

Applying Root Cause Analysis in Developing an Empowerment Program for an Emerging Hospitality SME in Bali

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ABSTRACT

Warung Pantai Seseh is an emerging SME in the food and beverage service industry on the shore of Seseh Beach in Cemagi, Badung, Bali. Started by a young entrepreneur in 2020, this family-owned business has experienced rapid growth amid the Covid-19 pandemic due to its 'hidden gem' status and easy-going nostalgic ambiance. As the business proliferated, Warung Pantai Seseh partnered with a team of lecturers and students from Universitas Dhyana Pura for an empowerment project centered around business development and capacity building. This article explores the authors' efforts in applying the principles of Lean Six Sigma (LSS) principles with particular attention given to Root Cause Analysis (RCA)—to clearly define, measure, analyze, improve, and control the areas of improvement for the hospitality-based SME. Three priority areas were defined: (1) capacity building for the service staff, (2) adherence to hospitality standards, and (3) business and marketing strategy, with an overarching problem to be addressed, i.e., stagnancy in the average spending per person (ASP) at the F&B establishment. Using RCA, the authors were able to identify and address five specific areas of improvement: (1) material, i.e., the F&B menu, (2) method, i.e., SOP related to the sequence of service, (3) human resources (workforce), i.e., staff knowledge and skills, (4) machine/equipment that are compliant to hospitality and CHSE standards, and (5) marketing, including branding elements, marketing strategy, and digital marketing implementation. The steps and specific actions taken using the DMAIC framework are discussed in the article. Results and lessons learned from applying LSS and RCA in this SME empowerment project are also discussed.

Keywords: Empowerment Project, Hospitality, Lean Six Sigma, Root Cause Analysis, SME

1 Introduction

Despite significant setbacks during the Covid-19 pandemic, Bali remained one of Southeast Asia's favorite tourist destinations. As over 60% of Bali's GDP is tourism-related [1], the Covid-19 pandemic has adversely and significantly impacted the island's economy as it has undergone a 'hard reset' [2]. Nevertheless, many businesses supporting Bali's tourism sector, including SMEs, have survived. Many hospitality-related businesses that have emerged and continued to operate in recent years (as well as amid the pandemic) are beach-based establishments. It includes beach clubs, beachside restaurants, and even beachside shacks (*warung*)—especially along the south to the southwest coast, from Uluwatu to Tanah Lot and beyond. One of the emerging beachside businesses is Warung Pantai Seseh, a family-owned SME operating right on the shore of Seseh Beach in Cemagi Village, Mengwi sub-district, Badung Regency. Warung Pantai Seseh was founded in November 2020 by I Made Santika Putra, a 25-year-old local entrepreneur laid off due to the Covid-19 pandemic. Made started selling fresh coconuts in his family's plot on the cusp of Seseh Beach. What started as a small beach shack with no electricity and running water has developed into an emerging SME with 11 employees. More than 70% of *Warung's* clientele are foreigners, tourists, and expatriates.



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The beach shack's relatively hidden location and leisurely ambiance as a family-run business have become its unique selling point. The establishment is only accessible on foot (300 meters walk along the sandy shore) from the nearest vehicle parking area at Seseh Beach. Many social media postings noted the 'nostalgic' vibe—reminding visitors of Double Six Beach (Seminyak) in the 1980s or Dreamland Beach (Jimbaran) in the 1990s (Figure 1). The limited access to Warung Pantai Seseh adds to visitors' exclusivity and 'easy-going' charm while spending time there. Even amid the pandemic, the beach shack has been frequented by many expatriates and foreign tourists who stayed in Bali. Over 75% of the *warung's* patronage is comprised of foreigners.



Figure 1: *Warung Pantai Seseh Location and Situation at the Beginning of the Project*

Due to the rapid development of this 'hidden gem' beachside establishment, the SME has had to grow as it goes. However, little time and effort have been spent on the capacity building of the staff, as well as marketing planning. Starting in Q2 of 2022, Warung Pantai Seseh has partnered with a team of lecturers and students from Universitas Dhyana Pura (Undhira) in an empowerment project. This project was to help this small business for sustainable growth based on sound business and marketing strategy, coupled with capacity building of its employees. From the project's onset, capacity building in English language skills, adherence to hospitality standards, and branding and marketing strategy had been clearly defined as the priority areas or areas of concern for Warung Pantai Seseh.

In helping Warung Pantai Seseh overcome its growing pains, the authors applied basic principles of Lean Six Sigma (LSS) with Root Cause Analysis (RCA) to define more clearly, measure, analyze, improve, and control the areas of improvement for the hospitality-based SME. Lean Six Sigma (LSS) refers to a business improvement effort that aims to improve profitability, operational efficiency, and effectiveness to meet customers' needs and expectations [3]. One systematic literature study found that LSS can be seen as an approach, a strategy, a methodology, a model, a philosophy, or a system that aims at improvement at various organizational levels. LSS is derived from combining concepts of Lean production and Six Sigma, initially developed separately and with differing points of view, but in many cases, are linked together to complement one another [4]. While Lean takes a horizontal approach to process improvement, Six Sigma takes a vertical approach to quality improvement for organizational performance [5].

The application of LSS in the case of Warung Pantai Seseh involved using Root Cause Analysis (RCA), which refers to an analytical tool to help unearth deeper causes of problems or shortcomings and understand why they happen [6]. RCA involves an iterative series of questions (i.e., the 'five whys' technique) to get to the 'root causes' to take corrective actions for the cause or preventive measures to attain some desired effects [6, 7]. By applying LCC and RCA, the authors sought to help improve the processes and outcomes of Warung Pantai Seseh as the project partner, to arrive at solutions that are relevant and empowering for the partner's actual and deep-rooted problems, as well as to achieve outcomes that are impactful for the SME.

2 Methodology

The authors utilize the DMAIC framework (define, measure, analyze, improve, and control) from LSS [5], paying particular attention to the RCA approach [7] in a descriptive narrative on the project implementation in partnership with Ketut Bagong Rental. This empowerment project, with a local hospitality-based SME as the partner, was conducted between May and December 2022 and funded by a competitive grant from the Indonesian Ministry of Education, Culture, Research, and Technology.

In the define stage, the authors sat together with the tourism entrepreneur for an in-depth discussion of the SME's needs and expectations that the authors can meet. For example, the most critical and pressing needs that can be addressed given the team's expertise in English for Specific Purposes (first author) [8], business development and tourism marketing (second author) [9, 10], and hospitality service standards (third author) [11]. In the measuring stage, the authors observed and measured relevant indicators derived from the previous stage of the DMAIC process. In the third stage, the authors conducted personal interviews and focus group discussions with the SME's main proprietor, his family members involved in the business, and the *warung*'s employees—to get a more holistic view of the main problems to improve. In this stage, Root Cause Analysis (RCA) was conducted with several rounds of discussions, which was then presented in the form of a fishbone diagram (*Ishikawa*) as a commonly used visualization tool to depict the results of a root cause analysis [5, 12, 13]. Following the RCA, the authors designed and conducted improvement measures through activities and assistance to implement relevant solutions to the already well-defined and analyzed problems. Lastly, the authors controlled the empowerment project by evaluating the results and impacts of the entire process.

3 Results and Discussion

LSS and the DMAIC framework had previously been applied to various contexts, including service-based industry [14, 15], as well as in SMEs [4, 12]. It is considered a logical and systematic approach to identifying core problems, offering feasible solutions for the needed improvements [12], and ensuring that the improvements are sustainable [5]. In this project, the authors applied LSS and the DMAIC framework, emphasizing the analysis stage using the Root Cause Analysis (RCA) approach. RCA has been used previously in a community service project in the Indonesian context [16]. Finally, this section discusses the result highlights and lessons learned from the project implementation.

3.1 Define

In the Define stage, the authors worked closely with the principal proprietor and his co-owner (i.e., his brother) to identify the most critical and urgent needs to be addressed by this project, aligning with the Undhira team members' expertise. As a result, it was determined that there are three priority areas to be addressed: (1) capacity building for the service staff, particularly English language skills (as most of the guests in the establishment are foreigners), (2) adherence to hospitality standards including standards of guest services for food and beverage establishments, and (3) business and marketing strategy.

An overarching problem to be addressed, which encompasses the three priority areas mentioned, is the stagnancy faced by SMEs when it comes to average spending per person (ASP). Also known as 'average check per guest' or 'mean spend per head' in the restaurant business, ASP is a measure of how much each guest spends on average—calculated by dividing the amount spent per check/table divided by the number of guests in each check/table [17]. The business has been improving since Warung Pantai Seseh opened in November 2020, mostly due to increased customers and extended opening hours. The business used to only open for lunch and dinner (at the beginning only until 7 or 8 p.m.) due to a lack of electricity and running water, but it is now open from 8 a.m. to 10 p.m. With the extended hours, and as more guests

shared their experience on social media as a form of electronic word-of-mouth [18], more patrons visited and frequented the F&B establishment. Yet upon deeper discussion, the proprietors stated that the average money spent per person/guest did not increase significantly, even though the average spent per check had increased (on average, more guests per check/table). This overarching problem was to be addressed in the next step.

3.2 Measure

Based on the preliminary results from in-depth discussions in the Define stage of LSS, the authors continued with the Measure stage by conducting direct observations and guest services simulations. This was to identify problem areas to be analyzed further in the next stage and eventually addressed with applicable solutions. This stage confirms the proprietors' statement that the average spending per person (ASP) experienced much slower growth than the number of guests. Based on empirical data at Warung Pantai Seseh, although the number of checks processed per day had increased by 50% in Q1 of 2022 compared to Q4 of 2021 (the authors and Warung Pantai Seseh team only worked with a limited set of sales data from the last quarter of 2021 and the first quarter of 2022), the average spending when calculated per person only increased 15-25% over the same period. This confirmed that while more guests had come to the *warung*, they were not spending significantly more per person.

3.3 Root Cause Analysis

In the Analysis stage, the authors engaged again with the proprietors, but this time also with other family members who were involved in and familiar with the business, as well as the staff members, to try to determine the root causes that may have contributed to the overarching issue of stagnant ASP. As this empowerment project was taking shape, serendipitously, Made Santika, the entrepreneur/owner of Warung Pantai Seseh, was also revamping the menu and building a full bar—which he saw as the solution to increasing the ASP and thus the revenue. Since food and beverage production was not part of the grant proposed in this empowerment project, the authors focused on exploring other underlying root causes that can be addressed using the authors' expertise in English communication, business, marketing development, and hospitality services. Using the '5 Whys' technique to explore the root causes of the main problem of stagnancy in ASP, five causes (and five specific areas of improvement) were identified as depicted by a fishbone diagram constructed by the authors. From the three priority areas derived from the Define stage and based on data collected in the Measure stage that pointed to stagnancy in ASP, five areas of improvement were identified by applying RCA (Figure 2).

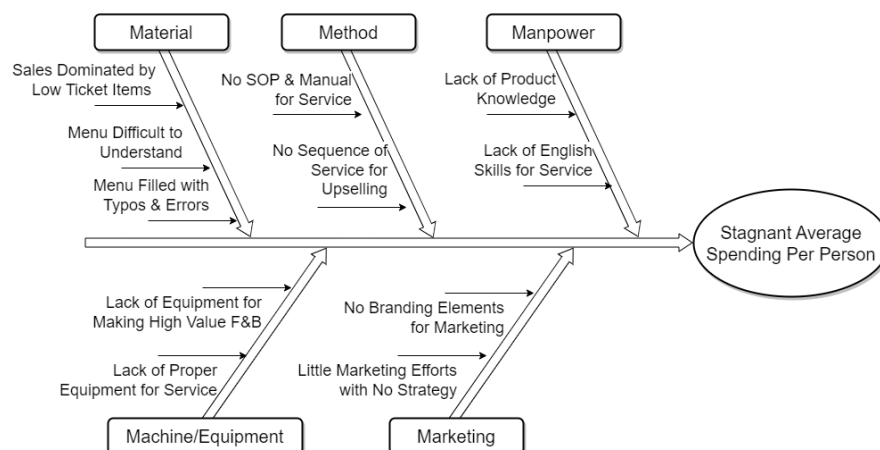


Figure 2: Fishbone Diagram (Ishikawa) of Warung Pantai Seseh RCA

3.3.1 Material

The first area of improvement was Material, specifically in the menu. Familiar, low-ticket items like fried rice, French fries, fresh coconut, and beer dominated sales at Warung Pantai Seseh. Even though at the beginning of Q2 2022, the *warung* had already started rolling out new menu items, sales for these new items had not picked up as expected. Upon deeper analysis with RCA, by focusing on the menu alone, the authors identified the need for more organization and specific descriptions in the menu as the primary concern. The menu was confusing and difficult to understand, as it was rather unorganized and often only consisted of brief descriptions that could cause even more confusion for the guests. This problem was exacerbated by the many typos and grammatical errors found in the menu. As most of the *warung*'s patrons are foreigners, the menu was already written in English—yet the lackluster organization, coupled with typos and errors, discouraged guests from ordering new, high-ticket items on the menu. The authors conducted several direct interviews with foreign guests who visited Warung Pantai Seseh. They confirmed the assumptions mentioned above about the menu.

3.3.2 Method

The second area of improvement was the Method. There was no Standard Operating Procedure (SOP) in place for food and beverage service at the *warung*. Also, the staff members only relied on their previous knowledge and training from vocational high schools (all the service staff had at least some vocational high school education, all of whom were in tourism/hospitality). With the lack of SOP, which is essential to ensure consistency in service-related businesses, Warung Pantai Seseh did not have a formalized sequence of service. Previous projects have shown the importance of having a standardized procedure for customer interactions at various touchpoints [19, 20]. The lack of SOP and the proper sequence of service often created confusion and even complaints from the guests (as observed directly by the authors). Additionally, no concerted effort was put in place for upselling and cross-selling menu items, which could increase ASP and revenue.

3.3.3 Workforce

The third area of improvement was the workforce. Little emphasis was given to ensuring the service team members at Warung Pantai Seseh have adequate product knowledge. As such, they could not provide recommendations or offer customized solutions for guests' special needs (e.g., vegan/vegetarian options, gluten-free items on the menu, and substitutions). In addition, the service staff members were still lacking in conversational English skills that had to do with English for customer service, as well as in food-related vocabularies, including food/beverage ingredients, cooking methods, and related adjectives.

3.3.4 Machine/Equipment

The fourth area of improvement was Machine/Equipment. Warung Pantai Seseh was still lacking in hospitality-grade service tools and equipment, such as anti-slip trays, mats, table numbers, order racks, and equipment for making higher-value food and beverage items. The SME's proprietor was already addressing the latter issue by hiring a chef and a mixologist as a consultant and fulfilling the equipment needs for the production side. However, the lack of service equipment was yet to be addressed, especially ones that could improve the standards and quality of service—including proper menu binders, anti-slip trays, mats, aprons, table numbers, and order racks.

3.3.5 Marketing

The fifth area of improvement was Marketing. At the onset of this project, the only branding element that Warung Pantai Seseh had was a brand name. The lack of cohesive branding meant no Integrated Marketing

Communication (IMC). In addition, the *warung* had engaged minimal effort in marketing (with an Instagram page and Google Maps location filled with guest reposts), with no marketing strategy. This could also adversely affect the ASP and revenue, as the public and *netizens* were unaware of the new and improved menu of Warung Pantai Seseh and the possibility of booking a barbeque dinner party at this F&B establishment. As stated by the entrepreneur/owner of this SME, barbeque dinner parties had been significant sources of revenue and increased ASP. It is because the parties tend to spend more on food and beverages per person—but only a few people know about the possibility of having such parties at Warung Pantai Seseh.

3.4 Improve

Based on the Root Cause Analysis, the authors developed and implemented an empowerment program in the Improve stage that consisted of (1) designing a grammatically correct and descriptive menu to help guests better understand the offerings and make optimal choices to boost sales, (2) designing and training employees on SOP for a *sequence of service* (e.g., pivot point, repeating order, checking back), (3) designing and implementing an English for Specific Purposes (ESP) training, significantly to boost product knowledge and service-oriented communication skills, (4) procuring and training the use of hospitality-grade restaurant equipment; and (5) designing branding elements and executing a digital marketing plan, significantly to increase engagement on social media and creating ‘buzz’ to increase the number of guests as well as the average spending per person. These activities were carried out with empowerment in mind, meaning that the partner (both the entrepreneur and the staff members) were actively involved as subjects throughout the process, not merely as objects receiving assistance and training.

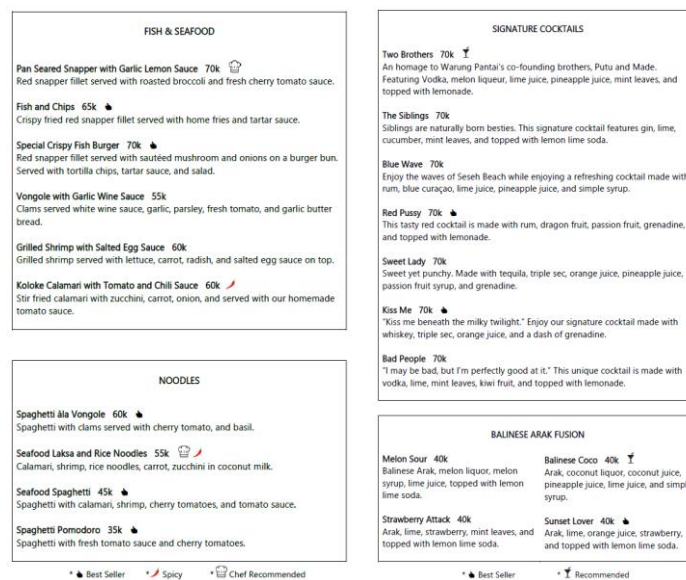


Figure 3: Improved Menu of Warung Pantai Seseh

3.5 Control

In the Control stage, the authors and the partner evaluated the results and impacts of the empowerment activities designed by RCA conducted. First, as a result of menu improvement, Warung Pantai Seseh now has a clear, descriptive, easy-to-understand menu in English—free from typos and grammatical errors. The menu was designed to be descriptive, using descriptive and sensory words to incite curiosity and desire rather than visual or photo-based. The menu also has indicators for chef's recommendations, crowd favorites, and spicy items (Figure 3). Evaluating the impacts of the menu improvement, the Warung Pantai Seseh team reported that sales have increased on new food and beverage items. This is particularly true for

the recommended items with either the chef's hat, thumb up, or cocktail glass icons next to the menu title, which saw a 50-150% increase in sales between Q2 and Q4 of 2022. Additionally, this improvement helped to reduce guest complaints typically associated with wrongfully choosing spicy menu items. The addition of the red pepper icons distinguished spicy food items from regular, non-spicy food items. The inclusion of these icons in the menu, and the positive effects they have on sales, are in line with previous studies stating that these simple yet suggestive signs could increase perceptions of item quality and selection likelihood in food service establishments [21] and even help consumers make better and healthier decisions [22].

Second, Warung Pantai Seseh now has a Standard Operating Procedure (SOP) for a sequence of service, which the partner and the authors developed together, and then trained the employees (Figure 4). This SOP was developed by applying Knowledge Management's SECI cycle to capture the existing knowledge in the organization (Socialization), formalize it in writing (Externalization), combine it with the available body of knowledge and best practices of service excellence in the food and beverage industry (Combination), and using it to improve the skills of employees in a training program (Internalization) [23]. Competency assessment indicated that almost all of the 11 employees trained had achieved a minimum competency level of 80% (except one employee who only attained 70% competency) in the sequence of greeting, seating the guests, taking orders, repeating orders, delivering drinks, delivering food, checking back, offering, processing payment, farewell, and closing.

SOP SEQUENCES OF SERVICE	STANDARD OF OPERATING PROCEDURES	BAHASA INDONESIA	BAHASA INGGIS
Greeting the Customer	Greet the Guest and bring the menu with server dan hand sanitizer	Selamat ..., selamat datang di Warung Pantai Seseh	Good morning/afternoon/evening, welcome to Warung Pantai Seseh, how are you?
	Menanyakan pilihan tempat duduk dan mengantar tamu ke pilihan tempat duduk	Bapak/Ibu/Saudara memilih duduk dimana? (tunjukkan meja/bean bag?)	How many of you? Would you prefer chair or bean bag?
	Menarik kursi atau bean bag sampai tamu duduk	• Menanyakan apakah tamu sudah pernah ke warung pantai seseh • Ya - tanyakan apakah tahu apa yang mereka mau order • Tidak - tunjukkan menu	Have a seat please. Have you been here before? Answer - Yes - would you like to see the menu? or do you know what you would have. Answer - No - Here is the menu
	Informasikan menu	• Berikan informasi menu section dan jelaskan menu of the day	We have varieties of drinks either alcoholic or non-alcoholic and varieties of food. I would like to inform you that we have special for today is Gado-Gado. It has -----
	Tinggalkan meja tamu kembali ke server section	• Apabila tamu sudah tahu apa yang ingin dminum - catat ordernya dari pivot point • Apabila tamu belum tahu apa yang ingin dminum, maka berikan waktu untuk melihat menu	If you already know what drinks you like to have, I will bring you drinks first while you decide for the food. My name is ..., I will be right back. Answer yes - May I know what do you like to drink? Answer No - I will be right back to take your order
Taking Order	Server datang dengan nomor meja dan buku order untuk mencatat order	Bertanya apakah tamu sudah memilih menu yang mereka inginkan	Are you ready to order? May I take your order now?

Server menanyakan order dari pivot point (terdekat dengan service station) dan berputar searah jarum jam	• Menanyakan apakah ada alergi? • Menanyakan apa saja ingredients, dan apa saja kondisioner yang datang dengan entree • Menanyakan berapa lama proses.	Is there any food allergy? The meal will be served with On the side and takes about ... Menit
Ketika sudah mengambil semua order	Menanyakan apakah ada lagi yang ingin dipesan atau ditanyakan	Is there anything you would like to add to the order?
Repeat Order	Mengulangi pesanan	Mengulang pemesanan sesuai dengan pivot point
Delivering Drinks	Membawa minuman	• Mengatakan terimakasih sudah menunggu • Meletakkan minuman sesuai dengan order pivot point dan meletakkan alat makan sesuai dengan pesanan dan meletakkan saos (apabila served in bottle)
Delivering Food	Membawa makanan	• Menanyakan sesuai dengan pivot point, dan menyajikan dengan tangan kanan dari sebelah kanan tamu • Menanyakan Wanti-dulu selanjutnya menyajikan kepada tau pria • Memastikan semua makanan sudah lengkap beserta alat makan • Menanyakan apakah ingin menambah minuman
		Let me repeat your order Thank you for waiting, here is your drink (sambil sebutkan minuman terutama yang mix drink dan selanjutnya taruh alat makan) Here is your meal (sambil sebutkan nama makanannya) Your order is all set I hope you enjoy your food And Is there anything else I could get for you?

Figure 4: SOP for Sequence of Service at Warung Pantai Seseh

Third, the service staff's English skills have improved, especially in product knowledge regarding the menu items, ingredients, cooking methods, and descriptions. Pre-test/post-test results indicated that nine of the 11 employees (82%) did not meet the passing grade of 80% in the pre-test of product knowledge. In contrast, after English for Specific Purposes (ESP) training, eight of 11 (73%) had met the minimum threshold for product knowledge (including food/beverage ingredients, menu items and descriptions, cooking methods, and food/beverage-related adjectives) [24]. The employees' English skills also increased in areas of service, including (1) greeting and seating the guests; (2) taking and processing orders; (3) checking back, offering other menu items, and processing payment; and (4) thanking and inviting the guests to come back. At the same time, only two of 11 employees met the criteria for overall proficiency (80% average and above) at the pre-test. However, proficient employees increased to nine out of 11 after the training. To ensure that the capacity building is sustainable, the team has provided the partner SME with an easily-accessible tutorial on YouTube (Figure 5) and the accompanying online quiz to ensure sustainability in future use for future new employees.



Figure 5: English for Specific Purposes Training and Tutorial Video

In terms of equipment, the authors procured and trained the partner SME on the use of proper service anti-slip trays (for food and beverage), specially color-coded cutting boards (especially for ready-to-eat or ready-to-drink items), menu binders, bill holders, table numbers, aprons, hats, order rack, trash bins, safety signs, fire extinguishers, and printer (Figure 6). The authors also helped the partner register the business to have a PeduliLindungi QR code from the Indonesian Ministry of Health and conduct further training to improve the *warung's* compliance with Indonesia's Cleanliness, Health, Safety, and Environmental Sustainability (CHSE) measures. Based on the self-assessment by the authors and the Warung Pantai Seseh team, this SME has met 70% of the CHSE measures for food and beverage establishment compliance. Areas of improvement have been recommended to be improved and procured by the partner.



Figure 6: Equipment to Improve Service Quality and CHSE Compliance

Lastly, the Undhira team, along with Warung Pantai Seseh, had developed brand elements for the SME, consisting of (1) logo, which was designed to be 'flat' and monochrome with pictorials depicting sunset, beach, coconut tree (as the signature of the Warung), and two birds signifying the two brothers who operate the business; (2) tagline (i.e., "good folks, good vibes), to highlight the family-oriented business and the relaxed/homey atmosphere in the Warung; (3) typography; and (4) color palette. These brand elements have been adopted in various print media, staff uniforms, store merchandise (available for sale to customers/guests), as well as for digital marketing (Figure 7), adopted to help realize brand recognition/association and strengthen brand equity [25, 26].



Figure 7: Warung Pantai Seseh Brand Elements in Use

For social media marketing, the authors also worked closely with the partner in copywriting company descriptions in various online media (e.g., Instagram, Google Maps, Google My Business), highlighting the SME's unique selling proposition (USP) and point-of-difference (POD) [27]: “**Family owned** and operated **beachside** warung. A true **hidden gem** in Seseh Beach, just **west of Canggu**”, which is also used in the SME's Instagram account (<https://instagram.com/warungpantaiseseh>), along with selected hashtags to boost popularity. Three-month analytics from Instagram insights indicated that between June and September 2022, the reach increased by 789%, engagement increased by 144% after the new branding was adopted, and the digital marketing strategy was implemented (Figure 8).

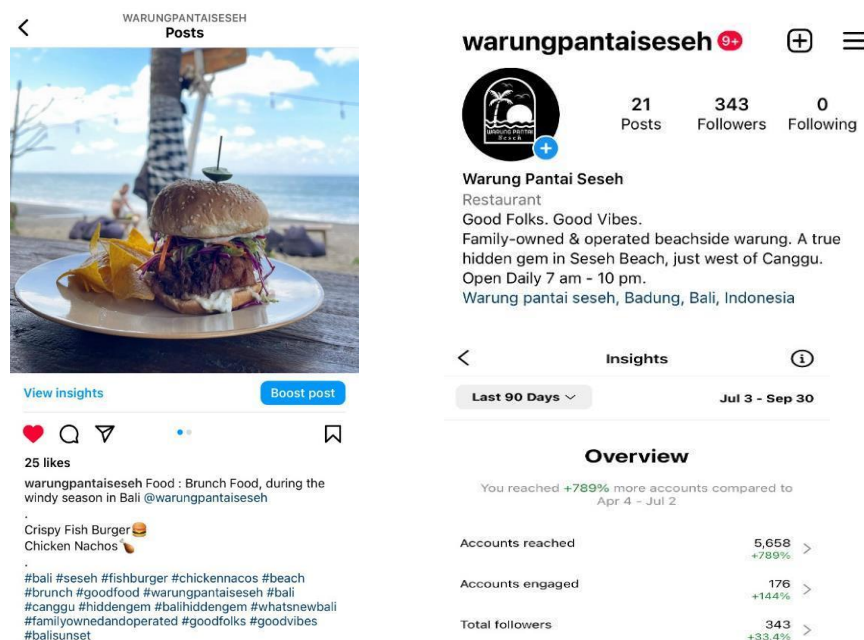


Figure 8: Warung Pantai Seseh Digital Marketing and Results

4 Conclusions

Overall, the impact of this empowerment program has been felt positively by Warung Pantai Seseh as the partner. According to Made Santika, the tourism entrepreneur who runs the SME, the number of visitors increased 50-60% between Q2 and Q4 of 2022, primarily due to the increased momentum of Bali's reopening for foreign tourists and improvements in the establishment. More interestingly, however, the average spending per person (ASP) increased by 90-120% in the same period. It signified that the menu

improvements and the empowerment project's efforts to improve the quality of business processes, employee communication skills, hospitality service standards, and marketing have positively affected the business. Not only are there more guests to the establishments, which is also due to the reopening of Bali, but the increase in spending per guest indicates that the empowerment program has had a positive impact. Warung Pantai Seseh's team also indicated that complaints have decreased, mainly due to decreased misunderstandings about the menu and improved staff skills. The main proprietor, the family, and the staff indicated that this project has helped escalate the SME to the next level with all-around quality improvements. They also indicated that the training, consultancy, and assistance have been efficient and relevant because it is based on actual problems faced by the newly established small business. As a lesson learned from this project, the application of Lean Six Sigma (LSS), with particular attention given to the analysis stage using Root Cause Analysis (RCA), has helped develop a relevant, problem-based, effective, and impactful empowerment program.

5 Declarations

5.1 Limitations

This project was limited in scope, scale, and timeframe. As such, the results from applying Lean Six Sigma (LSS) and Root Cause Analysis (RCA), as evident from the implementation of this project, cannot be sufficiently claimed to be generalizable, merely based on the encouraging results from this project alone. Further empirical examples of applying LSS and RCA for SME and community development projects are needed and encouraged.

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5.4 Competing Interests

The authors declare that there is no conflict of interest in this publication.

5.5 Publisher's Note

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