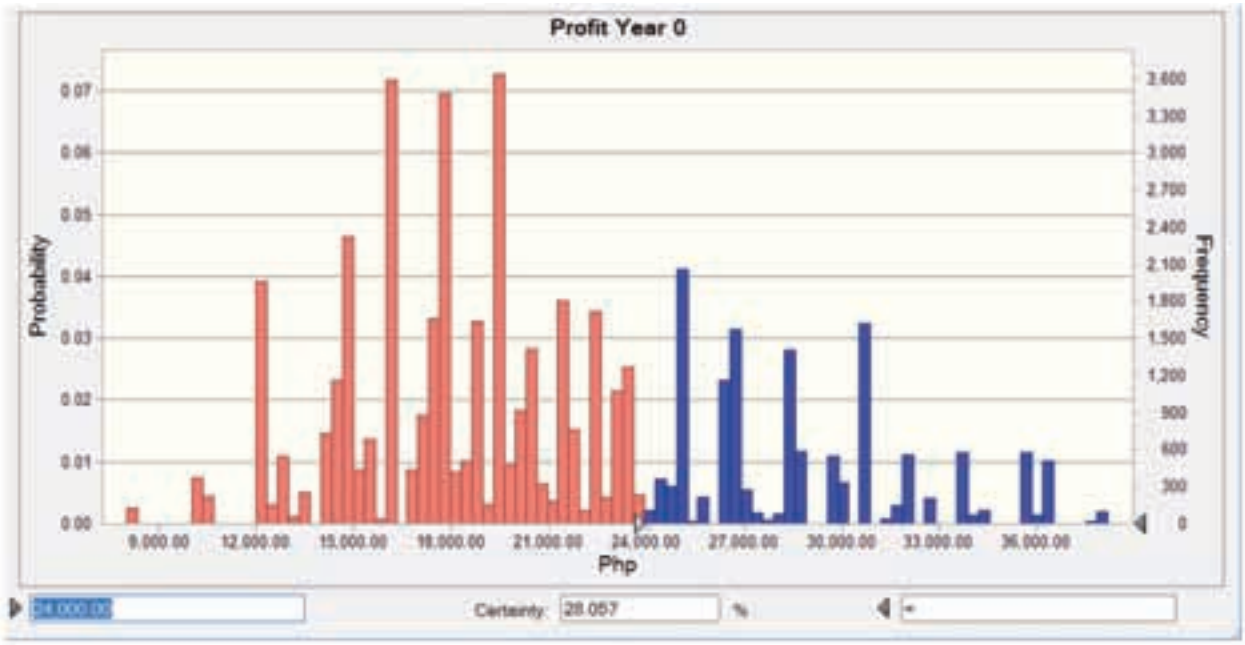
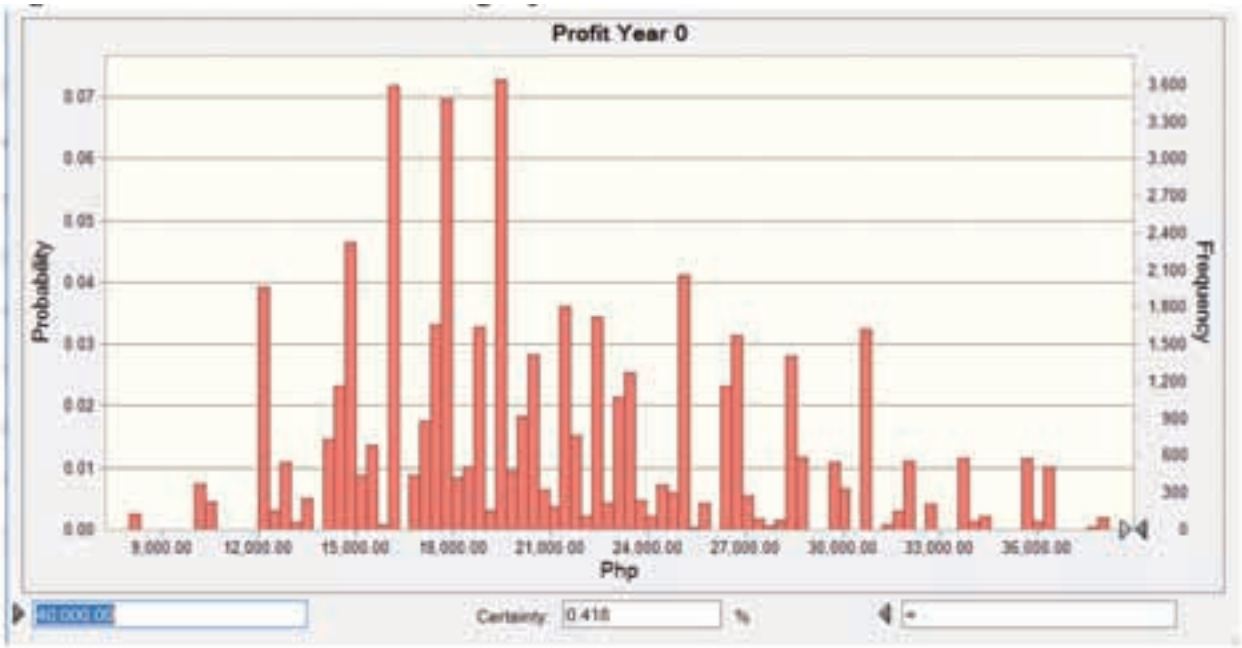


Figure 3. Monte Carlo Simulation using Crystal Ball



Year 1

The assumption is that once farmers join the cooperative, they will have an avenue to sell their harvest at the prevailing market rate. This is a significant increase from the 70% market rate they currently sell to traders. On top of this, the cooperative aims to educate farmers on the benefits of using organic fertilizers. However, the increase in organic portion should be gradual each year to allow the land to adjust. For year 1, the target mix is at 75% chemical and 25% organic. This is not only a cheaper option for the farmers, but a healthier alternative as well as studies have shown the harmful effects of using chemical fertilizers.

The formula used to get the simulation of profit and reflect the change in the expected selling price is shown below:

> Average profit per farmer per year = (Hectares of Land) * [(Expected Yield per Hectare * Expected Selling Price) – Costs Incurred per Hectare]

Based on the simulation results (Table 21), the average income of a farmer will increase to P46,027.12, more than double the current amount they earn each year. Joining the cooperative, therefore, will significantly increase their income and hopefully improve their quality of life, as well. With the entry of the cooperative, minimum income will be at P29,782.02, well above the previous average income. The cooperative also makes it possible for a farmer to earn up to P77,227.76 per year; with 73.6% of farmers now able to enjoy earnings of over Php40,000 per year, much higher than the previously projected 0.42% in Year 0 (Figure 4). Further analysis of the data also shows that almost 16.2% of farmers can earn over P55,000 a year (Figure 5), and 0.54% can earn over P70,000 (Figure 6).

Table 21. Simulation Results Summary at Year 1

Statistic	Forecast values
Trials	50,000
Base Case	0.00
Mean	46,027.12
Median	43,506.60
Mode	38,961.24
Standard Deviation	8,570.19
Variance	73,448,088.19
Skewness	0.7810
Kurtosis	3.20
Coeff. of Variation	0.1862
Minimum	29,782.02
Maximum	77,227.76
Mean Std. Error	38.33

Figure 4. Monte Carlo Simulation using Crystal Ball

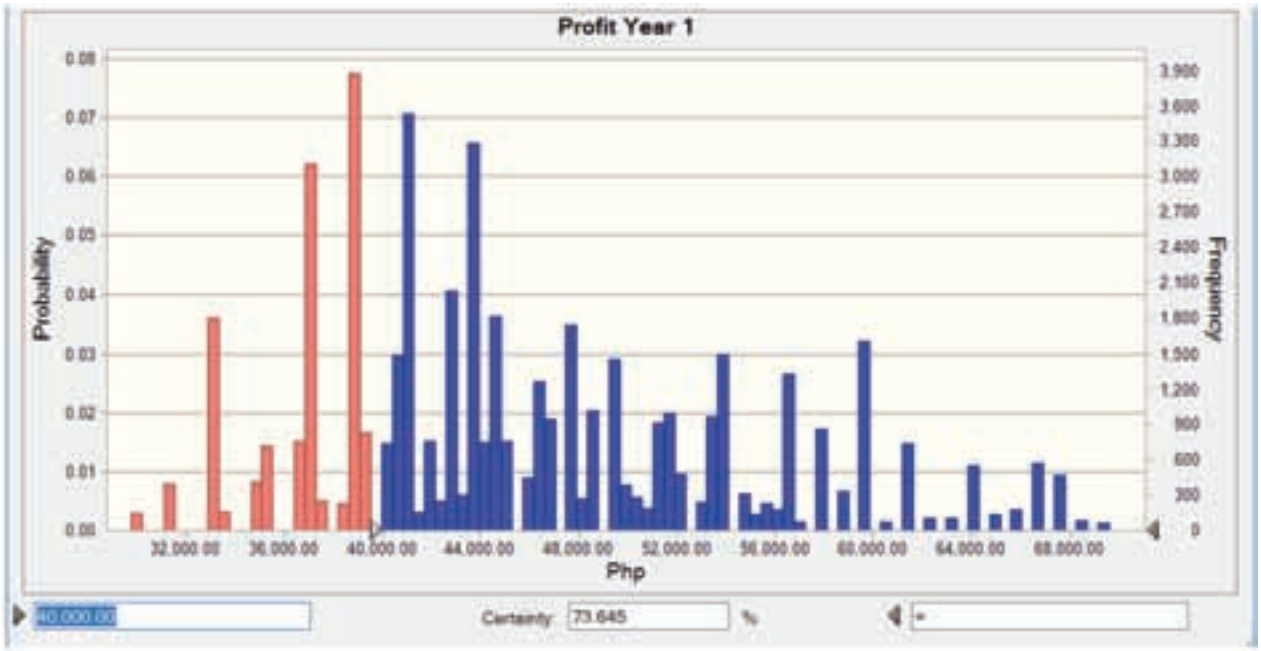


Figure 5. Monte Carlo Simulation using Crystal Ball

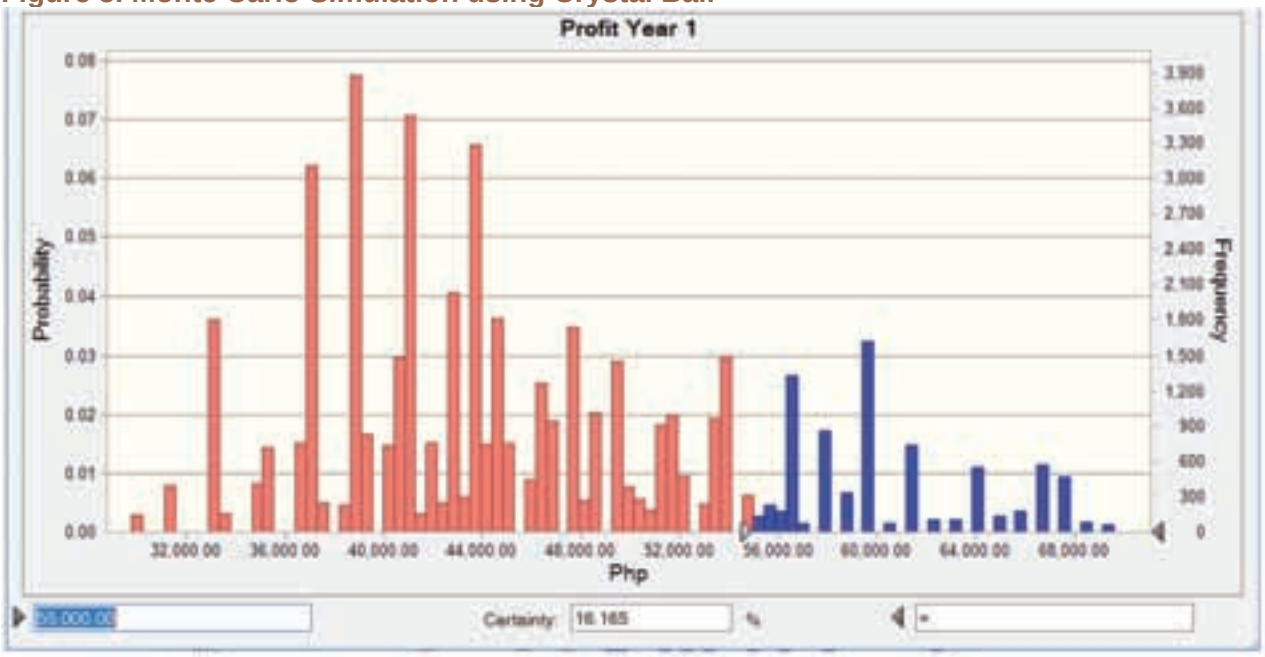
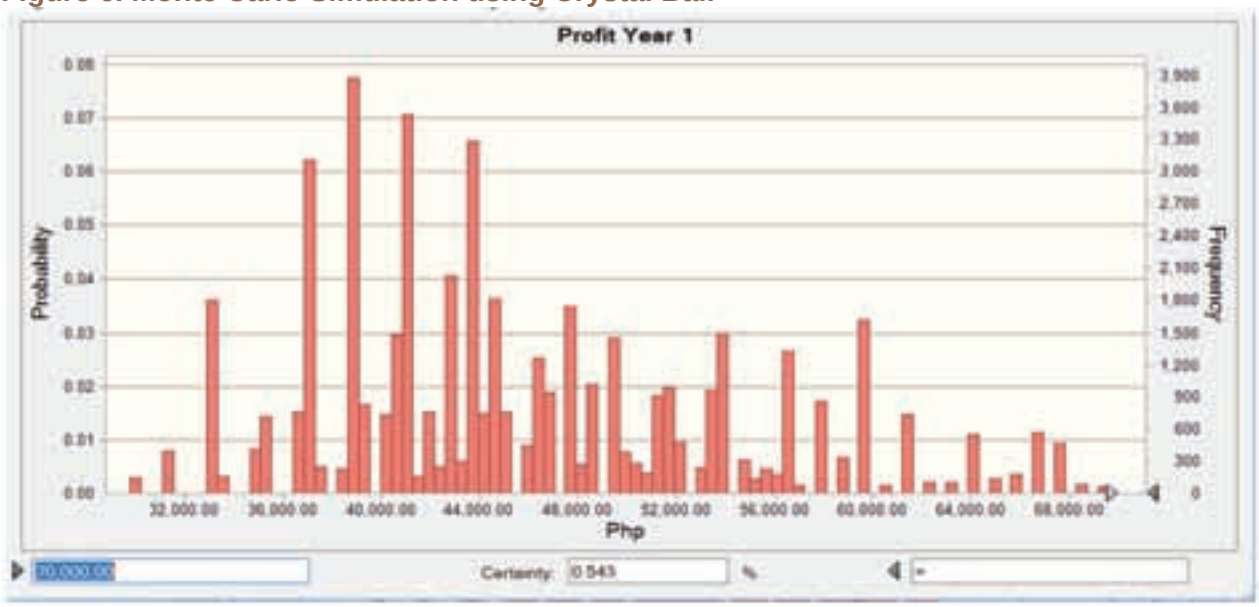


Figure 6. Monte Carlo Simulation using Crystal Ball



Year 5

In Year 5, it is assumed that the grant has been fully utilized for capital expenditure and acquisition of a processing facility for coffee beans. Based on linear programming, it was determined that the net margin of the cooperative amounts to Php51,259,406; and after all the operating expenses, the net profit is at Php30,030.465 (Table 22).

As per R.A. 9520 or the Amendment to the Philippine Cooperative Code of 2008, 50% of the profits must be kept as reserves for the first five years, and then it will be down to 10% thereafter. A 10% Training Fund, as well as a 3% Community Development Fund, must also be kept. Only 20% of the profit can be distributed amongst the farmer-members, thus leaving only P6,006,093 less taxes for distribution and P4,084 in dividends. The goal is to further increase the dividends in the coming years in order to improve the welfare of the farmers. In addition, the cooperative aims to encourage the use of the target fertilizer mix of 25% chemical and 75% organic, which will also significantly lower costs.

To reflect the items above, the formula used to get the simulation of profit is as follows:

Average profit per farmer per year = (Hectares of Land) * [(Expected Yield per Hectare * Expected Selling Price) – Costs Incurred per Hectare] + Dividends

Table 22. Projected Income Statement, in Pesos

Net Margin		51,259,406
Operating expenses:		
Depreciation	1,323,000	
Utilities	12,000,000	
Marketing	5,125,941	
Rent of Storage	180,000	
Salaries (20 at 10K)	2,600,000	
Total Operating Expenses		21,228,941
Profit		30,030,465
Less:		
Reserve	15,015,233	
Training Fund	3,003,047	
Community Development	900,914	
		18,919,194
Profits Available for Distribu-tion		11,111,271
Profit distribution @20%		6,006,093
Less: Tax @ 32%		1,921,950
Dividend for distribution		4,084,143
Dividend per Farmer		4,084

As shown in Table 23, Year 5 projects the minimum income per farmer at P45,017 and the average earnings per farmer per annum at P59,782, a definite improvement from Year 1. Also, 100% of the farmers are calculated to earn above P40,000 (Figure 7), a substantial increase from the 0.418% prior to joining the cooperative. Moreover, 64.1% of the farmers will take home a minimum of P55,000 per month (Figure 8), a percentage significantly better than the 16.17% in Year 1. Also, the probability of earning over P70,000 increased from 0.54% in Year 1 to 12.51% in Year 5 (Figure 9). These figures demonstrate how the lives of the farmers can be made better with their entry into the cooperative.

While they may seem modest, these changes, along with the training programs for the proper rejuvenation of trees, are expected to increase the overall yield and earnings per farmer. With the increase in the farmers' average income from P21,084.63 to P59,782.10, farmers are projected to be in a better financial position five years after their entry into the cooperative. Not only does the cooperative address the welfare of individual farmers, it also seeks to entice more people into farming. This will increase overall sustainability and provide more employment options for Filipinos.

Table 23. Simulation Results Summary at Year 5

Statistic	Forecast values
Trials	50,000
Base Case	4,084.00
Mean	59,782.10
Median	57,502.16
Mode	52,603.24
Standard Deviation	8,456.17
Variance	71,506,855.40
Skewness	0.8084
Kurtosis	3.24
Coeff. of Variation	0.1414
Minimum	45,017.02
Maximum	90,073.26
Mean Std. Error	37.82

Figure 7. Monte Carlo Simulation using Crystal Ball

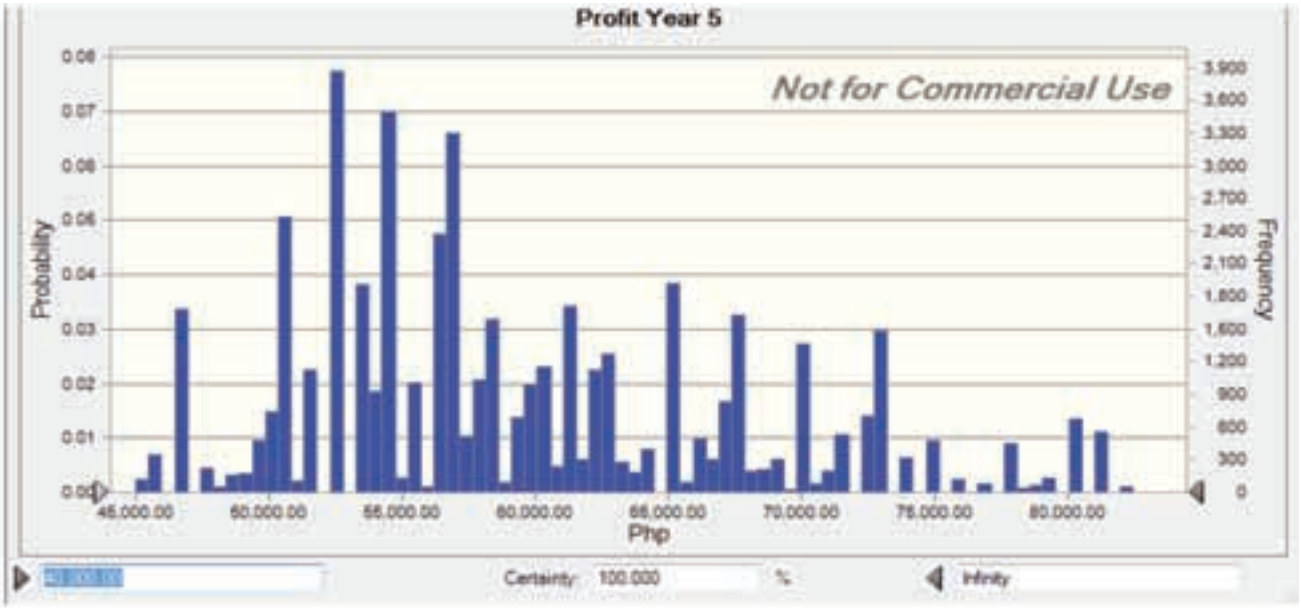


Figure 8. Monte Carlo Simulation using Crystal Ball

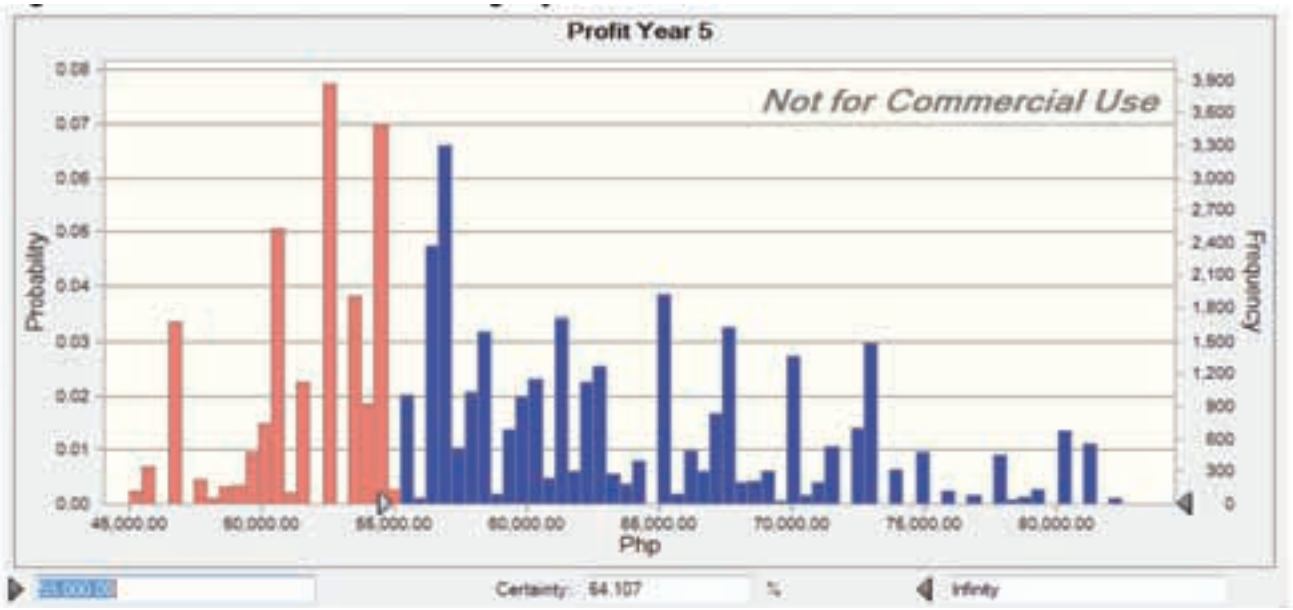
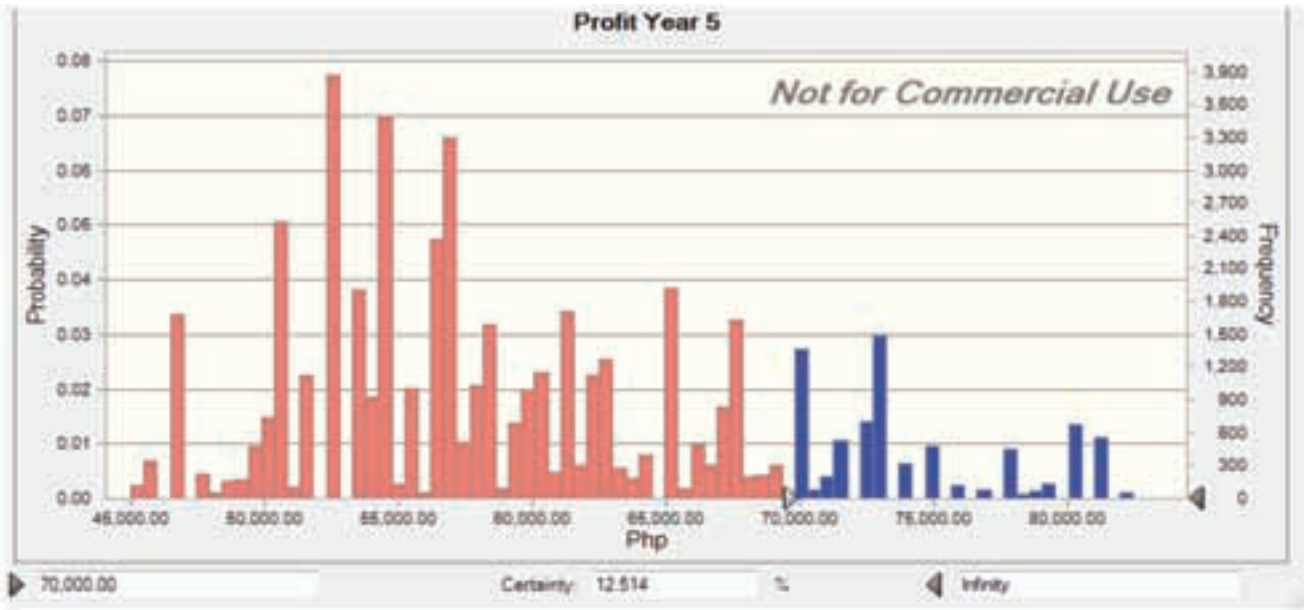


Figure 9. Monte Carlo Simulation using Crystal Ball



Conclusion

Agriculture occupies a significant position in the economic development of the Philippines. Despite the country's archipelagic terrain, its rich soil has produced a diverse range of crops with attributes at par with those of its neighboring countries. Unfortunately, over the years, agriculture has been set aside and the development of farming skills and product marketing has diminished. Once among the best producers of crops in the region, the Philippines is now an avid importer of the very same products it used to abundantly produce.

Such situation is most evident in the case of coffee. While the Philippines is not one of the world's biggest coffee producers, the variety and superiority of the products it used to harvest are worthy of note; likewise its previous ability to sufficiently supply the growing coffee demand of its population. Today, only 25% of the country's demand is sourced locally, the rest are imported from Vietnam, Thailand, and Indonesia – countries that learned about coffee production from the Philippines.

Considering the foregoing objectives of this study, the establishment of an additional cooperative in Amadeo, Cavite could be one of the solutions in addressing the core issue revolving the coffee industry – the coffee farmers. At first glance, one can hastily conclude that the quality of coffee in Amadeo is declining due to certain superficial factors. A deeper look, however, would show that the ultimate pain point is the quality of life of its farmers and the circumstances that surround them. The number of farmers has been continuously dropping due to a shift in the occupational preference of the youth population. The growing costs of farming and the meager net profit from indirect sales to the big green bean users (i.e., Nescafe and URC) have also contributed to the steady decline in number. Therefore, uplifting the farmers' quality of life and facilitating a fair trade of their yield can lead to better production quality, and consequently, a revitalized and sustainable coffee industry.

Amadeo, however, only has one cooperative for its almost 4,000 coffee farmers, and it was only able to connect 234 farmers and traders. It also only has a 10% year on year membership growth to maintain its protectionist policy on dividends. Given these shortcomings, a more inclusive approach in terms of cooperative membership and advocacy could be proven useful.

To move things forward in time for the next harvest in December, this paper recommends expediting the establishment of the cooperative. Typically, the standard process costs P601,000 and takes about 284 days to complete all activities and start the initial operations. If this procedure was to be followed, the completion date is projected to be on February 1, 2018, way past the harvest season. With the help of PERT/CPM, crashing the process to 186 days will allow operations to start on September 18, 2017, roughly 3 months before the start of harvest season. This time margin would provide a net benefit of P353,750 to the cooperative.

However, if the focus is on the improvement of the farmers' quality of life, the foregoing Monte Carlo-Probability simulation provided a concrete basis for the computation of their annual earnings. In this case, it increased from P21,084.63 prior entry into the cooperative to an average of P59,782.10, thereby reflecting a 184% increase in their take home. This provides the farmers a higher disposable income that can help improve the condition of their family life, as well as encourage them to explore options for capitalization in their field (i.e., further training and/or making the most out of their farm output).

Indeed, the existence of cooperatives in the Philippines has proven its effectiveness in terms of production improvement and marketing, particularly in the agricultural sector. This study successfully corroborates this assertion using a quantitative approach.

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Gabay Magdalena

Maico **Abejuro** • Marvin **Blanco**
Catherine **Boriga** • Harney **Caparas**
Chrizel **Mojares** • Melodie **Suyat**
Joseph **Varona** • Ninna **Zornosa**

The Project

The Project Management class led by Professor Apolinar Ng conceptualized, planned for, and implemented an outreach project they called Gabay Magdalena. Gabay Magdalena is an application of the project management concepts taught in class, and it likewise brought to life the AGSB's "Mulat-Diwa" spirit. The project was successfully conducted in partnership with the University of the Philippines (UP) Los Banos Institute of Cooperatives and Bio-Enterprise Development.

Gabay Magdalena culminated in a one-day workshop for the farmer members of the Dairy Farmers Cooperative. The main objectives of the workshop were to educate the farmers and inculcate in them the value of saving and managing their personal finances, as well as teach them the benefits and requirements of forming a cooperative. The workshop included two main topics: a) basic financial literacy and b) the benefits and requirements of forming a cooperative. These lectures were supplemented with inspirational talks.

Background

Carabao-based dairy farming has become a viable enterprise in the Philippines. Experts say that it is an emerging industry that has the ability to address food security concerns and provide income-generating opportunities to Filipinos. The farmers, formed under the TechnoMart (TM) modality project of the Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCCAARRD), were able to seize this opportunity. Aligned with the mission of The Philippine Carabao Center (PCC) to transform the Philippine carabao from a beast of burden into a productive partner of the rural household, the local government unit organized the Dairy Farmers Cooperative with a group of 44 farmers to serve as the recipient of a two-year project that ran from March 2013 to March 2015.

Magdalena is a 4th class municipality located in Laguna where the main sources of livelihood are farming, quarrying, and carabao dairy-raising. On average, farmers of the cooperative harvest 5-7 liters of milk per carabao and sold each liter to the association for P50. The continuous effort to increase milk volume also means an increase in earnings for the farmers. At present, the farmers earn an average of P10,000 below. The challenge now is how these farmers would manage their earnings and daily finances in such a way that could uplift their quality of life in a more sustainable manner and ensure a better future for their families.

Project scope

The following were included as elements of the project:

- Arrange for guest speakers during the workshop
- Secure the venue and provide food and beverages
- Provide modules and training kits to the first 50 participants of the workshop
- Provide one-on-one consultation and discussions related to personal budgeting, saving, and investment
- Give guidance on the development of the vision and mission of the formed cooperative

Out of Scope

- Award certificate of participation to all participants
- Monitor the after-workshop results of the participants' personal application of what they learned in the workshop

Project Planning

The project's major deliverables and milestones are listed in Table 1. Table 2 provides the requirements the project's service must meet in order to satisfy the main objectives. Table 3 lists the project's roles and responsibilities. Table 4 presents the project's budget estimates.

Table 1. Major Deliverables and Milestones

MAJOR DELIVERABLE	DESCRIPTION
Project Charter	Provides the project overview, defines the objectives and scope, and estimates the budget and timetable
Roles and Responsibilities	Provides a list of all team members and their corresponding roles and responsibilities
Gantt Chart	Provides the project team a guide on weekly target milestones
Budget Plan	Identifies all the possible costs
Event's Program	Provides the schedule of workshop activities

Table 2. Project Requirements

REQUIREMENT	DESCRIPTION
Personal Finance Management Basics (Mabuting Pamamahala ng Pera)	Lecture on the importance of personal finance management; distinction between performing and non-performing assets, productive and onerous liabilities and man's true worth (Tunay na Yaman)
Savings (Pag-iimpok)	Lecture on the following topics: Definitions and Concepts The Need to Save Money Vehicles for Savings Four Simple Ways to Save Money

*Basic Inventory Management (Wastong Pamamahala ng Imbentaryo)	Simple ways of tracking inventory from receipt of materials to stock keeping and issuance
*Vision & Mission	How to formulate a good vision and mission statement
*Basic Operations Management in a Cooperative Setting	Relevant Operations Management concepts
Consultation Sessions	One-on-one session with selected farmers

Table 3. Roles & Responsibilities

COMMITTEE	MAIN RESPONSIBILITY	PERSON IN CHARGE
Project Management	To oversee and lead the project from start to completion (including Workshop proper)	Harney
Food and Logistics	To handle and prepare the event meals	Luke
	To purchase items included in the training kits	
Training Content	To organize and handle the preparation of presentation contents/ slides	Bit and Ninna
Documentation	To ensure that all stages of the project are properly documented	Maico and Melodie
Resource Management	To organize and prepare the training materials	Chrizel and Cathy

Table 4. Budget Estimate

Estimated Participants		50	
Estimated Guests and the Team		20	
Total		70	
	Estimated Cost Per Head in Pesos	Quantity	Amount in Pesos
AM Snack	40	70	2,800
Lunch	150	70	10,500
PM Snack	40	30	1,200
Training Kit for Participants			
Modules	30	50	1,500
Notebook	40	50	2,000
Pen	20	50	1,000
Other items (plastic envelope, etc.)	30	50	1,500
Raffle Items	700	3	2,100
Tokens/Gift for Speakers and Key Personnel	300	6	1,800
Certificates	70	1	70
Miscellaneous Expenses			1,000
Estimated Total			25,470

Timetable

The summary of milestone dates is shown in Table 5. The project Gantt Chart is in Table 6. The risk management plan is presented in Table 7.

Table 5. Summary of Milestone Dates

No.	Activity	Location	Start Date	End Date	Duration
1	Project Inception	AGSB	June 4, 2016	June 17, 2016	2 weeks
2	Project Conceptualization	AGSB		June 18, 2016	1 day
3	Project Design	AGSB	June 17, 2016	June 25, 2016	1 week
4	External Communication	Online / AGSB		July 2, 2016	1 day
5	Resource Planning and Budgeting	AGSB	June 26, 2016	July 30, 2016	4 weeks
6	Site Survey	Magdalena		July 16, 2016	1 day
7	Pre-Event	Online	August 1, 2016	August 26, 2016	3 weeks
8	Project Execution	Magdalena		August 27, 2016	1 day
9	Project Close-out	Online / AGSB		August 31, 2016	1 day

Table 6. Gantt Chart

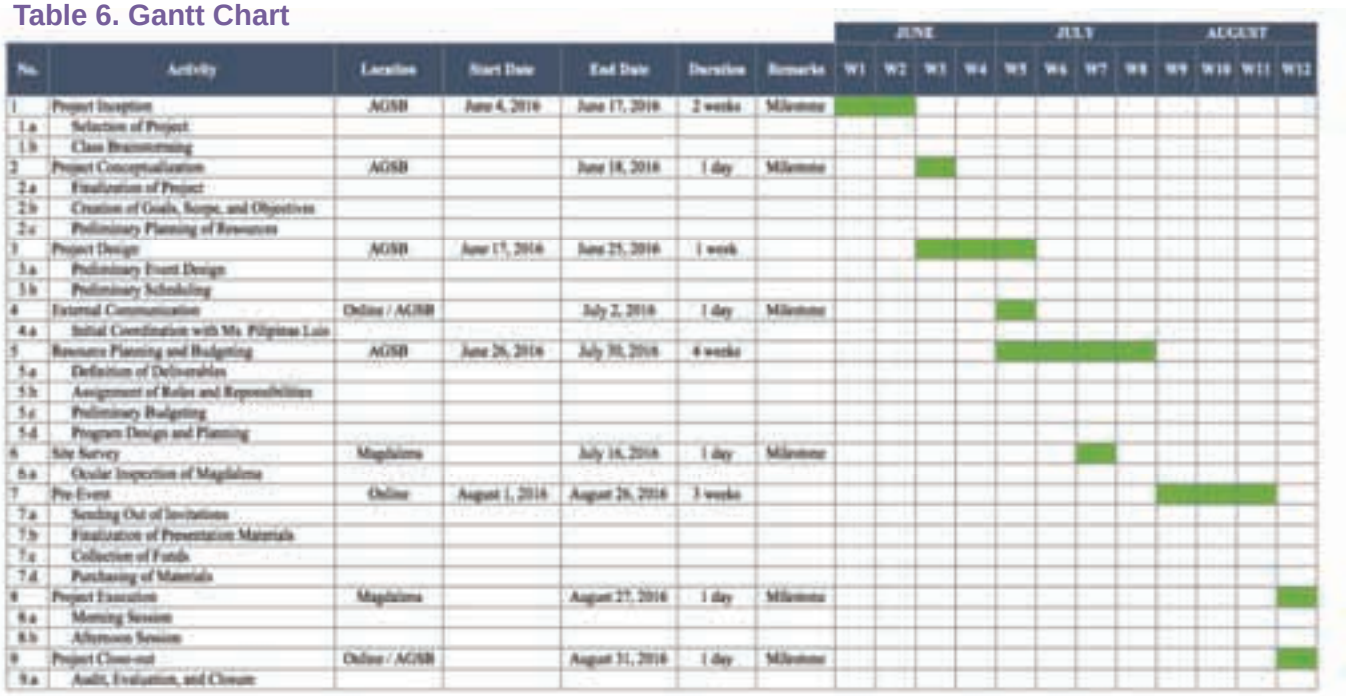


Table 7. Risk Management Plan

RISK TITLE	DESCRIPTION	ACTION PLAN	PROBABILITY
Technical Performance	Possible system failure of venue equipments such as projector, speakers and microphones, and/or power supply	Prepare and bring print-outs of lecture slides	Low
Disaster	Unfavorable weather	Immediate response is to call off the event if weather conditions become extremely unfavorable	Medium
Budget Overrun	Budget estimate is insufficient and other unanticipated expenses may arise	Each member / committee to provide and bring extra money	Medium
Schedule Overrun	Not enough time allotted for each activity	Strictly follow allotted time	Low

Project Execution

Pre-event Activities

Site Visit

The Group and Ms. Luis did an ocular inspection of Barangay Magdalena on July 16 to assess the feasibility of conducting the workshop there in terms of location, safety, and accessibility. The initial visit was intended to:

- Gather insights on who will be the target participants
- Understand the level of training and content needed for the workshop
- Find network or contact person in the area to help organize the project

During the site visit, the team met with Mr. Victoriano Solis, Jr., Chairman of Dairy Farmers Cooperative. Mr. Solis, Jr. provided some insights on Carabao milk farmers; he also assumed the role of being the contact person for the invited members. The team also met with Ms. Marinie, the operations manager of of the cooperative who helped them coordinate with Ms. Cecille Sy. Ms. Sy is the Municipal Agriculturist of Magdalena and she helped with the reservation of the local training center for the workshop.

Searching, Inviting and Briefing of Guest Speakers

Due to budget constraints, the team was unable to hire professional speakers for the workshop. Hence, they decided to utilize the team members currently working in the banking industry or teaching finance to be the main speakers for the topic of personal finance. Two other speakers from outside the team were also invited to speak to and inspire the farmers. Dr. Thelma Saludes, OIC Director of Philippine Carabao Center at UP Los Baños, was also requested to give the opening remarks. They were given a formal invitation letter that included the information on the workshop's target participants and time allocation for the talks. Details of the logistics, such as location and facilities, were also provided; and the speakers were encouraged to let the team know if they need any assistance prior to the event. The following line up of speakers, and their respective roles and topics, were arranged for the event:

Dr. Thelma Saludes
Opening Remarks

Marvin Blanco and Melodie Suyat
Mabuting pamamahala ng pera

Angelica Reyes
Banko sa Bukid

Gary Ceria
Tunay na Yaman

Designing and Conceptualization of Materials

Based on the current data gathered by the team, time was allotted for them to conceptualize, brainstorm, and draft the logos, program flows, modules, and presentation materials. The team decided to name the event "Gabay Magdalena," and a poster bearing this title was printed in tarpaulin and used during the event. The flow of the program, including the line-up of speakers, was settled; and the content of the presentation materials was aligned with the preferred language of the target audience.

Fund Raising and Solicitation

After the conceptualization of the event and agenda, the team drafted a solicitation letter to help raise money for the event. Each team member was required to raise at least P2,500 for the event either through personal contributions or solicitation of cash or relevant goods from other people.

Sending Out of Invites and Pre-registration

While the team was unable to achieve its initial plan to come up with a list of participants through pre-registration, Mr. Victoriano Solis Jr. and Ms. Cecille Sy fortunately committed to send at least 50 farmer participants during the event. The team sent an email invitation to Ms. Cecille Sy for her to distribute it to potential participants. The invitation included the program flow and target time of the event.

Purchase of Supplies, Food and Tokens

The person in charge of materials sourced out different sets of supplies to supplement the training and workshop event. Even with the consideration of incurring minimal cost, he still managed to source out quality notebooks, pens, and plastic envelopes for the participants. The team also prepared tokens to be given to the people who helped organize the event. For convenience and economic purposes, the team decided to purchase the food from the nearest fast food chain.

Printing of Modules, Forms, and Certificate of Appreciation

Upon finalizing the content of the modules and forms to be used in the event, the assigned group designed the layout and printed the modules, survey forms, and certificate of appreciation.

Final Briefing and Reminders for the Event

Given the distance of the venue from the metropolitan area, the team decided to stay overnight around the Laguna area. This allowed the team to have more time to prepare for the event and have a final briefing, thus ensuring that the program flow was followed and all the necessary items were in place. The overnight activity included the following:

- Purchasing of snacks for the event
- Bundling and putting stickers on 50 training kits, which included the modules, forms, supplies
- Review of presentation materials
- Wrapping of the tokens and raffle items
- Engagement in bonding games and activities to reinforce camaraderie among the members of the team

Farmer's Workshop

Fifty farmers (some are representatives) from Magdalena attended the one-day workshop held at the Farmers' Training Center, Office of the Municipal Agriculturist Compound, Bernardo St., Magdalena, Laguna on August 27, 2016. The event was opened with a prayer led by Ms. Ninna Zarnosa, followed by the opening remarks of Dr. Thelma Saludes, Philippine Carabao Center OIC director. Organized by the S43 class of Prof. Apolinar Ng, the event focused on educating and inspiring the farmer participants to improve their personal finances.

The first part of the morning lecture, entitled "Mabuting Pamamahala ng Pera," was delivered in fluent Tagalog by Ms. Melodie Suyat and Mr. Marvin Blanco. They talked about the importance of personal finance management, the distinction between performing and non-performing assets and productive and onerous liabilities, and man's true worth. The purpose of the lecture was to equip the farmers with the correct financial mindset and management tools. The value of

saving money in order to sustain and support their financial growth and wellness was the focus of the discussion.

The second part of the morning involved an inspirational talk from Ms. Angelica "Andel" Reyes, who previously worked at the Development Group of BPI Globe BanKO and was awarded as one of the Ten Outstanding Students of the Philippines (TOSP) in 2011. Entitled "Kwento ng Pag-asa Mula sa Tacloban," Ms. Reyes used her experiences during the aftermath of typhoon Yolanda to inspire the farmers. She shared how hope and perseverance helped the typhoon victims recover from their adversity, as well as how most of them borrowed small amounts of money from a SimulaKo (a product of BPI Globe BanKO) to start opening small businesses. It is through hard work, she added, that the typhoon victims they were able to carry out the fruits of their labor.

The last guest speaker was Mr. Gary Ceria. He talked about "Tunay Na Yaman," which is based on his personal life. He helped the farmers understand how poverty should not be a hindrance to success. Mr. Ceria came from a poor family in the province; but with a positive attitude, he was able to succeed and fulfill his vision.

Prof. Poly ended the morning session by teaching the farmers how to assess their own finance. With assistance from the team members, the participants were asked to fill in the budget form, Annex A, to determine their actual income, expenses, and savings (if any). As this is the first time the participants had an opportunity to do this activity, many of them had difficulties filling in the budget form.

In the afternoon, Ms. Pilipinas Luis talked about "Tungo sa Pagiging Ganap na Kooperatiba," and in the final part, Prof. Apolinar Ng taught the farmers the meaning of a vision-mission statement. Vision is basically an organization's road map. It serves as a guide on what they want to achieve in the future. Internally, a leader should set strategies on how to achieve their organization's objectives, along with the consideration of all external and internal factors surrounding these objectives. For the farmers, no matter how small their group is, they should set targets in order for them to improve their overall performance. The members want a 'Matatag, Maunlad at Nagkakaisang' Samahan or Kooperatiba.

Post Project Evaluation

The initial budget estimate for the project was P25,470, 80% of which was allocated for the food and training kits. The other 20% was allocated for raffle items, tokens, certificates, and other miscellaneous expenses. The actual food expense is P5,000 less than the budget. This is mainly because the number of attendees and guests was less than expected. The group was also able to source

out inexpensive yet good quality supplies, such as steno notebooks, pens, and pencils, consequently saving approximately P2000. The group decided to use these savings to buy more premium gifts for the guest speakers. Part of the savings was also used to subsidize other expenses, such as the group's pre-event accommodation and meals. (See Table 8)

Table 8. Financial Report

Gabay Magdalena Project Management Expense Report August 27, 2016		
Collections		**27,998**
Project Expense		
Food for Participants	(9,536)	
Modules and Kits	(3,956)	
Tokens and Certificates	(2,969)	
Raffle Items	(1,740)	
Event Tarp	(500)	
Total Project Expense		**(18,701)**
Other Group Expenses		
Accommodation	(7,246)	
Food	(2,051)	
Total Other Group Expenses		**(9,297)**
Balance		**(0)**

Seminar/Topics

While the financial seminar does not guarantee the improvement and management of the Magdalena farmers' finances, this event was proven to be an eye-opener for most of them. The event has been successful as it was able to address the initial objective of educating the farmers in terms of budgeting and savings. The activity has given them the opportunity to think, list down, and assess all their income and expenses. This basic budgeting workshop will help them assess where their hard earned money goes to. Most of them realized that a big chunk of their expenses goes to alcohol and cigarette; and upon showing them how much is spent on those vices, they realized that it was too much.

Moreover, their feedback regarding the event showed that they appreciated the lessons shared with them. It was observed during the event that most of the participants were attentive and were jotting down notes about the key points of the topic. Their genuine interest on the topics was also reflected by the questions they asked the speakers.

Aside from personal financing, savings, and budgeting, the other topics included in the program were Insights on the Livelihood Program in Yolanda, Inspirational Talk from a simple farmer who became successful, and Steps and Guidelines Toward Cooperatives. These special topics provided the participants the opportunity to connect with people who could help them search for capital for their farming livelihood, just like with the examples shared on the Yolanda program. It also gave them the opportunity to network with people who can help them transform their current association into a cooperative. This could improve their benefits and access to marketing and finance, thus expanding their farming activities.

Timing and Program Flow

The program considered the farmers' daily activities. Hence, the program was designed to start at 9am and end at 4pm so as not to interfere with their morning and afternoon carabao milking. Despite the few minutes delay in starting the program, it still ended early. The importance of informing the guest speakers about their time allocation, as well

as providing them a little time buffer, helped ensure that the program flow was well-organized. As a result of the group's ocular visit and interview with some stakeholders, the prepared topics were initially related to inventory recording and managing. However, during the event, the group realized that these topics were less of a concern for the participants. This realization resulted in the topics' exclusion from the program. The lesson learned from this experience is that in every project implementation, it is important to be flexible and to be able to make some changes, if necessary. If there was more time to prepare, the group should have also validated the topics/contents with some invited participants prior to the event.

Setting/Place

The training center was provided by the local municipal agricultural head. The space was sufficiently able to accommodate the 50 participants. The local office also provided manpower support. For this kind of event, it is important to have good coordination to ensure proper allocation of resources. In terms of location, the only challenge the team experienced was the lack of clear directions on how to get to the training center. It helped that the group visited the venue prior to the event, but since they did not prepare a clear sketch of how to reach the venue, they took a route that made them arrive slightly late.

Group Members

No event would be successful without teamwork and harmony. Given that the task to organize the event was given to a small group of eight, it was a challenge to make this team work. The group seemed passive and silent at first, but towards the end of the preparation, the energy and excitement within the group have increased. Every member was active and involved in all the project updates and alignment meetings. Fortunately, no single strong personality dominated the group. This resulted to peaceful and argument-free discussions. In terms of the phases of a project team, there was no storming stage experience. The pre-event overnight of the group has given the members the opportunity to have a short but memorable bonding experience. This helped with the smooth sailing of the actual event implementation. Thus, with the right objective, harmony, and teamwork, even a small group can work big and make a difference in the community.

It was a very rewarding project for the group because they were able to inspire a lot of families in Laguna. As MBA students, the group members value the learning experience and the opportunity to share their knowledge with the farmers in hopes that it will help improve their quality of life.

Final Evaluation from Participants

A post-project evaluation was done immediately after the learning sessions. Evaluation forms (see Annex B) were distributed to the participants and 42 completed survey responses were collected. See Table 9. All of the participants agreed that the seminar helped expand their knowledge on personal finance management. There was also a consensus on how they will apply the lessons they learned from the seminar to their own lives; and if given the chance, they would again attend the Financial Literacy workshops, as well as invite friends, families, and colleagues to join them. The most liked part of the seminar was the "Mabuting Pamamahala ng Pera."

Recommendations

Given the experience they gained from planning and implementing the project, the group recommends that future follow-up projects concentrate on covering other areas/disciplines of management (i.e. Operations Management, Marketing, Cost Accounting, etc.). The current state of the Dairy Farmers Cooperative as an association, and possibly, as a cooperative in the future, requires technical support that can be provided by business schools such as AGSB. Admittedly, the association still lacks competence, particularly in the fields of marketing and

Table 9. Survey Results

	Oo	Hindi
Nakakatulong ba ang seminar upang lumawak ang aking kaalaman ukol sa pamamahala at paggastos ng aking pera?	42	
Isasabuhay ko ba ang natutunan ko sa Gabay Magdalena Seminar?	42	
Sa kabuuan, natuwa ba ako sa programa?	41	1
Angkop ba sa aking buhay ang mga paksang natalakay sa seminar?	42	
Kulang ang kalahating araw para sa programa?	35	7
Kung mauulit ang seminar, iimbitahan ko ba pumunta ang aking mga kaibigan at kakilala?	42	

	1	2	3
Mabuting pamamahala ng pera	24	8	
Kwento ng pag-asa	16	13	3
Tunay na yaman	12	1	19

operations. What future classes can focus on are consultancy projects that will assist the association in growing its business. Also, instead of holding one-day workshops for association members, future projects can implement a series of visits aimed at addressing a specific area of the business. Instead of acting as facilitators or inviting guest speakers for a one-day event, group members can also act as consultants with the goal of educating and helping key association officials improve their overall operations.

Considering the courses offered in the standard MBA program of AGSB, different classes can work together in order to simultaneously provide consultancy work to the Dairy Farmers Cooperative Classes from Marketing Management, Operations Management, Managerial Accounting, Project Management, and other courses can all work together on a single project to properly address all business areas. Alternatively, rather than writing papers on listed corporations as final output for their respective courses, students should instead write a paper on the Dairy Farmers Cooperative – covering analysis of its current state, as well as giving specific courses of action to improve the business.

Challenges Encountered

Despite the project's success, the class encountered several challenges during its project formulation and execution. The team was not able to get solicitations and sponsors to help finance the project. As such, the group, which is only composed of eight members, had to shell out a significant amount in order to meet the project's budget. Additionally, since there were no sponsors involved, the kits which were given to the participants had limited contents. If the team was able to get solicitations, more freebies and goodies could be given to the farmers.

During the seminar, the participants were asked to list down their household income and expenses. The farmers had difficulties in breaking down and adding up their personal finances. Given that there were only eight members in the group, it was similarly challenging for them to assist all 50 participants. The activity could have been more effective if there were enough group members to assist the farmers. Ideally, it would be better if each group member was able to supervise at least two participants.

Annex A. Budget Form

Gabay Magdalena
Agosto 27, 2016

Pangalan: _____
Edad: _____
Bilang ng Miyembro ng Pamilya: _____
Bilang ng Miyembro nagtatrabaho: _____

	Kinikita ng lahat ng miyembro sa aming tahanan (Linggo/ Buwan)		
Mga pinagmumulan ng kita/pera ng pamilya	Linggo	Buwan	Taon
Pagagatas ng Kalabaw			
Pagtatanim ng Palay			
Pagtatanim ng Gulay			
Iba pang trabaho			
Total			

	Mga Gastusin regular sa loob ng:		
Klase ng Gastusin sa tahanan	Linggo	Buwan	Taon
Ilaw, kuryente at tubig			
Pagkain			
Upa sa tahanan (kung nangungupahan)			
Pabaon sa eskwela (tuition at iba pang gastusin pang-eskwela)			
Pamasahe/transportasyon/gasolina			
Grocery (i.e sabon, delata, shampoo, at iba pa bukod sa pagkain)			
Gamot			
Cellphone load			
Alak			
Sigarilyo			
Iba pang regular na gastusing. Itala sa ibaba			
1.			
2.			
3.			
4.			
5.			
Total			

Halaga ng naiipon sa loob ng	Linggo	Buwan	Taon
Halaga ng ipon/perang itinatabi			

Halaga ng mga utang?

Annex B. Evaluation Form

Gabay Magdalena
Agosto 27, 2016

Pangalan: _____
Edad: _____
Bilang ng Miyembro ng Pamilya: _____
Bilang ng Miyembro nagtatrabaho: _____
Kita sa kada buwan: _____

Lagyan ng Tsek	Oo	Hindi	Walang Komento
Nakatulong ba ang seminar upang lumawak ang aking kaalaman ukol sa pamamahala at paggastos ng aking pera?			
Isasabuhay ko ba ang natutunan ko sa Gabay Magdalena Seminar?			
Sa kabuuan, natuwa ba ako sa Programa?			
Angkop ba sa aking buhay ang mga paksa natalakay sa seminar?			
Kulang ang kalahating araw para sa programa?			
Kung mauulit ang seminar, iimbitahin ko ba pumunta ang aking mga kaibigan at kakilala?			

Suhestiyon na paksa na gusto ko sana natalakay

Pagsunud-sunoring ayon sa pinakanagustuhan ko paksa sa seminar (1 -3).
1 - bilang pinakamataas

Mabuting Pamamhala ng Pera _____
Kwento ng Pag-asa _____
Tunay na Yaman _____

Iba pang Komento/ Suhestiyon o Katanungan

Salamat Po!
"Ang bawat tagumpay ay na sa ating mga kamay"

Incorporating Sustainability in a Fashion Company

Anna Lyn **Lopez**
Evangeline **Mercado**
Zabrina **Vergara**

Introduction

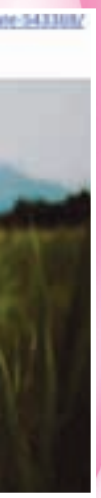
Clothing is one of life's basic necessities after food and shelter. As such, demand for clothing has increased exponentially to supply the needs of the world's growing population. In pursuit of profit and in the scramble to address market needs, apparel and fashion businesses have become oblivious to how mass clothing production negatively affects people and the planet. This leaves high environmental impact on the planet's natural resources, plant growth, animal welfare, ecological habitats, and climate, which consequently causes adverse social consequences on people's lives. In response to this predicament, apparel and fashion companies are rethinking their strategies in order to achieve a balanced triple-bottom-line for their businesses. Since businesses are traditionally set up as "mainly-for-profit" enterprises, strategic mechanisms must now be employed to tilt the balance towards sustainable development, as well as to the social and environment aspects of business operations.

With the mad rush to save the planet and its people, amidst efforts to meet various stakeholders' expectations from the business, the concept of sustainability and its incorporation into the core functions of business have become pressing objectives. However, it is tough for companies in the fashion industry to veer away from traditional supply chain and operations management methods, which are complex in nature. This complexity is mainly brought about by their attempt to leverage low-cost opportunities in order to stay afloat in the sea of intense market competition. Doing so also drives the companies' top management back to the drawing board to override future plans with sustainability programs that will boost the triple bottom-line. This, oftentimes, requires the acquisition of huge capital investments that serve as additional equities or loans from investors and creditors.

Sustainability is an "across-the-board" commitment and conviction that must be incorporated regardless of business location, type,

and size. No longer is it an alternative model of business management, but an imperative that must be embedded in the very core of every business. Sustainability is a key component of corporate culture, embodied in the very heart of business conscience. While there are existing references that require businesses to comply with specific regulations in a certain region or country, international and national laws on sustainable development as a requisite program to permit businesses to operate have yet to be formulated and passed.

Famoso is a global fashion company that exemplifies the characteristics of a truly sustainable brand. It embarks on programs and projects that provide sustainable value into its products, as well as bankrolls investments for workers' protection and environmental conservation as channels to guarantee its commercial position in the future.



Small fashion companies like United Industries, Inc. (UII), a licensed manufacturer and retailer of Famoso's brands, are to emulate the sustainable efforts of either their parent companies or like-minded companies that have since joined the sustainability bandwagon. Size, business type, and location do not exempt a company from inculcating the operationalization of sustainability into their core activities because the combined adverse environmental footprint and negative social impact of small enterprises are more detrimental than those generated by large businesses.

Sustainability Reporting Standards

To provide evidence of their sustainability engagements, "companies and organizations of all types, sizes and sectors, from every corner of the world, document and release Sustainability Reports." These reports are based on the guidelines outlined by the following major providers of sustainability reporting guidance:

1. Global Reporting Initiative's (GRI) Sustainability Reporting Standards
2. The Organization for Economic Co-operation and Development (OECD) Guidelines for Multinational Enterprises
3. The United Nations Global Compact (the Communication on Progress)
4. The International Organization for Standardization (ISO 26000, International Standard for social responsibility)

The Global Reporting Initiative's (GRI) Sustainability Reporting Standards

GRI is "an international independent organization that helps businesses, governments and other organizations understand and communicate the impact of business on critical sustainability issues such as climate change, human rights, corruption and many others. It has pioneered sustainability reporting since the late 1990s, transforming it from a niche practice to one now adopted by a growing majority of organizations."

"The GRI Standards represent global best practice for reporting publicly on a range of economic, environmental and social impacts. Sustainability reporting based on the Standards provides information about an organization's positive or negative contributions to sustainable development."

"GRI's Sustainability Reporting Standards are foundational to this success. With thousands of reporters in over 90 countries, GRI provides the world's most widely used standards on sustainability reporting and disclosure, enabling businesses, governments, civil society and citizens to make better decisions based on information that matters. In fact, 92% of the world's largest 250 corporations report on their sustainability performance."

"A sustainability report is a report published by a company or organization about the economic, environmental and social

impacts caused by its everyday activities. A sustainability report also presents the organization's values and governance model, and demonstrates the link between its strategy and its commitment to a sustainable global economy."

"Sustainability reporting can help organizations to measure, understand and communicate their economic, environmental, social, and governance performance, and then set goals, and manage change more effectively. A sustainability report is the key platform for communicating sustainability performance and impacts – whether positive or negative."

"Sustainability reporting can be considered as synonymous with other terms for non-financial reporting; triple bottom line reporting, corporate social responsibility (CSR) reporting, and more. It is also an intrinsic element of integrated reporting; a more recent development that combines the analysis of financial and non-financial performance."[1]

The current list of GRI Reporting Standards is shown in Table 1. The following GRI standards are examples for each standards classification.

Parent Company Famoso

Famoso has been in the fashion business for almost five decades. Founded in Europe in the early 1970s, it has since stationed its corporate activities in the US. It has been sourcing apparel from about 400 suppliers in 30 countries. It does not own any manufacturing facilities and uses a combination of overseas and local sourcing. Famoso maintains highly-skilled sourcing teams in its North American and European offices, establishing long-term relationships with many of its suppliers that aid in the efficient and timely delivery of its high-quality products. Famoso designs all its apparel

Table 1. GRI Reporting Standards

Foundation	Economic	Environmental	Social
GRI 101: Foundation 2016	GRI 201: Economic Performance 2016	GRI 301: Materials 2016	GRI 401: Employment 2016
GRI 102: General Disclosures	GRI 202: Market Presence 2016	GRI 302: Energy 2016	GRI 402: Labor/Management 2016
GRI 103: Management	GRI 203: Indirect Economic	GRI 303: Water 2016	GRI 403: Occupational Health and Safety 2016
	GRI 204: Procurement Practices 2016	GRI 304: Biodiversity 2016	GRI 404: Training and Education 2016
	GRI 205: Anti-corruption 2016	GRI 305: Emissions 2016	GRI 405: Diversity and Equal Opportunity 2016
	GRI 206: Anti-competitive Behavior 2016	GRI 306: Effluents and Waste 2016	GRI 406: Non-discrimination 2016
		GRI 307: Environmental Compliance 2016	GRI 407: Freedom of Association and Collective Bargaining 2016
		GRI 308: Supplier Environmental Assessment 2016	

[1] "Global Reporting Standards". Retrieved from https://www.globalreporting.org/information/sustainability-reporting/Pages/default.aspx

products from its design centers in New York, Los Angeles, and Milan, Italy.

Famoso's Sustainability Programs are based on GRI Standards

Globalization and growth have made Famoso increasingly conscious of its social and environmental responsibilities. Sustainability in their supply chain has become a top priority. It started work to protect the workers who make its garments, and has targeted long-lasting solutions by providing training at factories. It became a member of the Sustainable Apparel Coalition, which provides the company with sharper intelligence on the risk areas in the supply chain and allows them to better focus on supplier auditing and engagement. It also raises environmental issues with its suppliers, requiring compliance with regulations and giving incentives to the use of sustainable and recycled materials.

It also began its journey of extending environmental awareness deep into its supply chain, particularly in the mills that manufacture its textiles. It is testing samples of the wastewater from the main cotton mill suppliers in China to assure compliance with environmental regulations. The gathered data allows it to have constructive discussions with the mills and to request for environmental improvement where necessary.

It is also investing on its people, communities, and partners. It supports the careers of its employees with an outstanding talent development program, and it has consistently supported its communities for many years. It also launched a successful wellness program that has been extended to some of its facilities.

Over the past two decades, Famoso has encouraged its employees to participate in community outreach programs to support social, health, and educational opportunities. It also partnered with non-profit organizations to increase awareness on particular social issues and to offer support to the victims of these issues.

Famoso's first Sustainability Report was referenced from, documented, and released using GRI Standards.

Famoso's Sustainability Programs

Famoso's first Sustainability Report exclusively covered social and environmental topics related to its business. The scope mainly covered apparel products and corporate offices, distribution centers, warehouses, and retail stores directly-owned and operated by Famoso in North America and Europe.

The content and scope of the report was based on the following:

1. Significance to stakeholders and the company as determined by the materiality assessment report.
2. The size, number of employees, and overall impact of Famoso's largest business units based on revenue.

As Famoso grows its sustainability initiatives, future sustainability reports will also include the scope covering licensee operations and 3rd parties to which Famoso grants the right to manufacture, distribute, and sell in Latin America and Asia.

Following are the Sustainability Programs already in place for scope covered by the 1st Sustainability Report.

Environmental Standards Compliance

Water Conservation

Famoso encourages its principal suppliers, those from whom it purchases directly, to be aware of their water impact and to work towards full compliance and continuous improvement. Famoso even offers direct on-site support to help these suppliers to improve their waste water management practices.

1. *Wastewater Management Program, Non-Denim* – Famoso initiated a waste management program in the majority of

its non-denim fabric mills in China. The first phase of the program involves the distribution of a Fabric Mill Environmental Compliance Questionnaire which must be completed by its key mills. As a second phase, Famoso partnered with a third party laboratory to conduct wastewater testing for the compliance with local regulatory standards. The testing found one mill that exceeded local requirements for one of the 14 pollutants. It has since aided this mill in installing an internal effluent monitoring system to help prevent further unacceptable discharges of water.

2. *Wastewater Management Program, Denim Mills* – Famoso extended the waste management program to its denim mills and discovered that two of these mills were already implementing environmental improvements that Famoso can leverage on and share with its other denim mills. One of these mills uses N-Denim and Indigo Juice as innovative dyeing processes, which cut down on water, waste, energy, and chemicals used. The other mill produces fabrics out of recycled yarn that contains fibers recovered from black microwave food trays. The mill's spinning process blends these fibers into the yarn, creating fabrics with superior performance, softness, and wearability.

Carbon Footprint Analysis and Control

Famoso performed its first carbon footprint analysis for North America as a reference of how much its carbon footprint impacts the environment. Results of this analysis reveal that Famoso's annual carbon footprint is equivalent to 80 million miles driven by an average passenger vehicle, 80,000 barrels of oil consumed, and carbon captured by 30,000 acres of US forests in one year. Moving forward, Famoso continues to evaluate the impact of the carbon emission sources they use in conducting their operations such as building heaters, purchasing electricity from energy providers, and backing up generators or refrigerants. With this evaluation in mind, Famoso aims to make amendments to replace, reduce, or eliminate the use of such carbon emission sources.

Greening Initiatives

Energy Efficiency – In the past 3 years, Famoso focused on improving store energy efficiency by replacing existing lighting systems with LED lighting. Two years ago, , they began planning the retrofitting of 200 retail stores in North America and Europe, the effect of which will reduce their total electrical consumption by 48%.

Social Standards Compliance

Worker Protection

1. *Social Compliance Program* – Famoso requires its finished goods suppliers to comply with all the applicable laws of the country where the goods are manufactured. These include, but are not limited to, laws against unsafe working conditions and child or forced labor. To further ensure the protection of workers, Famoso adopted and issued a clear statement of standards in a detailed Supplier Code of Conduct and Global Sourcing Vendor Manual.
2. *Supplier Factory Approval* – Prior to giving finished goods suppliers the authority to manufacture, Famoso requires them to subscribe to the Supplier Code of Conduct. They are also obliged to provide evidence of social compliance records such as audit reports and certificates issued by peer companies, third party certification bodies, or multi-stakeholder organizations. When risk factors are identified, an initial social compliance audit is conducted in accordance with the Supplier Code of Conduct. This exercise assesses compliance, educates finished goods suppliers, and builds strategic relationships based on the continuous improvement of labor and environmental standards.

3. *Supplier Factory Monitoring* – On an annual and as-required basis, Famoso audits finished goods suppliers through internal or third party auditors who conduct the audits based on the standards outlined in the Supplier Code of Conduct. Famoso also performs security audits of its overseas factories in cooperation with a US Department of Homeland Security agency. This is part of their Customs-Trade Partnership Against Terrorism (C-TPAT) Program, which is a means to further improve the security measures in the production sites of its supply chain.
4. *Industry Collaboration* – To coordinate efforts on shared audits and remediation, Famoso reached out and partnered with like-minded brands that use the same factories. Famoso believes that such concerted efforts can strongly incentivize finished goods suppliers to achieve compliance, as well as lead to the efficient remediation of issues with suppliers.

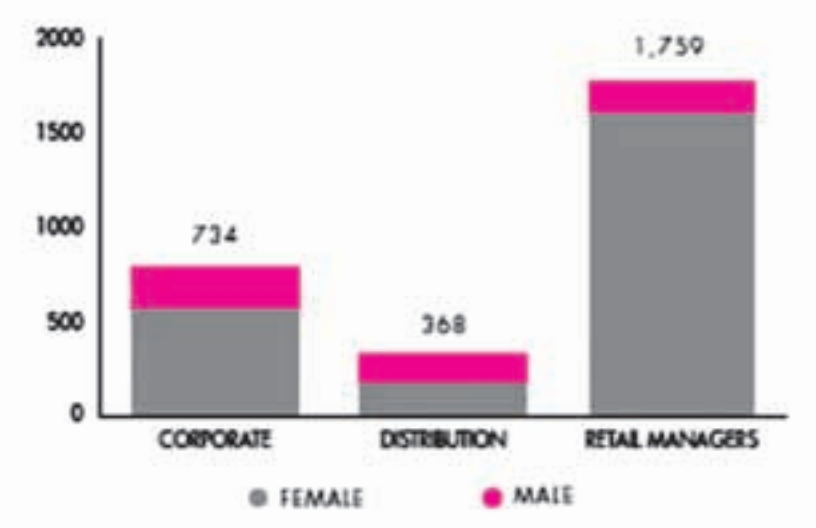
Community Care

1. *Famoso Foundation* – This foundation was established more than two decades ago with the mission of furthering social, educational, and health opportunities for all. It has since contributed large amounts of money to various non-profit organizations to aid them in the achievement of their various causes.
2. *Community Donation Programs* – Famoso partners with non-profit organizations whose missions are to connect people and businesses with those who are in need. Every year, Famoso donates about 100,000 items valuing over $6 million to charity and non-profit institutions.

Employee Development

1. *Performance Reviews* – Famoso conducts annual performance reviews of its employees across regions. The reviews include a discussion of standard topics such as job description, as well as the recognition of strengths and areas for improvement, training and other methods for improving performance, and establishing objectives for the future. In its first sustainability report, Famoso reported that only 35% of their total permanent employees received a performance review, while temporary sales associates who are hired for seasonal work do not get performance reviews. The performance review for its full-time eligible North America employees, broken down by gender, is shown in Figure 1.

Figure 1. Famoso's Performance Review Chart by Job Classification Broken Down by Gender



2. *Talent Development* – Famoso offers its employees a comprehensive range of training programs in leadership development, management skills and delegation, presentation skills, industry knowledge, compliance, professional development, and communication. Training programs are delivered through one-on-one, instructor-led classroom sessions, with online learning resources and external seminars.
3. *Health & Safety* – Famoso's first sustainability report disclosed its personal injury rate at two incidents for every 100,000 hours worked in the US; and five incidents for every 100,000 hours worked in Canada. This may not yet be in accordance with Famoso's safety goals, but it has embarked on employee safety education and workplace audits to ensure an accident and injury-free place at all times.
4. *Wellness Program* – Famoso developed an incentive-based wellness program that encompasses both the physical and mental wellness of employees. Employees earn points each time they engage in health-related activities, and they are rewarded based on the total points they earn. Examples of point-based activities are gym visits, health cooking demonstrations, nutrition seminars, medical physical exam, and meditation classes.

UNITED INDUSTRIES, INC. (UII)

United Industries is a small French-and-Chinese-owned company operating in the Philippines. It has acquired the exclusive license to manufacture and sell Famoso's brands in the Philippines. Established in 1992, it is involved in the development of Famoso products, the outsourcing of its sewing and laundry requirements to manufacturing sub-contractors, and its outlet retailing to major malls around the country. Its product designs and bill of materials are dictated by the Famoso design center in Los Angeles or New York.

UII's supply chain begins with the local development of Famoso product samples that are to be marketed and sold in the Philippines. After production, the finished samples are brought to the laundry subcontractor for washing, after which they are sent to the design center for approval. Once styles are approved for bulk production, the product development team procures all raw material requirements from its local and overseas suppliers. As soon as the required raw materials are complete, bulk production of the approved styles begins with the pattern-making and cutting processes within UII's cutting facilities. The finished cut-parts are then shipped to either UII's sewing sub-contractors which produce the majority of UII's sewing requirements, or to UII's own production lines which exclusively sew styles that are proprietary to UII. All sewn products then go through washing at the laundry subcontractor facilities, followed by the finishing processes (e.g., attachment of buttons and accessories) and packaging processes at designated areas in UII. The items are then moved to the finished goods warehouse. UII's finished goods inventory warehouse also has own-source styles produced by manufacturing suppliers in China and India.

UII's corporate and general offices, production facilities, and finished goods warehouse are located in Laguna province. Meanwhile, its sub-contracting partners in the Philippines are located in various provinces in the island of Luzon. UII has a total of 800 employees including retail sales employees, finishing production workers, and office staff. It has 10 finished goods suppliers, five fabric suppliers, one laundry sub-contractor, and 60 retail stores.

Operationalization of Sustainability in UII

As business efforts for the past 25 years were only focused on the economic bottom-line, the principles of sustainability in business are fairly new concepts for UII. However, a recent review of their various programs revealed

that UII has in fact engaged in activities that can be classified as sustainability programs. Listed below are programs that describe the operationalization of sustainability in UII.

Environmental Standards Compliance

Water Conservation

Wastewater Testing - Just recently, the wastewater from UII's facilities passed the required levels of wastewater pollutants and effluents. The test was conducted by the Laguna Lake Development Authority. UII also requires its laundry subcontractor to have its wastewater tested on a regular basis.

Carbon Footprint Analysis & Control

Environmental Campaigns – UII launched an incentive-driven green program where departments race to gather recyclables. The department with the highest sale value of collected recyclables for a given quarter gets rewarded.

Social Standards Compliance

Community Care

Charity Donation Activities – UII engages in charity donation activities when major calamities hit the country, particularly when big typhoons cause widespread devastation. They launch donation drives and employees are encouraged to contribute in cash or in kind.

Employee Development

1. *Talent Development* - UII offers its employees a wide range of training programs in personality development, teambuilding, leadership development, and livelihood programs aimed at stimulating their entrepreneurial spirit to boost active income. Training programs are mostly instructor-led classroom sessions or external seminars. UII also engages in one-on-one Guided Pep Talks, and conducts five-minute daily meetings where employees are given words of encouragement and guidance on how to achieve targeted goals.
2. *Health & Safety* – UII regularly conducts various awareness seminars about the most common health issues in the Philippines today (i.e., hepatitis, tuberculosis, diabetes, HIV/AIDS, heart diseases, and substance abuse). They also conduct seminars about responsible parenthood in support of the Reproductive Health Act of 2012 or Republic Act No. 10354, "an act providing for a national policy on responsible parenthood and reproductive health. The law aims to empower the Filipino people, especially women and youth, through informed choice and age- and development- appropriate education. Further, the law guarantees access to information, facilities and services most especially for the poor by ensuring stable and sustainable reproductive health programs are in place through partnerships between national and local governments in collaboration with CSOs (Civil Service Organizations), basic sectors, academe and private sector."[2]
3. UII also organizes an annual health and wellness caravan in partnership with various pharmaceutical, medical, and wellness companies. The caravan provides the UII employees access to discounted vaccination procedures, routine medical tests, dental checkups and procedures, plus access to free consultations and reduced prices of organic healthcare products. UII also organizes schedules for blood-letting, *"the withdrawal of blood from a patient to cure or prevent illness and disease, a practice based on an ancient system of medicine in which blood and other bodily fluids were regarded as "humors" that had to remain in proper balance to maintain health."*[3]

[2] RPRH – General Information, RA 10354 "Responsible Parenthood and Reproductive Health Act of 2012. Retrieved from http://www.popcom.gov.ph/23-faq/395-ra-10354-responsible-parenthood-and-reproductive-health-act-of-2012

[3] "Bloodletting". Retrieved from https://en.wikipedia.org/wiki/Bloodletting

4. *Wellness Programs* – UII developed a fun program for employees to pay attention to their wellness. They organize Zumba classes twice-a-week, beauty care seminars, an annual sports-fest, and programs to ensure a drug-free work environment. It also put together in-house gym facilities accessible for use by all employees.

Sustainability Programs for UII's Alignment with Famoso's Sustainability Initiatives

While UII is a licensee of Famoso, the materiality assessment for priority offices and companies that Famoso deals with did not cover licensees. As such, UII is not yet covered by the first sustainability report released by Famoso. Nevertheless, such exclusion did not exempt UII from expanding its sustainability programs in order to comply with local socio-environmental requirements, as well as to align its programs with those of Famoso's licensees.

Environmental Standards Compliance

Water Conservation

UII will encourage all its finished goods, fabric suppliers, and laundry subcontractor to be aware of their water impact and to work towards full compliance and continuous improvement. For these suppliers to know their level of wastewater compliance, UII will hire a third party laboratory to conduct wastewater testing, vis-à-vis the local regulatory standards.

Carbon Footprint Control

The following are recycling schemes that UII will adopt to help reduce its carbon and waste footprint:

1. Recycling of in-house waste raw materials (e.g., fabric cut-ends) into GWPs (Gifts with Purchase) for Famoso outlets in the Philippines
2. Conversion of marketing tarpaulins into bags as giveaways to suppliers
3. Using of recycled newsprint papers for documentation purposes
4. Launching of its own garment collecting initiative where customers are encouraged to return old clothes, regardless of brand and condition, at any of the Famoso outlets. They are then rewarded with a special discount when buying items from Famoso outlets.
5. Building of recycling partnerships with fabric mills to process returned clothes and accessories into new fabric or textile.
6. Building of partnerships with garment alteration businesses where customers can bring their old Famoso jeans to the alteration shops, give modification instructions, and get a special discounted rate for the service. UII gets a commission for every Famoso jeans altered.
7. Sourcing and purchasing of biodegradable versions of polybags and packaging plastic bags.

Greening Initiatives

Energy Efficiency – UII will consider the mixed use of basic solar panels and LED to provide electric and lighting power to its offices and store outlets.

Social Standards Compliance

Worker Protection

1. *Social Compliance Program* – UII will require its finished goods suppliers to comply with all applicable laws of the Philippines, including but not limited to laws against child or forced labor and unsafe working conditions. To further ensure the protection of workers in its internal plant and finished goods supplier factories, UII will review and determine the applicability of Famoso's supplier compliance requirements as detailed in the Supplier Code of Conduct and Global Sourcing Vendor Manual.
2. *Supplier Factory Approval* – Prior to giving its finished goods suppliers the authority to manufacture, UII will require them to provide evidence of compliance to the 12 principles of the Worldwide Responsible Apparel Production (WRAP). WRAP is the

world's largest independent certification program mainly focused on apparel, footwear, and sewn products sectors. For full compliance with Famoso's sustainability programs and to aid in its growth, UII will require its finished goods suppliers to subscribe to the Supplier Code of Conduct. In consideration of time and budgetary constraints, it will be a phased implementation.

3. *Supplier Factory Monitoring* – As a complement to the social compliance program described in (1), UII will also adopt the auditing system of Famoso on its suppliers, vis-à-vis the standards outlined in the Supplier Code of Conduct. Under this system, the supplier factories will be audited by an internal or a third party auditor.
4. *Industry Collaboration* – As with Famoso, UII can reach out and partner with like-minded brands that use the same factories in order to coordinate efforts on shared audits and remediation. Doing so encourages finished goods suppliers to seriously consider social compliance as an imperative objective of their businesses. Likewise, the remediation of issues with these suppliers can be more efficiently accomplished. Moreover, these partnerships can foster collaborations on environmental projects such as those pertaining to recyclables.

Community Care

Community Donation Program – On an annual basis, UII will donate a portion of its second or returned apparel to non-profit organizations or charity institutions who will, in turn, facilitate the distribution of these goods to those who are in need. UII can also encourage its employees to join in this endeavor by donating used-but-still-wearable clothes, shoes, and other apparel.

Employee Development

Performance Reviews – UII will provide evidence of the annual performance reviews conducted among its eligible full-time employees. An industry best-practices format will be used to facilitate the evaluation and discussion with employees. Additionally, a summary report will be provided on the percentage of employees reviewed, categorized according to gender and job classification

Challenges to Incorporating and Managing Sustainability in UII

Despite the implementation of several initiatives that can already be classified as sustainability programs within social and environmental standards, there are still challenges with the incorporation and management of the Famoso-aligned programs at UII. These challenges are as follows:

1. Being oblivious to the ongoing sustainability efforts of the parent company, Famoso, and how they will impact the local operations. The existing social and environmental programs at UII, while appearing to be sustainability programs, were originally human resource initiatives and were not specifically conceptualized to address compliance with the Famoso sustainability programs.
2. Insufficient knowledge of the principles of "sustainability" or the "triple bottom-line" on the part of the owners and top management. Bottom-line is still solely viewed as the economic bottom-line.
3. Management and key staff are composed of traditional long-tenured employees who are usually uninformed of the many evolutions and radical changes happening around the world that could ultimately affect the business and the way they work.
4. Insufficient financial resources to embark on Famoso-aligned sustainability projects.
5. Inability or reluctance to invest in technological innovations which are more environment-friendly and energy-efficient.
6. Lack of a dedicated internal socio-environmental compliance team that

will be tasked to audit finished goods suppliers on their compliance to the Philippine laws and to the requirements detailed in Famoso's Supplier Code of Conduct.

7. Dwindling number of local finished goods suppliers. UII is often left with limited options and is forced to deal with the remaining few who are still around. These suppliers may have equally big challenges in complying with sustainability requirements. Many garment factories in the Philippines have closed shop due to the increasing labor wages and production competition from China, Vietnam, Cambodia and Myanmar.
8. Inability or reluctance to develop its own design team and to create its own brands while remaining as a licensee of Famoso. Exploring this possibility could be the key to boosting its triple bottom-line, but it may also increase its risk to supply chain vulnerability as it leads to a more complex network of suppliers, internal manufacturing, stores, and IT business partners. This complex network is a result of UII's efforts to leverage outsourcing partnerships, cheaper raw materials, market opportunities, and IT infrastructure and software solutions. The expanded system exposes it to higher risks of operational disruptions and social compliance issues that must be mitigated or managed along with other fashion industry challenges such as shorter product life cycles, high product variety, unpredictable market demands, cost and lead time pressures, and excess inventories. Moreover, all these must be done while keeping pace with a highly competitive market that it will now share with Famoso. This can be done by outlining a market-oriented business strategy, strengthening its ability to respond to market stimuli, forming and implementing a demand-driven supply chain, and increasing visibility and control over its supply chain. These tasks are achieved through the coordinated efforts of segments within UII's supply network, and are best aided by technological infrastructure and resources.

The 5W2H and Gantt Charts of Famoso-Aligned Sustainability Programs for UII are shown in Table 2 and Table 3.

Table 2. 5W-2H Chart of Famoso-Aligned Sustainability Programs for UII

WHAT	WHEN	WHERE	WHO	WHY	HOW	HOW MUCH
WATER WASTE TESTING	Jul-18	UII BUILDING AND SUPPLIERS	ENGINEERING TEAM	WATER CONSERVATION	LLDA LAB TEST	P 6,000/COMPANY
RECYCLING OF FABRIC CUT-ENDS	Aug-17	UII BUILDING	PRODUCTION DEPARTMENT	CARBON FOOTPRINT CONTROL	COLLECT AND REPRODUCE AS GWPs FOR STORE PROMOTIONS	100 pesos per piece depending on available cut-ends
RECYCLING MARKETING TARPAULINS/MATERIALS	Aug-17	UII BUILDING	MARKETING AND PRODUCTION DEPT	CARBON FOOTPRINT CONTROL	COLLECT REPRODUCE AS BAGS FOR CHRISTMAS GIVEAWAYS	50 pesos per piece depending on available tarpaulins
NEWSPRINT INSTEAD OF WHITE BOND PAPER	Jul-18	UII BUILDING AND STORES	ALL EMPLOYEES	CARBON FOOTPRINT CONTROL	FINISH ALL BONDPAPERS PURCHASED AND START ON NEXT FISCAL YEAR	50% decrease in cost
OLD GARMENTS COLLECTION	Jul-18	FAMOSO OUTLET STORES	CUSTOMERS	CARBON FOOTPRINT CONTROL	CUSTOMERS TO BRING ANY USED CLOTHES AND PUT THESE TO THE ALLOCATED BINS PROVIDED BY STORES	100,000 total cost of recycle bins per store
FABRIC MILLS TIE-UP IN RECYCLING FABRIC	Jul-18	FABRIC MILLS	FABRIC SUPPLIERS	CARBON FOOTPRINT CONTROL	USED CLOTHES FABRIC POSSIBLE FOR RECYCLING TO NEW TEXTILE	FABRIC PER YARD WOULD BE 50% LESS THAN AVERAGE COST OF FABRIC THAT CAN BE USED FOR IN-HOUSE BRANDS OR FOR DEVT FAMOSO STYLES
JEANS ALTERATIONS PROGRAM	Aug-17	ALTERATIONS PLUS	PRODUCT DEVT DEPT	CARBON FOOTPRINT CONTROL	CUSTOMERS TO BRING OLD FAMOSO JEANS AND ALTER THEM ACCORDING TO THEIR PREFERRED STYL REFERENCE	10% COMMISSION ON EVERY PAIR FOR GUESS INC
BIODEGRADABLE PLASTICS FOR PACKAGING	Jul-18	UII BUILDING	PURCHASING DEPT	CARBON FOOTPRINT CONTROL	TO FINISH ALL AVAILABLE POLYBAGS AND PURCHASING TOO LOOK FOR BIODEGREDABLE POLYBAGS AS REPLACEMENT	DEPENDS ON THE COST OF THE SUPPLIER
SOLAR PANELS AND LEDS	Jul-18	UII BUILDING AND STORES	ENGINEERING TEAM	ENERGY EFFICIENCY	TO SET-UP PRODUCTION AND WAREHOUSE BUILDING WITH SOLAR PANELS AND REPLACE ALL LIGHTS IN THE ENTIRE UII COMPOUND WITH LED LIGHTS	DEPENDS ON THE COST OF THE SUPPLIER (ROUGH ESTIMATE: 1 MILLION)
SUPPLIER SOCIAL COMPLIANCE	Jan-18	SUPPLIERS' FACTORY	PRODUCT DEV AND PROD TEAM	WORKER PROTECTION	THIRD PARTY AUDITOR TO CHECK ON COMPLIANCE IN SUPPLIER CODE OF CONDUCT	TO BE SHOULDERED BY THE SUPPLIER
INDUSTRY COLLABORATION TOWARDS SUSTAINABILITY GOALS	Jan-18	SUPPLIERS' FACTORY	PRODUCT DEV AND PROD TEAM	WORKER PROTECTION	REACH OUT AND PARTNER WITH LIKE-MINDED BRANDS THAT USE THE SAME FACTORIES TO COORDINATE EFFORTS ON SHARED AUDITS AND REMEDIATION	TO BE SHOULDERED BY THE SUPPLIER
PERFORMANCE REVIEWS	Jul-17	UII OFFICE	HR AND MANAGEMENT	EMPLOYEE DEVELOPMENT	CONDUCT ANNUAL PERFORMANCE REVIEWS FOR ELIGIBLE EMPLOYEES USING INDUSTRY BEST PRACTICES	NO COST
COMMUNITY DONATION PROGRAM	Jul-18	UII BLDG	PRODUCTION AND WAREHOUSE TEAM	COMMUNITY CARE	ALLOCATE A PORTION OF 2NDS OR RETURNED APPAREL TO NON-PROFIT ORGANIZATIONS ON AN ANNUAL BASIS	500,000 PESOS

Table 3. Gantt Chart of the Implementation of Famoso-Aligned Sustainability Programs for UII

ACTIVITY	2017		2018	
	Jul-17	Aug-17	Jan-18	Jul-18
WATER WASTE TESTING				
RECYCLING OF FABRIC CUT-ENDS				
RECYCLING MARKETING TARPAULINS/MATERIALS				
NEWSPRINT INSTEAD OF WHITE BOND PAPER				
OLD GARMENTS COLLECTION				
FABRIC MILLS TIE-UP IN RECYCLING FABRIC				
JEANS ALTERATIONS PROGRAM				
BIODEGRADABLE PLASTICS FOR PACKAGING				
SOLAR PANELS AND LEDS				
SUPPLIER SOCIAL COMPLIANCE				
INDUSTRY COLLABORATION TOWARDS SUSTAINABILITY GOALS				
PERFORMANCE REVIEWS				
COMMUNITY DONATION PROGRAM				

Overcoming the Challenges to Managing Sustainability in UII

UII can succeed in overcoming the challenges in incorporating and managing the sustainability programs by the doing the following measures:

1. Create a sustainability culture within UII's supply chain that must be spearheaded, supported, and be evident among UII's business owners, top management, and key staff. They must formulate target goals that will uphold sustainability objectives. This sustainability culture must then be cascaded to UII's in-house direct labor employees, finished goods suppliers, fabric suppliers, and services subcontractors. As UII has already on-going programs, these can be re-packaged or re-promoted as sustainability programs in order to propagate the culture. Additionally, UII must launch a sustainability idea proposal or continuous improvement recommendation and approval system where ideas provided by employees will be assessed for materiality and value, and then approved for implementation. This will be facilitated through the use of an IT workflow tool within UII's existing intranet system, providing access to employees and their superiors, the review team, and the top management for final approval.

   Furthermore, UII must also launch a sustainability program or a continuous improvement project implementation monitoring system for approved programs and projects. Under this system, a project or program implementation team will be assigned; and with the use of another IT workflow tool, they will provide all stakeholders with information on the progress of the project or program.

2. Promote knowledge within the business by providing employees access to literature on the principles and concepts of sustainability, as well to the guidelines from the following major providers of sustainability reporting guidance:
   - Global Reporting Initiative's (GRI) Sustainability Reporting Standards
   - The Organization for Economic

Co-operation and Development (OECD) Guidelines for Multinational Enterprises
- The United Nations Global Compact (the Communication on Progress)
- The International Organization for Standardization (ISO 26000, International Standard for Social Responsibility)

This could be done through the distribution of factsheets to employees and business partners, administration of orientation programs, and provision of a knowledge area on the principles and methods of sustainability implementation, which will be made available for access in UII's intranet system.

3. Build investor equity or acquire loans from financial institutions to fund technology innovations and other sustainability programs. UII can consider an environment-friendly equipment upgrade for its production facilities in order to replace their inefficient and possibly hazardous old equipment. Also, to improve visibility and control over supply chain, UII can consider purchasing and implementing a cloud-based IT application system that could be used as a collaboration tool to monitor the progress and delivery of raw material and production orders.
4. Employ and form a dedicated internal socio-environmental compliance team that will be tasked to audit the compliance of finished goods suppliers to Philippine laws and to the requirements detailed in Famoso's Supplier Code of Conduct. This team can also be designated as UII's sustainability champion, responsible for the promotion and monitoring of the progress of all sustainability programs within UII's supply chain.
5. Develop closer partnerships and create win-win collaborations with finished goods suppliers and other stakeholders within the supply chain. These efforts will not only improve UII's visibility and control over its network, but they will also ensure business longevity and prevalence over business challenges.
6. Develop a long-term sustainability strategy that may include the formation of UII's own design team and the creation of its own brands so that it can enter new market opportunities that will help boost its triple bottom-line.

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Contributors

Everyone on the list is currently taking up or has completed his/her Master's Degree in Business Administration at the Ateneo Graduate School of Business (AGSB).

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Sabrina Alleje has been in the corporate world since 2005. She has a background in Marketing and Strategic Management, an area she has always enjoyed. She is currently the Unit Head of AXA Philippines, a company dedicated to changing lives by educating others on the benefits of insurance and investments.

Emelyn Balboa is planning to pursue a career in pediatric surgery. She graduated from the Ateneo de Manila University with a Bachelor's Degree in Management of Applied Chemistry. She is currently a 4th year medical student, pursuing a dual degree of Doctor Medicine and Master of Business Administration at the Ateneo School of Medicine and Public Health.

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Catherine Boriga has been working with the Bank of the Philippine Islands as a Customer Relationship Specialist. She handles accounts, investments, and other bank products for almost eight years now. She graduated from La Salle College in 2008 with a Bachelor's degree in Hotel and Hospitality Management, major in Hotel and Restaurant Management.

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Harney Caparas works as a Business partner and Controller for Capital Expenditure Projects and Support Process functions at Holcim Philippines Inc. Prior to joining Holcim, she worked in a pharmaceutical and local conglomerate company handling various positions and roles under Finance. She graduated with a degree in Bachelor of Science in Business Administration and

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Christian Cerafica graduated with a Bachelor of Science degree in Biochemistry at the University of the Philippines Manila. He is a 4th year student under the MD-MBA program of the Ateneo School of Medicine and Public Health. He hopes to manage healthcare institutions while practicing pediatrics.

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John Estaño is the Philippine Technical Business Manager for Akzo Nobel, under the Coil Coatings Business Unit. He is a graduate of BS Chemistry from Centro Escolar University. With 15 years of experience in the paint industry, he is taking his MBA to boost his confidence and reach his dream of becoming the next CEO of the biggest paint company in the Philippines.

Mel Flores is a Certified Public Accountant with 15 years of solid experience in finance management. She is currently the Vice President for Finance Services Department of Philippine Export-Import Credit Agency, a government-owned and controlled corporation. She earned her degree in Bachelor of Science in Accountancy from Centro Escolar University, where she graduated as cum laude.

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Betina Therese Lazaro graduated as a dean's lister from the Ateneo de Manila University. With a Bachelor of Science degree in Psychology, she is now a 4th year medical student under the MD-MBA program of the Ateneo School of

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Louela Lina is a Key Account Manager for Monde Nissin Corporation. She ensures the achievement of the company's business objectives and helps maintain good supplier-customer relations in the key supermarket chains she handles in North and Central Luzon.

Anna Lyn Lopez, Associate Fellow in Personnel Management, is the Senior HR Manager for the Philippines, Australia, and New Zealand for GCP Applied Technologies. She has over 15 years-worth of HR, Training, and OD practice. Married with three kids, Anne dabbles in yoga, Pilates, and badminton.

Joseph Lorenzo is a Business Development Manager in Microlab, a medical equipment company providing innovative and high quality solutions to customers. He has 10 years of experience in the corporate world, focusing on Sales, Marketing, Leadership, and Strategic Management.

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Jaime Antonio Magalong graduated with a Bachelor's degree in Biology at the Ateneo de Manila University. He is a 4th year student taking the MD-MBA program at the Ateneo School of Medicine and Public Health. He is a passionate lover of life and one day aspires to be an oncologist.

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Evangeline Mercado is a Registered Financial Planner (RFP), personal finance advocate, contributing writer for BusinessMirror and MoneySense magazine, blogger (www.evereyesmercado.com), and small-business entrepreneur (Gateau de Eve Dessert Shop, a home-based business). She also spent some decades as an IT management/IT Project Management professional.

Chrizel Anne Mojares has been working with Citibank NA as Portfolio Sales Officer since 2011. She graduated Cum Laude with a degree in Bachelor of Arts in Communication at De La Salle Lipa in 2007.

Juan Antonio Neric is currently a 4th year medical student at the Ateneo School of Medicine and Public Health. He is an aspiring surgeon and is into sports such as football and swimming. He hopes to influence systemic change in his future career and help make people's lives better.

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May Roxas is a graduate of BS Chemical Engineering from the University of the Philippines Diliman. She started her career designing and commissioning oil and gas plants in the Middle East. Later in her profession, she decided to focus

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Patrick Donald Teng was a Biology graduate of the Ateneo de Manila University and was a medical student of the Ateneo School of Medicine and Public Health. He is an aspiring surgeon.

Kyle Terrenal is an entrepreneur with businesses in a few industries with plans to diversify further. He is a Marketing Consultant and a Certified Digital Marketer (CDM).

Cher Marie Tuason has always been the curious one, believing that most of the answers to our questions are right in front of us because it's all about how willing we are to see them and adopt a different perspective. Introverted by nature, she spends afternoons reading Khaled Hosseini, browsing through Figure1, or catching up on her calligraphy drills, if she's not spending time with family or long-time friends. She is a firm advocate of Universal Health Care, Mental Health, and LGBTQ Equality.

Samantha Ui is currently a Vice President at The Bank of New York Mellon – Manila Representative Office, handling all Treasury Services (Correspondent Banking) Relationships for the Philippines.

Joseph Luke Varona handles the construction and office operations of the SM supermalls. An engineer by profession, he enjoys restoring and rebuilding old cars during his free time. He finished his Bachelor's degree in Mechanical Engineering at University of Perpetual Help Dalta System in 2009.

Zabrina Vergara is the Director for Sales and Marketing of SmartMove Industries Inc. She has eight years of retail and business development experience. Young and active, Zab gives importance to work-life balance by squeezing in yoga and boxing sessions in between work and by traveling at least three times a year to study the culture of other countries.

Ma. Ninna Rineth Zornosa started out as a Management Trainee in the Bank of the Philippine Islands. She now works as Fixed Income Salesman under BPI Capital Corporation. She is handling Sales and Distribution of fixed income securities of the retail clients of BPI and BPI Family Savings Bank. She finished her Management Economics degree at the Ateneo de Manila University in 2011.

DOIT Forum: Maximizing Operational Excellence with IT

Ms. Kathleen Muller

The Internet of Things, the Cloud, and the numerous developments in technology have shifted the way individuals and businesses of today evolve. Many are dependent on these advances with the hopes of improving efficiency and recognizing new business opportunities. With the advent of technology also comes numerous data that need to be filtered, interpreted, analyzed, and applied. Linking the two variables is essential in this increasingly competitive global world. Aiming at scalability and efficiency, the precise adaptation of Technology and Data must be maximized excellently.

The Project Management class (Section S30) was tasked to organize the Department of Operations Management and Information Technology (DOIT) forum to discuss the latest trends and the synergy between IT and Operations. The event was held at the Ateneo Professional Schools Auditorium on 30th March 2017, from 6pm to 9pm. The rationale for the forum was anchored on how technology has developed greatly in the last century, so much so that it has changed the way companies operate and interact with its stakeholders.

With the general theme "Maximizing Operational Excellence with IT," the specific topics discussed were IT cognitive learning, data analytics, and developments in digital technology. The DOIT Forum dealt with the next big things in the fields of Information Technology and Operations – from the inevitable integration of IT with Operations to the fast evolution of technology – highlighting their impacts on the way companies do their work and interact within and outside their respective organizations.

Mr. Lope Doromal, Jr.

Forum Speakers

1. Ms. Kathleen Muller on "Data Analytics"

The first speaker, Ms. Kathleen Muller, is the Head of Analytics and Insights for Southeast Asia at SAP. Ms. Muller is passionate about leading a Data Driven Southeast Asia through workshops using SAP's platform tools, working closely with multi-cultural and multi-function groups in Sales, Marketing, Product, and Channel across South-East Asia.

Prior to her stint in SAP, she was a Channel and Regional Manager in Blackberry, and the Sales Lead in AT&T. She graduated with a double degree in Industrial Psychology and Commerce, with an Associate Degree in HR from St. Scholastica's College Manila.

Ms. Muller provided insights on what data analytics mean on a personal level and how they would translate to proper decision-making. She emphasized that data is an asset that must be analyzed, and that not all data are relevant. She further stressed that people are essential in taking that extra step of analysis and making use of it in business.

2. Mr. Lope Doromal, Jr. on "Cognitive Operations"

With over a 20-year career with IBM, Mr. Lope Doromal, Jr. has been in the forefront of various IT trends that have transformed industries over the years. Starting as an e-business specialist, Mr. Doromal, Jr. was the lead advocate for IBM on the value of Internet for Business. As the Chief Technologist in the late 2000s, he helped organizations understand how an Instrumented, Interconnected, and Intelligent world changes the way we understand and react to our environment. And now, as the Chief Technology Officer, he continues to lead IBM's campaign on Cloud and Cognitive Technologies.

He is also an IBM Certified Solution Advisor, specializing in Cloud Computing Architecture. Prior to joining IBM, he worked as a Programmer in Software Brewers, Inc., and as an Analyst/Programmer in AxSys Philippines, Inc. He graduated from the University of the Philippines Los Banos with a degree in Computer Science.

Mr. Doromal, Jr. focused his talk on cognitive operations. Continuing on from Ms. Muller's presentation about data analytics, he further delved into the development of computers and Artificial Intelligence (AI) which lead companies of various industries towards a "smarter" environment. He jokingly referred to the AI of the movie Terminator as an example, but ultimately pointed out that it is not something we should be worried about. Computers cannot replace humans when it comes to certain values and activities, and it would all boil down to "how man will use the information."

3. Mr. Roman Mercado on "Developments in Digital Technology"

The third speaker, Mr. Roman Mercado, exemplified the skills and potential of the Filipino talent in the field of digital technology and innovation. Mr. Mercado is passionate about solving business problems in new and non-traditional ways. He co-founded SquadZip, a cloud-based productivity tool designed to help businesses better manage their sales and customer data. SquadZip enables firms to support their marketing and sales front-liners, and basically focus on what is most important in today's business world: The customers.

Mr. Mercado was previously in the banking industry as a Sales Head at Metropolitan Bank and Trust Company. For nine years, he was also the Marketing and Business Development Manager at Microlab. He obtained his undergraduate degree in Marketing Management from De La Salle University, and his MBA degree from the University of Western Australia.

Mr. Roman Mercado

Mr. Mercado discussed the trends and developments in the field of Information Technology, and how they have

helped businesses achieve operational efficiency. He then focused on several instances in history that drove growth in economies – from the factories and machines to the current cloud technology. As one of the co-founders of a locally based productivity tool that mimics a social media application, he shared his experience in the realm of IT and how it has helped his business and many other businesses with the way they work.

Forum Speakers

The program of the event was the main highlight of the forum's success. The detailed flow of the program has allowed for good time management during the event. This could be seen in the way the audience, speakers, and reactors were able to participate throughout the event. As seen in the Q&A session, many participants posed interesting questions for the presenters. Guided by Professors Apolinar Ng and Sandra Lovenia of DOIT, the presenters tackled several issues, from misconceptions about Big Data, to the importance of 'Relevant Data' in the ownership of assets in the cloud, up to the more personal level of how one can develop data-analytic skills. During the Q&A session, Ms. Muller stressed that rather than be obsessed over the accuracy of data, one should focus more on how the data could be useful and what decisions could be made from it.

One of the key takeaways from the event was the number of attendees – more than 300 AGSB and non-AGSB participants. On the more technical side, one of the main comments from the participants was the promptness of the forum, starting and finishing on time. The program, the presenters, and the timeliness of the event were what defined the forum and it was all thanks to the class organizers, the AGSB faculty and staff, and most importantly, the attendees.

Social Media

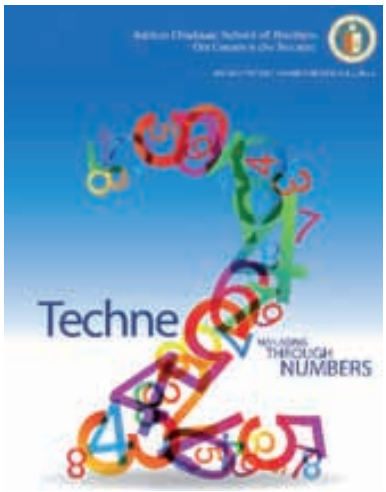
The creation of a Facebook page played a critical role in ensuring attendance to the forum. It served as the main channel of information for the forum's intended audience. To entice more audience, teasers were released a few days prior to event. These teasers introduced the speakers and created excitement for the possible attendees.

Some statistics from the social media marketing displayed the reach of the Facebook page, hitting 500 to 3,500 users per post. The total page reach was 6,511 users on the day of the event. This experience allowed the Project Team to be more responsive to messages from users (both on the public page and from personal comments), concentrate on the efficiency of the registration, and ensure that the other requirements of the project were met. Furthermore, the exposure in social media made up for the delay in the project's print collaterals.

Previous Techne Issues

Techne 1:

The maiden issue of Techne features six articles that discuss management science applications in small- and medium-sized enterprises, as well as in large-scale undertakings in the private and public sectors. The applications employ widely useful management science tools, such as linear programming, queuing, and simulation. The issue reflects the high quality of student understanding as well as their pragmatic bent.

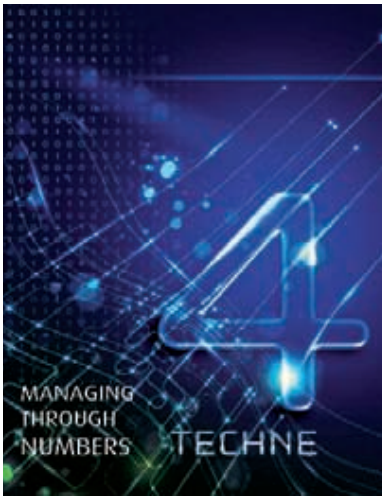


Techne 2:

The second issue features seven articles that apply quantitative methods to arrive at efficient and effective decisions and interpret common activities such as buying toys, raising funds, or joining a volunteer program, and translate them into mathematical models. The issue also focuses on topics on environment, scheduling, business management, and health. Optimization is also highlighted in all of its articles.

Techne 3 and 4:

The third and fourth issues combine as a double back-to-back issue with a total of 13 articles covering technical applications for large corporations, government, schools, SMEs, entrepreneurs, and CSR initiatives. Articles discuss the best way to move people and things, reduce time, optimize resources, and justify green initiatives (the focus of Techne 3) backed by the use of mathematical tools such as Monte Carlo simulation, linear programming, linear regression, queuing models, project management, inventory management, integer programming, process improvement, and quality management.



Techne 5:

This issue features six articles written for the operations management course with focus on systems and the goal of seeking the one best way to do things. Logical processes such as fishbone diagrams, Pareto charts, pokayokes, process flow diagrams, time and motion studies, facility designs, and layouts were applied by the authors on varied scenarios that include preparing burgers and setting up a feeding program for school children, organizing career development sessions and institutionalizing enterprise resource planning, operating a radiology department, and using biometrics.

Techne 6:

The sixth issue features seven articles touching on various aspects of our lives, from milk matters for infants and books for elementary school kids to projects for professionals and enrollment tips for graduate students, a fitting tribute to our goal of nation-building and being a man for others. It highlights our students' expertise in the operations field shown by their innovative use of the various management tools and techniques in various projects and research.

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