Decision Support System to Predict Business Performance: Study of Small and Medium Scale Enterprises During COVID-19

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Declaration

We declare that is our own work and has not been submitted in any form for another degree or diploma at any university or other institution of tertiary education Information derived from the published or unpublished work of others has been acknowledged in the text and a list of references is given.

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Abstract

The COVID-19 pandemic has disrupted business activity, particularly for small and medium enterprises, some of which have been entirely lost to the economy. This unexpected crisis has required that businesses change quickly with few resources. Some enterprises respond to this situation by applying creativity and have responded to the change more successfully than others. Generally, business performance depends on the owner's characteristics and how they operate their businesses. Therefore the aim of this research was to examine the relationship between owner characteristics and small business performance and limitations during the pandemic. This research consisted of collecting primary data, using a questionnaire, from small and medium enterprises in three grama niladari divisions, in Chilaw. Hypotheses were tested using descriptive techniques, multiple regression analyses, and decision tree algorithmhem. It was hypothesized that the owner's s characteristics would relate to business performance according to sales growth, profit growth and number of employees growth. The results indicate that a substantial proportion of businesses have closed due to the pandemic. Business owners had used financial and non-financial strategies to tackle the crisis (obtaining loans, utilizing business and social networks, pursuing new market channels), but a substantial number simply did not adopt particular strategies. The personality characteristics, adaptability, competitiveness, autonomy, risk propensity and emotional resilience significantly affected business performance ($p<0.05$). The owner's age, business type, business age, and some finacila and non-financial strategies also showed significant relationships with business performance ($p<0.05$). The research findings give insights into how the pandemic has taken a toll on SMEs and findings are used to build up a decision support system.

Keywords**:** Owner's characteristics, Business characteristics, decision support system, Business performance, COVID-19

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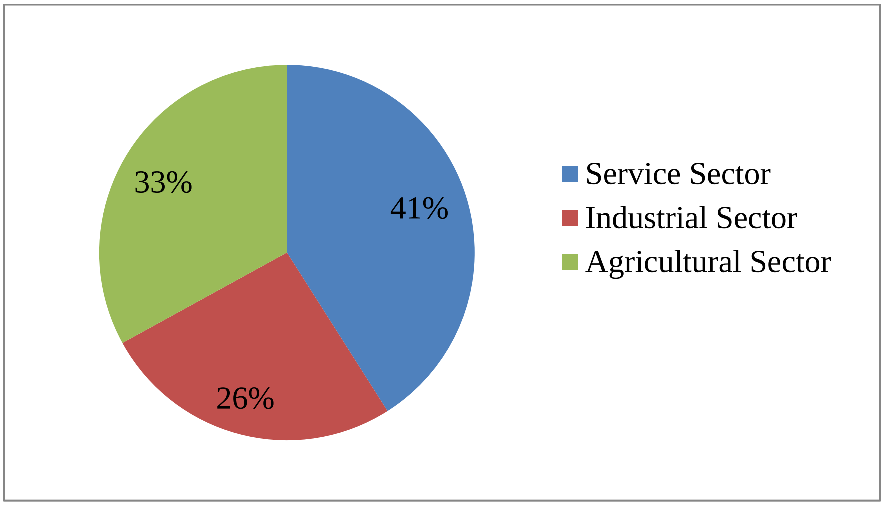
Chapter 01

1. Introduction

1.1 Overview

Small and medium businesses (SME) play a critical part in the country's socio-economic growth [1]. In Sri Lanka SMEs are expected to generate 52 % of GDP and are regarded as the economy's backbone [2] . SMEs are defined in several ways by different countries, using characteristics such as the number of employees engage in, the amount of capital invested, and the amount of turnover or the nature of the business being used [3]. In the Sri Lankan context, an enterprise with fewer than 50 people and a capital investment of less than Rs 5 million and less than Rs 50 million annual turnovers consider as a SME [4]. In the Sri Lankan context, SMEs provide 41% of the total jobs in the service sector, 26% in the industrial sector, and 33% in the agricultural sector [4]. The employment by sector is given in Figure 1.1.



(Source: Department of Census and Statistics, 2010)

Figure 1.1 Employment sectors provide by SMEs in Sri Lanka

In Sri Lanka, SMEs play a key role in economic development through creating employment opportunities, mobilizing domestic savings, poverty reduction, income distribution, regional development, worker and entrepreneur training, and the creation of an innovation culture environment in which large firms flourish [3].

In general, a detailed understanding of owners/managers and how they act in the business environment is required for good business performance [5]. The owners, either alone or with a partner, must make most business decisions [5]. The COVID-19 pandemic has evolved into not simply a health crisis but also one that has impacted the worldwide economy and has disrupted many businesses worldwide [6]. Since COVID-19 is an ongoing crisis with no cure, it has resulted in significant behavioral changes, posing severe hurdles to business survival [2]. Therefore, greater emphasis is being placed on how businesses adapt to these difficulties [7].

1.2 Research Problem and Justification

Unfortunately, COVID-19 has spread to practically every country in the world [8]. Lockdown rules have been used in many nations, and with that, shutting down millions of SMEs were observed [2]. SMEs faced numerous problems including, input disruptions, labour mobility limitations, and loss of markets [7]. The key issues differed from industry to industry [9]. Some enterprises suffered more than others due to a drop in external demand and a shortage of crucial parts that kept them afloat [10]. SME's have been struck particularly hard as demand has decreased [10]. Also, in Sri Lanka, with more and more infected cases being detected, quarantine programs, curfew, and lockdown were introduced as a measure to control the spread of the virus [2]. With this situation, most economic activities were badly affected, causing the SMEs to undergo severe hardships [2]. The daily wage earners (persons engaged on a casual basis) were the most affected [3]. Although travel restrictions, island-wide curfews, and lockdown have slowed the spread of the COVID-19, they have harmed the Sri Lankan economy in other ways [1]. COVID-19 is anticipated to lower GDP by 0.359 % (319.4 million USD) [1]. Therefore COVID-19 has had a significant impact on many small and medium-sized businesses [2].

Also, manufacturing firms were more likely to report labour shortages as a big issue than other sectors . Agricultural and manufacturing industries reported more problems with raw material shortages [8]. Manufacturing production involves many intermediate goods, and any missing parts or raw materials would drag the whole production process [11]. The pandemic depressed demand for most goods and services [6]. Also, the shortage of market orders is a major challenge for SMEs [12]. Even though SMEs are dealing with a novel COVID-19 pandemic, not all enterprises have been affected equally [6]. It was observed that some businesses have remained open while others have been closed [1].

Business owners have to face the challenge of making decisions when fulfilling their day-to-day business activities. This trend is also actual for Sri Lanka, where the real impact of the pandemic was felt around mid-March 2020 with the detection of the first Sri Lankan case [2]. This situation leads businesses to operate in the context of severely limited resource pools and substantially changed environments [8]. Therefore, SMEs have to adapt to new and unfamiliar contexts [11]. The success they engaged successfully in this environment is likely to have depended on owner/manager personal characteristics and behavior [4].

When looking at the geographic distribution of enterprises in Sri Lanka, the rural sector accounted for 73.9 percent of all firms, while the urban sector accounted for 24.6 percent [13]. In the Puttalam district, 65.3 percent were self-employed [4] Furthermore, when considering the area contribution to GDP, Chilaw provides a high contribution relates to Puttalam district. Therefore this research is target to Chilaw.

Most businesses are currently searching for ways to survive the COVID-19 pandemic [11]. However, some SMEs are responding to the crisis by applying creativity to problems to obtain opportunities and become more successful, and survive in this crisis period [6]. As a result, certain enterprises are more successful than others [2].

As a result, the owner-manager abilities and motives will influence whether they desire to expand the business or simply stay at the current size. It seems that personal characteristics should have important implications for how the owner-manager is managing a business [5]. Due to that if there is a system to identify the owners limitation that would be a adavantages for the SMEs [6].

Since all the economic elements are intricately interrelated with public health measures, this results in economic instabilities [11]. So there should be precise investigations of this case because this can directly affect the Sri Lankan economy. This study fills the research gap by helping to understand to what extent the owner/manager characteristic can determine the business performance during COVID-19 and identify the owners' limitations.

1.3 Research Aim

To create a decision support system for SMEs to survive in economic world, to understand the owner limitations by exploring the relationship between owner and business characteristics, rescue strategies and business performance indicators during COVID-19

1.4 Research Objectives

1. To identify the relationship between owners' demographic characteristics , personal traits, business characteristics, finance and non finance rescue strategies with business performance.

2. To investigate the business performance indicators related to sales growth, profit growth and no of employees increment.

3. Create a model to identify owners' limitations and to suggest corrective actions related to business performance regarding to sales growth, profit growth and employees increment.

Chapter 02

2. Review of Literature

2.1 Introduction

The first chapter discussed the introduction, background of the research, and the objectives of the study. The review of relevant theories and frameworks for the relationship between business performance and owner characteristics is presented in Chapter 2. Therefore this chapter gives an analysis of business performance and performance indicators by using relevant literature. The owner’s demographic factors (age, gender, and education), and personality characteristics, and business characteristics (age, type, and size of business) also will be discussed. After analyzing the literature, the chapter eventually focuses on the conceptual framework and hypotheses of the research.

Because SMEs are an essential part of the national economy, it is essential to understand why some are more successful than others. According to the literature, individual characteristics of owners have a direct impact on the performance of SMEs. The emergence of the Covid-19 coronavirus has unfortunately confirmed negative scenarios for the world economy and people's behaviors [14]. Rather than entrepreneurship, the current study focuses on self-employment and small business performance. Small business owners and self-employed individuals will be referred to as participants. The term "entrepreneur" shall be used only to refer to existing entrepreneurship research literature.

2.1 Business Performance

Business success is defined as the process of creating something unique and valuable by committing the necessary time and effort, accepting the associated financial, psychological, and social risks, and reaping the financial and personal satisfaction [15] Various measures have been used in the literature to determine the business performance levels, therefore both financial and non-financial performance standards have been utilized in many studies [5]. There is no widely acknowledged definition of business success, as there is for other constructs [5]. The most common operational definition of success involves the measurement of economic factors associated with the performance of the business [16]. Traditional measures of business success have been based on either employee numbers or financial performance, such as profit [12]. Several researchers suggest that financial growth variables are the best measures of performance [16]. Economic indicators used to measure performance include growth in employees [3], profitability [17] sales growth [17]. Growth in sales, profits, and the number of employees are all financial and non-financial indicators use to evaluate a business performance [16]. Research related to this study shows that business performance is measured in financial and non-financial factors [5]. Therefore, this study included three growth measures to determine the business performance.

- Growth in sales [17]
- Increase in profits [17]
- Increase in employees [18]

Several researchers suggest that criteria used to evaluate business performance were sales growth, profit growth, and employee growth, therefore, here, all replies were graded with the lowest to the highest performance values [16]. The business growth performance questions were combined to create a business performance index/ overall performance [16]. The premise of growth implicit in these measurements is that all small business owners desire or need to grow their firms [10]. For a firm to be considered successful, these financial metrics must show an increase in profit or revenue and an increase in the number of employees [18].

2.4 Owners Personality Characteristics

According to the literature, it would seem that personal characteristics should have important implications not only for the decision to start a business but the way in which the owner managing a business [19].

When a person possesses different characteristics, he seeks to be internally consistent in their motives and behaviors, and values are used to guide these motives and behaviors [5]. Some personal characteristics are thought to have an impact on business performance [5]. These personal characteristics impact business success and development [20]. As a result, it is critical to identify the characteristics that enable entrepreneurs to think and act in ways that favorably influence the outcomes of their ventures. In reality, personality characteristics are correlated with psychological behaviors and associated with business activities.

Although the personal characteristics needed for business success differ from person to person and sector to sector, experts have identified a few essential personal characteristics that can help entrepreneurs succeed [5]. Among these characteristics, the literature mention risk propensity [21], competitiveness [21,16] independence and autonomy [12,16], emotional resilience [16], and adaptability [15]are affected to the business success compared to others. These characteristics may vary from person to person.

Personality Characteristics are defined as characteristics that are stable over time, provide the reasons for the person's behavior, and are psychological in nature [12]. Following are the selected studies on personality and success variables examined.

- Adaptability - flexibility and willingness to adjust in the face of change in demands [16].
- Propensity to Take Risk - The capacity for taking risks in the pursuit of prospective rewards and psychology of decision making under uncertainty [15]
- Autonomy - need for independence and freedom from control with regard to life and work [12]
- Competitiveness - preference for embracing challenges and measuring oneself against others [21]
- Emotional resilience - The total level of adjustment and emotional resilience in the face of job stress and pressure [15].

Additional personality variables were looked at in various studies. However, they do not allow a quantitative review because they are typically single studies that have not been replicated [22]. In this context, research reveals that high levels of owner values lead to higher levels of business performance, but moderate levels of owner-manager values lead to lower levels of business performance [12]. As a result, it may be assumed that the owner's personal characteristics and business success are empirically associated [15]. More specifically, based on the significance levels of each performance component, the conclusion is that personal values such as autonomy, competitiveness, adaptability, and risk-taking have a substantial link [5].

2.5 Demographic Factors

Characteristics about groups of people consider as demographic characteristics [16]. Literature also predicts that the owner's age and education, as an owner, would enhance success rates at closing since older, more educated, and more experienced owners might give more expertise and capital [5]. Gender also would appear to have little bearing on success or failure [23].

One of the common misconceptions about tiny businesses or businesses that are not high-growth is that they are run mainly by women and operate at the low end of the small business spectrum [12]. Instead, women have not had the same opportunities to start firms as their male counterparts since they have not been in business for as long [24].

According to certain studies, people between 25 and 44 are the most enterprising [24]. According to the findings of another study, successful entrepreneurs were generally younger. In addition, several studies have shown a correlation between age of the entrepreneur and the success of the business [25]. Also, literature expresses that entrepreneurs who were older (>25 years old) were more successful than those who were younger [21].

Also, research expressed, owner education generates self-sufficient enterprising people [25]. Furthermore, they discovered that education enhances the likelihood of forming new ventures, self-employment, product development, and self-employed graduates owning a high-tech enterprise[21]. According to the literature, owner's education also promotes business performance [18]. Entrepreneurs with business and technical educational backgrounds are better positioned to be influential entrepreneurs [24].

2.6 Characteristics of the Business

It is acknowledged that business characteristics also are used to judge the performance of a small business. Other aspects of the operation and the owner's characteristics may influence perceptions of the relative relevance of these business characteristics to relate measurements [12]. The combination of the owners' characteristics, the environment, and the business characteristics led to business performance, including venture development and growth [22]. Therefore literature showed employment size, business age, business type is correlated with business performance [23]. In terms of employment, the size of an organization reflects its size [15]

According to certain studies, the size of a company is directly related to its performance. The success of larger businesses was discovered to be higher [24]. Literature also suggests that learning time may be linked to business operation [23]. Older players are more likely to have gained knowledge from their experiences than newcomers [24]. The time company has been in existence has a significant impact on its performance [24]. Also, when measuring business performance with the time, high performed businesses vary in type. But in some research, it was discovered that the features of the firm had no substantial impact on SMEs performance [5].

2.7 Finacial and non-Finacial Rescue Strategies

Rescue strategies can be defined as an organizational resource in determining firm decisions, capabilities, competitive advantages, and performance during a crisis period [6]. It relates to the formal configuration of work and power that effectively directs the firm's activities [26]. Also, changes in business strategies, operations, business conduct, and pressures to search for new sources and opportunities for redevelopment are recognized as crucial survival challenges for most SMEs [15] So most of the related research emphasized that strategies are of particular importance for small business success. [2]. Furthermore, innovative strategies have been considered particularly successful for small businesses since they are seen as useful attempts to keep market share, produce below cost, or maintain flexibility [15] Several careful studies have shown that innovative strategies are directly related to the success of small-scale enterprises and two identical themes of strategies as financial and non-financial strategies [14].

One of the most common challenges is a lack of finding financial resources to form continuing firms, particularly in developing nations with limited credit and venture capital resources [12]. Several empirical studies have found that business owners see a lack of access to capital and credit schemes, and financial system limits, as the most significant barriers to business performance [6]. Therefore recent literature suggests that financial flexibility, as mentioned above, determining business success [14].

Personal savings, borrowings, banking institutions, and other forms of financing can be all possibilities for finance [26]. Banks and financial institutions discovered that informal credit sources make significant contributions to business growth.

When considering non-financial strategies, social and business networks also play an essential role in the business process [18]. The social networking perspective assumes that entrepreneurs can be linked to other people and organizations, and these links may provide access to resources that may sustain a new venture [25]. A social and business network comprises several formal and informal links between the business owner and other actors. It serves as a gateway for obtaining the resources needed for a company's performance [8]. Formal support sources were hardly used, such as institutions like banks [20]. Informal networks were more often used and were most helpful such as support from friends and relatives [23]. The likelihood of a successful business journey is influenced by social networks [20].

Also using new marketing channels are helping to business in crisis [8]. SMEs should respond proactively to increased market competition by engaging in market development, and that is one of several problems that SMEs face. As a result, maintaining the company's strong growth rate requires market [24]. Therefore many businesses are developing online working and marketing for the present situation [2].

Product-related decisions were correlated with more information-seeking compared to employee-related or technical choices. Another study showed most product development activities are related to environmental threats and opportunities products would implement and diversified to serve customers [27].

Since the early 1970s, scholars in the management information systems (MIS)/decision support systems (DSSs) areas have recognized the important roles computer-based information systems play in supporting managers in their semi-structured or unstructured decision making activities.To examine the development pattern of a DSS over time, analyzed and summarized survey results were used according to the underlying models in DSSs and the management level (operational, tactical, or strategic) for which the DSS was designed.

2.8 Conceptual Framework and Hypotheses

This study's conceptual framework was adapted from the Giessen-Amsterdam Model and the psychological model proposed by Rauch and Frese in 2000. For this study, the model has been adapted to investigate potential direct links between specific owner characteristics, business characteristics, and rescue strategies during COVID 19 and business performance.

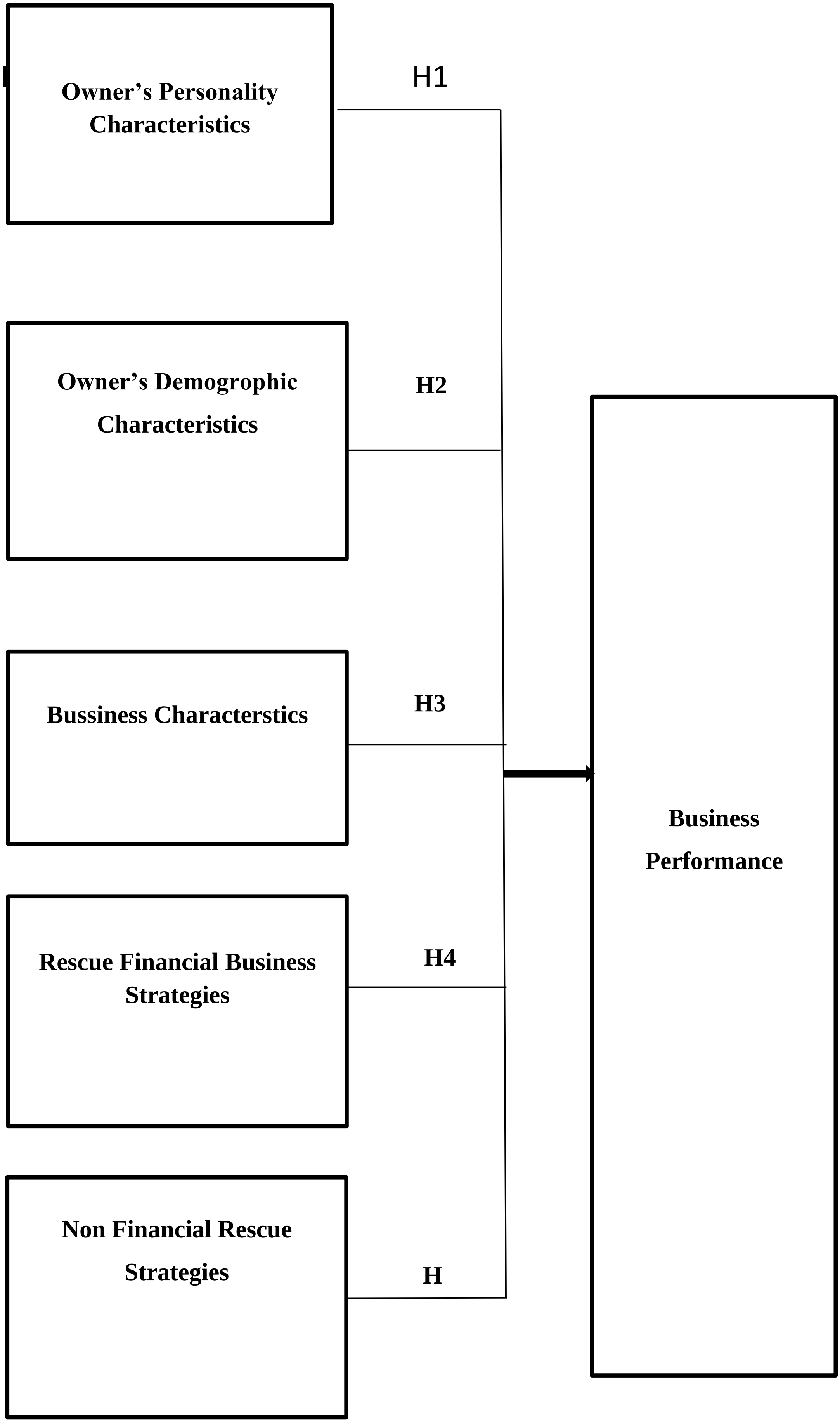


Figure 2.2: Conceptual framework of the research study

2.8.1 Hypotheses

Hypotheses are also drawn from literature based on the research objectives that are mentioned in chapter one. Table 2.1 shows the hypotheses of the research.

Table 2.1: Hypotheses

H1: There is a significant relationship between Owner's Personality Characteristics and business performance during COVID-19
H2: There is a significant relationship between Owner's Demogrophic Characteristics and business performance during COVID-19
H3: There is a significant relationship between Bussiness Characterstics and business performance during COVID-19
H4: There is a significant relationship between Rescue Financial Business Strategies and business performance during COVID-19
H5: There is a significant relationship between Non Financial Rescue Strategiesand business performance during COVID-19

2.8 Summary

This chapter presented the previous literature on the business performance, owner's personal characteristics, demographics characteristics, business characteristics and their relationships. Also, the chapter concluded with the conceptual framework and the hypotheses of the study.

Chapter 03

3. Methodology

3.1 Introduction

Research methodology is described in this chapter. The selected research design is described in Section 3.2, and the study site, population, and sampling procedure are described in Section 3.3.. In 3.4, the data collection and 3.5 section define the operationalization of the variables. Finally, in section 3.7, data analysis techniques used to answer the research questions and objectives are discussed.

3.2 Research Design

This study can be regarded as an explanatory study since the focus is on identifying business performance factors in SMEs in Chilaw during COVID 19.. A telephone survey was used as primary data collecting tool in this study. The results of the survey were utilized to determine SME business performance and SME rescue measures and as a final out put design a dessions support system to understand owner limitations.

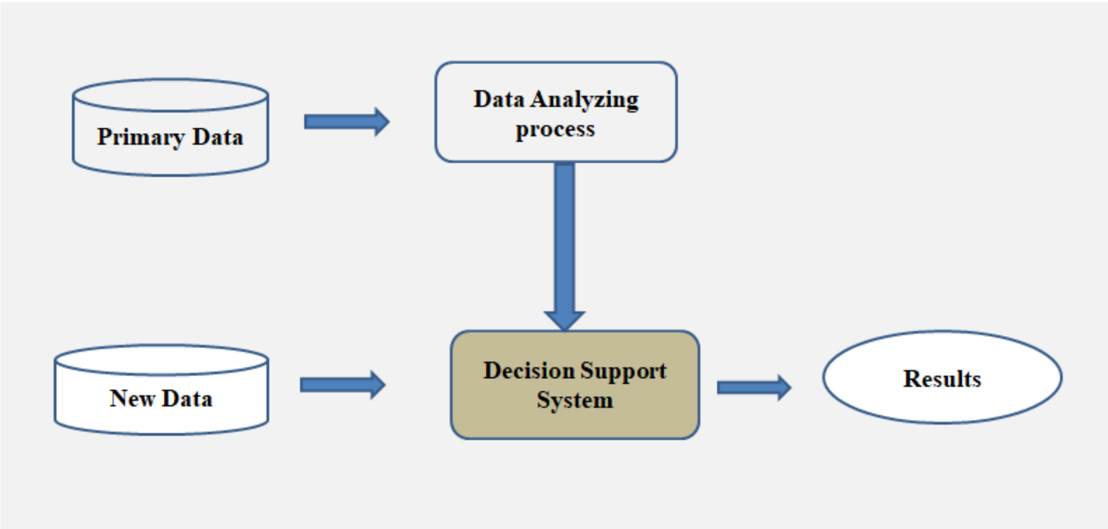


Figure 3.1: Solution Design

3.3 Study Site, Population, and Sampling

The study site was three *grama niladari* (GN) divisions in Chilaw - Arachchikattuwa, Weerakumandaluwa, and Kusala. Furthermore, when it comes to GDP, Chilaw significantly contributes to the Puttalam district GDP. As a result, this study is focused on Chilaw. SMEs in the three *grama niladari* divisions were taken as the population of the study. The list of the registered SMEs was taken from the divisional secretariat office Chilaw. The unit of analysis was the individual SMEs owner in 3 *grama niladari* divisions. One hundred and ten individuals consisted of the total population. Among them, ninety-three responded to the survey, resulting in a response rate of 84.5%. Among non-respondents, some did not pick up the call, and some telephone numbers were nolonger in use.

3.4 Data Collection

Structured interviews with participants were used to acquire primary data. A questionnaire was used as a guide for conducting telephone interviews. Before using the questionnaire for data collection, it was pre-tested. The survey took 15 minutes to complete. Before beginning the interviews, the participants were informed about the purpose of the study. Because of COVID 19 and travel constraints, this method was determined as the optimal way to gather data during this time period.

The questionnaire consisted of four sections. The first section comprised three questions about the age, gender, and educational qualifications of the owner, and three questions about the size, type, and age of the business. The first section contains a total of six questions. These details were used to create a more accurate profile of the sample. The second section was followed by questions about the owner’s personal characteristics. Five different characteristics were identified using the methods used in the literature. This section comprised 40 questions. Within the questionnaire, participants were asked to assess each personal value item on a five-point Lickert scale.The financial and non-financial rescue strategies were discussed in the third section of the questionnaire. Financial success was assessed using growth-related questions**.**Three performance measures were chosen: sales growth, growth of employee number, and profit growth. All of the replies were open-ended and expressed as percentages. This scale compares the trends of various performance items before and after COVID. The data collection process was conducted over three weeks period.

3.5 Operationalization of the Variables

This section describes all variables used in the survey and how dependent and independent variable measurements were developed for the analysis. All personality dimensions and success criteria were assessed using existing measures. Below is a brief description of the variables and measures used in the study.

3.5.1 Personality Variables Measurements

According to the literature, the most involved five dimensions of personality characteristics were identified and measured with the development and adjustment of the Personal Style Inventory (PSI) [16]. Reliability coefficients for the personality variables were up to.*9* (see Tabe 3.2). The adapted personality measure contains five subscales and a total of 40 items. Each subscale was evaluated independently [16]. On a Likert-type scale, item responses were indicated (see table 3.1). The mean of the participant responses (one to five) for each construct was used to calculate the scores for each personality subscale [28].

3.5.1.1 Business Rescue Strategies Measurements

Survival strategies used during COVID-19 are measured in this section. Multiple-choice questions were asked in the interviews to determine the financial and non-financial rescue strategies used by the owners. In that, respondents were asked to describe any financial strategy, resources, or tactics that help their business survive during and COVID-19 and ask to explain other non-financial strategies, resources, or tactics. Use of personal investment during COVID-19, asking for borrowings and banks loans or any other different strategies were asked as financial rescue strategies. Products diversification, new marketing channels, and social and business network that help businesses survive during this COVID-19 were asked as non-financial rescue strategies. Percentages and frequencies were taken to the descriptive analysis, and dummy codes were followed for multiple regression analysis.

3.5.1.2 Business Performance Variables Measurements

Three growth measures for performance indicators were included in this study. Sales growth [5], profit growth, and the number of employee growth,were evaluated by questions. All replies were graded on a scale ranging from 0% declining to 100% declined [16]. A performance index was created using the responses to the performance questions. Summing the replies to the three items yielded the index score [16]. The performance measure had a *Cronbach coefficient alpha reliability of .9* (Refer Table 3.2).

Table 3.1:Variable, Measurements, and scales used in the study

Variable	Measurement	Scale
Business performance	Item on three validated scale	Nominal
Business rescue strategies	Financial strategies Non- financial strategies	Nominal Nominal
Personality characteristics	Adaptability Propensity to take risks Autonomy Competitiveness Emotional resilience	Five points likert scale ranging strongly disagree to strongly agree
Age		Nominal
Gender		Nominal
Education Level		Nominal
Business Type		Nominal
Business Size		Nominal
Business Age		Nominal

Cronbach's alpha was applied to verify the validity and reliability of the study instrument. A brief overview of the reliability measures utilized in the study is found above. *Cronbach's alpha* values for personality items ranged from.*9*. As a result, the items used to assess personality traits were valid and trustworthy business performance indicators [16]. The instrument's *Cronbach's alpha* values for business performance and owner satisfaction were *.9* and *.98*, respectively. Cronbach's alpha scores for all of the subscales in the study were within the acceptable range. Overall, the research instrument used in the study was found to be valid and reliable. (refer Table 3.2)

Table 3.2:Validity and reliability of the instrument

Variable	No of Items	Cronbach's alpha
Business Performance	3	.9
Adoptability	8	.98
Risk Propensity	8	.98
Autonomy	8	.98
Competitiveness	8	.98
Emotional Resilience	8	.97

The skew and kurtosis tests were used to determine the data set's normality. On exploratory data analysis, high degrees of skewness (symmetry) and kurtosis (peakedness) in regression/ANOVA model residuals are undesirable and unfit for a normal distribution [9]. To verify a normal univariate distribution, values for skewness and kurtosis between -2 and +2 are regarded acceptable [22]. The findings show that all data between -1.96 and +1.96, indicating that the data set is normally distributed.

3.6 Data Analysis

Both quantitative approaches and qualitative approaches were used to analyze the data gathered from the survey. Section 3.6.1 explains the quantitative analysis, whereas section 3.6.1 explains the qualitative analysis of the study.

3.6.1 Quantitative Data Entry and Analysis

The *Pearson correlation coefficient* (Pearson, 1951), multiple regression and dession tree techniques were used to test hypotheses [16] Quantitative data analysis was performed using the survey data. The data was analysed using the SPSS 22.0 statistical software suite. Several questions needed the use of post-coding. Transforming, constructing, labelling variables, and multicollinearity diagnosis between independent variables was checked before running the regression.

Table 3.3:The objectives and the analytical methods used in data analysis

Objective	Method of data analysis
Reliability of the scales	Cronbach's alpha reliability test Personality characteristics measurements scale :.90- .95 Business performance measurement scale: .914
Normality of distribution	skew and kurtosis values Values between -1.96 and +1.96
To identify the extent of owner and business characteristics predict the business performance	Multiple linear regression Model fit: Adjusted R square .802

3.7 Summary

The approach used to conduct the research was provided in this chapter. The research design used in this study was described first, followed by the data collection and data analysis methodologies used by the researcher to achieve the research objectives.

Chapter 04

4. Results and Discussion

4.1 Introduction

The study findings are discussed in chapter 4. In section 4.2 will explain relationship between separately owner characteristics, business characteristics, and business performance during COVID-19.

4.2 Relationship Between Owner Characteristics, Business Characteristics, and Business Performance During COVID-19

This section answers the objective to identify to what extent owner and business characteristics predict the business performance during COVID-19. This section contains statistically analyzed results for between owner characteristics, including demographic factors such as age, gender, and education levels, as well as personal characteristics such as adaptability, risk propensity, autonomy, competitiveness, and emotional resilience, and business performance addressing COVID-19 and business characteristics such as business age, size, and type. Multiple linear regression model was used for the statistical interpretation of the study. Summary of the model fit *adjusted R square was .80* with a statistical significance of $p<.05$. The Durbin- Watson statistic was *1.93* and between +1 and +3, which means that the independence of the observations has been met [9].

4.2.1 Relationship Between Owner’s Demographic Factors and Business Performance During COVID-19

There was no significant relationship between the owner's gender, education level, and business performance during COVID-19 ($p>.05$); therefore, Hypothesise, H2 were not accepted.

4.2.2 Relationship Between Personality Characteristics of the Owners and Business Performance During COVID-19

This section interprets the descriptive and statistical analyses for particular personality characteristics of owners; adaptability, propensity to take risk, autonomy, competitiveness, and emotional resilience when performing a business.

When looking at the regression interpretation related to the personality characteristics five hypotheses were supported. Therefore Hypotheses, H1 *($p<.05$)* were accepted.

The data analyzed above revealed an important finding that was in line with the literature. When something is not working or pretending to be a threat, successful business owners have to be willing to change it [5]. Also, self-employment may not be personally satisfying for those who dislike change [16]. Therefore, in this study also adaptability was found to be a significant positive relationship ($\beta = .316, p<.05$) with business performance.

In the study personality variable, competitiveness was significantly related to business performance ($\beta=.221, p<.05$). This finding was also agreed with the literature [15]. Generally, business owners inevitably face challenges, even setbacks, during their quest for business success [5]. Therefore being competitive can be advantageous for SMEs [7]. This study showed that emotional resilience was positively related to business performance.

Also, when considering the relationship between emotional resilience and business performance, SMEs are most vulnerable to any external impact, and this effect was also seen during recent years. However, direct threat lasted only a few weeks; hence it was possible to recover in many aspects within a reasonable period. But the COVID-19 is a pandemic with a very high infection rate, causing danger to lives and also caused hardships to all economic activities. Therefore this situation is somewhat complicated; therefore, most owners are not in stable mental condition.

4.5.3 Relationship Between Business Characteristics and Business Performance During COVID-19

When considering the pandemic, it was depressing demand for most goods and services, and according to this, fish and chicken demand were highly drop-down [2]. Therefore respondents related to fish and poultry businesses reported that shortage of market orders was another challenge. Poultry owners also highly pointed this problem; therefore, findings report that poultry-related SMEs faced both supply and demand shocks during COVID-19, and therefore 57% of the total poultry farm sector was stopped entirely.

4.6 Summary

This chapter presented the statistical analysis of the study regarding the owner's characteristics and business performance. Most of the findings were agreed with the literature.

Chapter 05

5. Conclusions and Recommendations

5.1 Introduction

This chapter summarizes the findings, wraps up the investigation, and gives recommendations for future research.

5.2 Summary of the Study

This study examined the relationship between owener characteristics and business performance during COVID-19 related to SMEs in three grama niladari divisions, Chilaw. The study was conducted with the objective to create to decision support system to survive in economic world, by exploring the relationship between owner characteristics, rescue strategies and business performance during COVID-19

The study was carried out in three grama niladari division Chilaw- Arachchikattuwa, Weerakumandaluwa, and Kusala. A telephone survey was used to collect data. The results revealed that the majority of the respondents were males and aged between 40 to 50 years. The majority was only had primary education as their education qualification. The majority of the businesses were operated for 5-10 years. Furthermore, the majority of the businesses had 7-9 employees.

Also, the study confirmed that owner’s personality characteristics- adaptability, competitiveness, autonamy, risk propensity and emotional resilience, using bank loans or personal investment as financial rescue strategies and product differentiation, online marketing, home delivery and using social and business network as non financial rescue strategies had affected to the business performance regarding to the sales growth, profit growth and no of employee growth during COVID-19.

5.3 Conclusion

According to the findings presented in the previous chapter, when considering business performance nature during COVID-19, the majority of SMEs faced numerous challenges throughout the COVID period because of travel restrictions and social isolation. Findings also showed that many enterprises collapsed during this period due to a lack of transportation, suitable storage methods for bulk output, and maintaining a large number of employees. As a result, most business owners have laid off employees and reduced production compared to the pre-COVID time. As a result, many businesses experience a drop-off in business during COVID-19

When considering the owner characteristics, individuals with a high degree of flexibility, competitiveness, risk propensity, autonomy and emotional resilience outperformed others. As a result, owners who adapt to the circumstances quickly and do not give up no matter what happens outperformed owners with lower adaption capability and low emotional resilience. When compared to others, the majority of owners in higher aged perform poorly. As a result, some have entirely shut down their businesses, while others have seen a dramatic drop in business performance.

Findings also expressed some business characteristics have an impact on their performance.

5.4 Recommendations

The results of the study suggest some practical recommendations to the SME owners to investigate the causes of business failures, and to demonstrate the owners' personal limitations when operating a business in comparison to others. Further research is recommended to know more about gender-based differences and the influence of other possible factors on SME performance. It is also recommended to further explore these relationships with the performance of the business and owner satisfaction. Expanding the sample size and conducting the research in different geographical and socio-cultural locations in the country are also recommended to increase the generalizability of the study findings.

This research can devolop to find that that business performance and satisfaction are correlated, and additional research is needed to investigate how both variables impact the business process.

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Appendix A

Questionnaire

Survey on Owner-Manager Characteristics and Business Performance During COVID 19

Small and Medium Enterprises in three Grama Niladari Divisions in Chilaw

Survey Questions

(A) Owner and Business Background

1. Participant No :
2. What is your gender?

Male		Female	

:

3. What is your age? :
4. What is your education level?

Primary		Up to O/L		Up to A/L		A degree		Other	

5. Type of business :

Paultry	
Cow/pig Farming	
Fishing	
Dry Fish	
Coconut	
Flowers farm	
Cashew nut	
Mushroom	
Spices	
Yoghurt	
Other	

6. Duration of the business (years) :

7. How many people worked for your business before COVID-19?

(B) Owner's Personality Characteristics

8. How do you personally evaluate the following aspects as an owner of the business?

	Strongly disagree	Disagree	Neither Agree or Disagree	Agree	Strongly agree
	1	2	3	4	5
A) Adaptability					
A.1) I allow commitments to occur if others want to make them.					
A.2) I avoid making deadlines.					
A.3) I am considering every possible angle for a long time before and after making a decision.					
A.4) I am always changing and keeping options open.					
A.5) I plan as necessities arise, just before carrying out the plans.					
A.6) I use appointment books as little as possible (although I may use them).					
A.7) I am being free to do things on the spur of the moment.					

A.8) I am starting meetings when all are comfortable or ready.					
B) Propensity to take risks					
B.1)I am being called imaginative or intuitive.					
B.2) I try to think of new methods of doing tasks when confronted with them.					
B.3) I am thinking about possibilities.					
B.4) I am an abstract or theoretical person.					
B.5) I always have possible views of the whole.					
B.6) I belive in ideas.					
B.7) I plan and structure without necessarily carrying them out.					
B.8) I can imagine the non-existent.					
C)Autonomy					
C.1) I am making decisions without consulting others.					
C.2) I am quiet, thoughtful time alone.					

C.3)I am talking while and then thinking to myself about the subject.					
C.4) My inner thoughts and feelings others cannot see.					
C.5) I communicate little of my inner thinking and feelings.					
C.6) I like to be alone, or with one person I know well.					
C.7) I am puzzling out issues in my mind, then sharing the results with another person.					
C.8) I like to be reserved.					
D) Competitiveness					
D.1) I am pushing for definite commitments to ensure that they are made.					
D.2) I am seeking a schedule and sticking to it.					
D.3) Normally I get the information I need, considering it for a while, and then making a fairly quick, firm decision.					
D.4) I like to Predictability and knowing in advance.					
D.5) I plan ahead based on projections.					

D.6) I keep appointments and notes about commitments in notebooks or in appointment books as much as possible.					
D.7) I know well in advance what I am expected to do.					
D.8) I always start meetings at a pre-arranged time.					
E) Emotional Resilience					
E.1) I make decisions about people in organizations based on available data and systematic analysis of situations.					
E.2) I draw conclusions based on unemotional logic and careful step-by-step analysis.					
E.3) I am being thought of as a thinking person.					
E.4) I help others to make logical decisions.					
E.5) I use data, analysis, and reason to make decisions.					
E.6) I prefer verifiable conclusions.					
E.7) I am a logical person					
E.8) I use my ability to analyse situations.					

(C) Impacts of COVID-19 and Adopted Business Strategies (Multiple choice)

10. What are the financial strategies that help your business to survive during COVID-19?

	Response
1. I used my personal savings as a financial rescue strategy for my business during pandemic	
2. I asked friends for borrowings as a financial rescue strategy for my business during pandemic	
3. I asked for bank loans as a financial rescue strategy for my business during pandemic	
4. I did not use any special financial rescue strategy for my business during pandemic	
5.Other	

11. What are the non-financial strategies, resources or tactics (such as business networking, products diversification, marketing, etc.) that help your company survive during COVID -19? (Multiple Choice)

	Response
1.Product diversification helped me to survive in business during pandemic	
2.I used online marketing channels to survive in business during pandemic home delivery	

3.I used home delivery system to survive in business during pandemic	
4. I used my social and business connection and network more and more to survive during pandemic	
5. I did not use any special non-financial rescue strategy for my business during pandemic	
6.Other	

(D) Business Performance

How do you classify the overall performance of your business during the COVID-19 pandemic compared to pre COVID period?

1. Compared to pre- COVID 19 condition during COVID period, sales growth conditions?

1.No growth (0%)	
2.Increased by	
3.Decreased by	

2. Compared to pre- COVID 19 condition during COVID period, no of employees growth condition?

1.No growth (0%)	
2.Increased by	
3.Decreased by	

3. Compared to pre- COVID 19 condition during COVID period, profit growth condition?

1.No growth (0%)	
2.Increased by	
3.Decreased by	

4. Overall business performance during COVID-19:

1.No growth (0%)	
2.Increased by	
3.Decreased by	

Appendix B

Regression Analys for stastical Intraprition of bussine performance regarding to the salse growth

Correlations

		Product differentiation	online marketing channels	home delivery system	social and business connection and network	Product differentiation+ Online marketing	Online marketing + home delivery	Home delivery+ Social network	Online marketing + Social Network	Product differentiation + home delivery + Social Network	Product differentiation + home delivery	Product differentiation + social network	Product differentiation+ Online marketing+ home delivery+ Social Network	Other NF	Sales growth
Product differentiation	Pearson Correlation	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]
	Sig. (2-tailed)		.	.	.	.	.	.	.	.	.	.	.	.	.
	N	100	100	100	100	100	100	100	100	100	100	100	100	100	100
online marketing channels	Pearson Correlation	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]
	Sig. (2-tailed)	.		.	.	.	.	.	.	.	.	.	.	.	.
	N	100	100	100	100	100	100	100	100	100	100	100	100	100	100
home delivery system	Pearson Correlation	.[a]	.[a]	1	-.058	.[a]	.[a]	-.079	.[a]	-.114	.[a]	-.044	.[a]	.[a]	.157
	Sig. (2-tailed)	.	.		.567	.	.	.432	.	.257	.	.661	.	.	.119
	N	100	100	100	100	100	100	100	100	100	100	100	100	100	100
social and business connection and network	Pearson Correlation	.[a]	.[a]	-.058	1	.[a]	.[a]	-.072	.[a]	-.104	.[a]	-.040	.[a]	.[a]	.046
	Sig. (2-tailed)	.	.	.567		.	.	.476	.	.304	.	.690	.	.	.648
	N	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Product differentiation+ Online marketing	Pearson Correlation	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]
	Sig. (2-tailed)	.	.	.	.		.	.	.	.	.	.	.	.	.
	N	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Online marketing + home delivery	Pearson Correlation	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]
	Sig. (2-tailed)	.	.	.	.	.		.	.	.	.	.	.	.	.
	N	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Home delivery+ Social network	Pearson Correlation	.[a]	.[a]	-.079	-.072	.[a]	.[a]	1	.[a]	-.142	.[a]	-.055	.[a]	.[a]	.328**
	Sig. (2-tailed)	.	.	.432	.476	.	.		.	.158	.	.585	.	.	.001
	N	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Online marketing + Social Network	Pearson Correlation	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]
	Sig. (2-tailed)	.	.	.	.	.	.	.		.	.	.	.	.	.
	N	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Product differentiation + home delivery + Social Network	Pearson Correlation	.[a]	.[a]	-.114	-.104	.[a]	.[a]	-.142	.[a]	1	.[a]	-.080	.[a]	.[a]	.597**
	Sig. (2-tailed)	.	.	.257	.304	.	.	.158	.		.	.431	.	.	.000
	N	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Product differentiation + home delivery	Pearson Correlation	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]
	Sig. (2-tailed)	.	.	.	.	.	.	.	.	.		.	.	.	.
	N	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Product differentiation + social network	Pearson Correlation	.[a]	.[a]	-.044	-.040	.[a]	.[a]	-.055	.[a]	-.080	.[a]	1	.[a]	.[a]	.143
	Sig. (2-tailed)	.	.	.661	.690	.	.	.585	.	.431	.		.	.	.155
	N	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Product differentiation+ Online marketing+ home delivery+ Social Network	Pearson Correlation	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]
	Sig. (2-tailed)	.	.	.	.	.	.	.	.	.	.	.		.	.
	N	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Other NF	Pearson Correlation	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]	.[a]
	Sig. (2-tailed)	.	.	.	.	.	.	.	.	.	.	.	.		.
	N	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Sales growth	Pearson Correlation	.[a]	.[a]	.157	.046	.[a]	.[a]	.328**	.[a]	.597**	.[a]	.143	.[a]	.[a]	1
	Sig. (2-tailed)	.	.	.119	.648	.	.	.001	.	.000	.	.155	.	.	
	N	100	100	100	100	100	100	100	100	100	100	100	100	100	100

**. Correlation is significant at the 0.01 level (2-tailed).

a. Cannot be computed because at least one of the variables is constant.

Appendix C

Regression Analys for stastical Intraprition of bussine performance regarding to the employee growth

Correlations

		personal savings	borrowings	bank loans	did not use any	Personal Savings + friend borrowings	Personal Savings + bank loans	Friends' borrowings + Bank loans	Other	Employees growth
personal savings	Pearson Correlation	1	-.032	-.099	-.560**	.b	-.072	.b	.b	.231*
	Sig. (2-tailed)		.755	.328	.000	.	.476	.	.	.021
	N	100	100	100	100	100	100	100	100	100
borrowings	Pearson Correlation	-.032	1	-.032	-.179	.b	-.023	.b	.b	.193
	Sig. (2-tailed)	.755		.755	.075	.	.820	.	.	.055
	N	100	100	100	100	100	100	100	100	100
bank loans	Pearson Correlation	-.099	-.032	1	-.560**	.b	-.072	.b	.b	.320**
	Sig. (2-tailed)	.328	.755		.000	.	.476	.	.	.001
	N	100	100	100	100	100	100	100	100	100
did not use any	Pearson Correlation	-.560**	-.179	-.560**	1	.b	-.408**	.b	.b	-.522**
	Sig. (2-tailed)	.000	.075	.000		.	.000	.	.	.000
	N	100	100	100	100	100	100	100	100	100
Personal Savings + friend borrowings	Pearson Correlation	.b	.b	.b	.b	.b	.b	.b	.b	.b
	Sig. (2-tailed)	.	.	.	.		.	.	.	.
	N	100	100	100	100	100	100	100	100	100
Personal Savings + bank loans	Pearson Correlation	-.072	-.023	-.072	-.408**	.b	1	.b	.b	.212*
	Sig. (2-tailed)	.476	.820	.476	.000	.		.	.	.034
	N	100	100	100	100	100	100	100	100	100
Friends' borrowings + Bank loans	Pearson Correlation	.b	.b	.b	.b	.b	.b	.b	.b	.b
	Sig. (2-tailed)	.	.	.	.	.	.		.	.
	N	100	100	100	100	100	100	100	100	100
Other	Pearson Correlation	.b	.b	.b	.b	.b	.b	.b	.b	.b
	Sig. (2-tailed)	.	.	.	.	.	.	.		.
	N	100	100	100	100	100	100	100	100	100
Employees growth	Pearson Correlation	.231*	.193	.320**	-.522**	.b	.212*	.b	.b	1
	Sig. (2-tailed)	.021	.055	.001	.000	.	.034	.	.	
	N	100	100	100	100	100	100	100	100	100

**. Correlation is significant at the 0.01 level (2-tailed).

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

b. Cannot be computed because at least one of the variables is constant.

Appendix D

Regression Analys for stastical Intraprition of bussine performance regarding to the profit growth

Correlations

		personal savings	borrowings	bank loans	did not use any	Personal Savings + friend borrowings	Personal Savings + bank loans	Friends' borrowings + Bank loans	Other	Profit growth
personal savings	Pearson Correlation	1	-.032	-.099	-.560**	.[b]	-.072	.[b]	.[b]	.318**
	Sig. (2-tailed)		.755	.328	.000	.	.476	.	.	.001
	N	100	100	100	100	100	100	100	100	100
borrowings	Pearson Correlation	-.032	1	-.032	-.179	.[b]	-.023	.[b]	.[b]	.158
	Sig. (2-tailed)	.755		.755	.075	.	.820	.	.	.117
	N	100	100	100	100	100	100	100	100	100
bank loans	Pearson Correlation	-.099	-.032	1	-.560**	.[b]	-.072	.[b]	.[b]	.439**
	Sig. (2-tailed)	.328	.755		.000	.	.476	.	.	.000
	N	100	100	100	100	100	100	100	100	100
did not use any	Pearson Correlation	-.560**	-.179	-.560**	1	.[b]	-.408**	.[b]	.[b]	-.665**
	Sig. (2-tailed)	.000	.075	.000		.	.000	.	.	.000
	N	100	100	100	100	100	100	100	100	100
Personal Savings + friend borrowings	Pearson Correlation	.[b]	.[b]	.[b]	.[b]	.[b]	.[b]	.[b]	.[b]	.[b]
	Sig. (2-tailed)	.	.	.	.		.	.	.	.
	N	100	100	100	100	100	100	100	100	100
Personal Savings + bank loans	Pearson Correlation	-.072	-.023	-.072	-.408**	.[b]	1	.[b]	.[b]	.236*
	Sig. (2-tailed)	.476	.820	.476	.000	.		.	.	.018
	N	100	100	100	100	100	100	100	100	100
Friends' borrowings + Bank loans	Pearson Correlation	.[b]	.[b]	.[b]	.[b]	.[b]	.[b]	.[b]	.[b]	.[b]
	Sig. (2-tailed)	.	.	.	.	.	.		.	.
	N	100	100	100	100	100	100	100	100	100
Other	Pearson Correlation	.[b]	.[b]	.[b]	.[b]	.[b]	.[b]	.[b]	.[b]	.[b]
	Sig. (2-tailed)	.	.	.	.	.	.	.		.
	N	100	100	100	100	100	100	100	100	100
Profit growth	Pearson Correlation	.318**	.158	.439**	-.665**	.[b]	.236*	.[b]	.[b]	1
	Sig. (2-tailed)	.001	.117	.000	.000	.	.018	.	.	
	N	100	100	100	100	100	100	100	100	100

**. Correlation is significant at the 0.01 level (2-tailed).

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

b. Cannot be computed because at least one of the variables is constant.

Appendix E

Pseudocode for Final Out Put

```
Begin

Read: a_1; //I_allow_commitments_to_occur_if_others;
Read: a_2; //I avoid making deadlines;
Read:a_3 ;//I am considering every possible angle for a long time before and after making
a decision;
Read:a_4: // I am always changing and keeping options open;
Read:a_5; //I plan as necessities arise, just before carrying out the plans;
Read:a_6 //I use appointment books as little as possible;
Read:a_7 //I am being free to do things on the spur of the moment;
Reda:a_8 //I am starting meetings when all are comfortable or ready;

Set sum=(a_1+a_2+a_3+a_4+a_6+a_7+a_8)/8;

if sum<=5 and sum>=4 then
set adaptability_message= "Excellent in adapatability";

else if sum ==4 then and sum>3 then

        set adaptability_message= "good in adapatability";

else if sum ==3 then and sum> then

        set adaptability_message= "fair in adapatability";

else

        set adaptability_message= " week in adapatability";

endif

Read:I am pushing for definite commitments to ensure that they are made;

Read:b_1; //I am pushing for definite commitments to ensure that they are made;
Read:b_2; //I am seeking a schedule and sticking to it;
Read:b_3; //Normally I get the information I need, considering it for a while, and then
making a fairly quick, firm decision;
Read:b_4; //I like to Predictability and knowing in advance;
Read:b_5; //I plan ahead based on projections;
Read:b_6;I keep appointments and notes about commitments in notebooks or in
appointment books as much as possible;
Read:b_7; //I know well in advance what I am expected to do;
Read:b_8 ;//I always start meetings at a pre-arranged time;

set sum = (b_1+b_2+b_3+b_4+b_5+b_6+b_7+b_8/8);
if sum<=5 and sum>=4 then
set competitiveness_message= "Excellent in competitiveness";
```

```
else if sum ==4 then and sum>3 then

        set competitiveness= "good in competitiveness";

else if sum ==3 then and sum> then

        set competitiveness= "fair in competitiveness";

else

        set competitiveness= " week in competitiveness";

endif


Read:c_1 //I am being called imaginative or intuitive;
Read:c_2; //I try to think of new methods of doing tasks when confronted with them;
Read:c_3; //I am thinking about possibilities;
Read:c_4; //I am an abstract or theoretical person;
Read:c_5; //I always have possible views of the whole;
Read:c_6; //I belive in ideas;
Read:c_7; //I plan and structure without necessarily carrying them out;
Read:c_8; //I can imagine the non-existent;

set sum = (c_1+c_2+c_3+c_4+c_5+c_6+c_7+c_8/8);


if sum<=5 and sum>=4 then
set propensity_to_take_risks= "Excellent in risk taking";

else if sum ==4 then and sum>3 then

        set propensity_to_take_risks= "good in risk taking";

else if sum ==3 then and sum> then

        set propensity_to_take_risks= "fair in risk taking";

else

        set propensity_to_take_risks= " week in risk taking";

endif

Read:d_1; //I am making decisions without consulting others;
Read:d_2; //I am quiet, thoughtful time alone;
Read:d_3; //I am talking while and then thinking to myself about the subject;
Read:d_4; //My inner thoughts and feelings others cannot see;
Read:d_5; //I communicate little of my inner thinking and feelings;
Read:d_6; //I like to be alone, or with one person I know well;
Read:d_7; //I am puzzling out issues in my mind, then sharing the results with another
person;
```

```
Read:d_8; //I like to be reserved;

set sum = (d_1+d_2+d_3+d_4+d_6+d_5+d_7+d_8/8);

if sum<=5 and sum>=4 then
set autonomy_message= "Excellent in autonomy";

else if sum ==4 then and sum>3 then

        set autonomy_message= "good in autonomy";

else if sum ==3 then and sum> then

        set autonomy_message= "fair in autonomy";

else

        set autonomy_message= " week in autonomy";

endif

Read:e_1; //I make decisions about people in organizations based on available data and
systematic analysis of situations;
Read:e_2; //I draw conclusions based on unemotional logic and careful step-by-step
analysis;
Read:e _3; //I am being thought of as a thinking person;
Read:e_4; //I help others to make logical decisions;
Read:e_5; //I use data, analysis, and reason to make decisions;
Read:e_6; //I prefer verifiable conclusions;
Read:e_7; //I am a logical person;
Read:e_8; //I use my ability to analyse situations;

set sum : (e_1+e_2+e_3+e_4+e_5+e_6+e_7+e_8/8);


if sum<=5 and sum>=4 then
emotional_resilience_message= "Excellent in emotional_resilience";

else if sum ==4 then and sum>3 then

        emotional_resilience_message= "good in emotional_resilience";

else if sum ==3 then and sum> then

        emotional_resilience_message= "fair in emotional_resilience";

else


set emotional_resilience_message= " week in emotional_resilience";

endif
```

Read:abc_1; //I used my personal savings as a financial rescue strategy for my business during pandemic;
Read:abc_2; //I asked friends for borrowings as a financial rescue strategy for my business during pandemic;
Read:abc_3; //I asked for bank loans as a financial rescue strategy for my business during pandemic;
Read:abc_4; //I did not use any special financial rescue strategy for my business during pandemic;

```
if abs_4==2

then
   if abs_1 == 1 and  abs_3==2 and abs_2==2) then


     financial_strategies_message = "used Good financial_strategies  ";

   else if abs_1 == 2 and abs_3==1 and abs_2==2
                        then

     financial_strategies_message = "Good financial_strategies ";

else if (abs_1 == 1 and  abs_3==1 and abs_2==2 )
     financial_strategies_message = "Used good financial_strategies ";

   else
     financial_strategies_message = "Used bad financial_strategies";

   end if

 else
   financial_strategies_message = "Used Bad financial_strategies  ";


end if
```

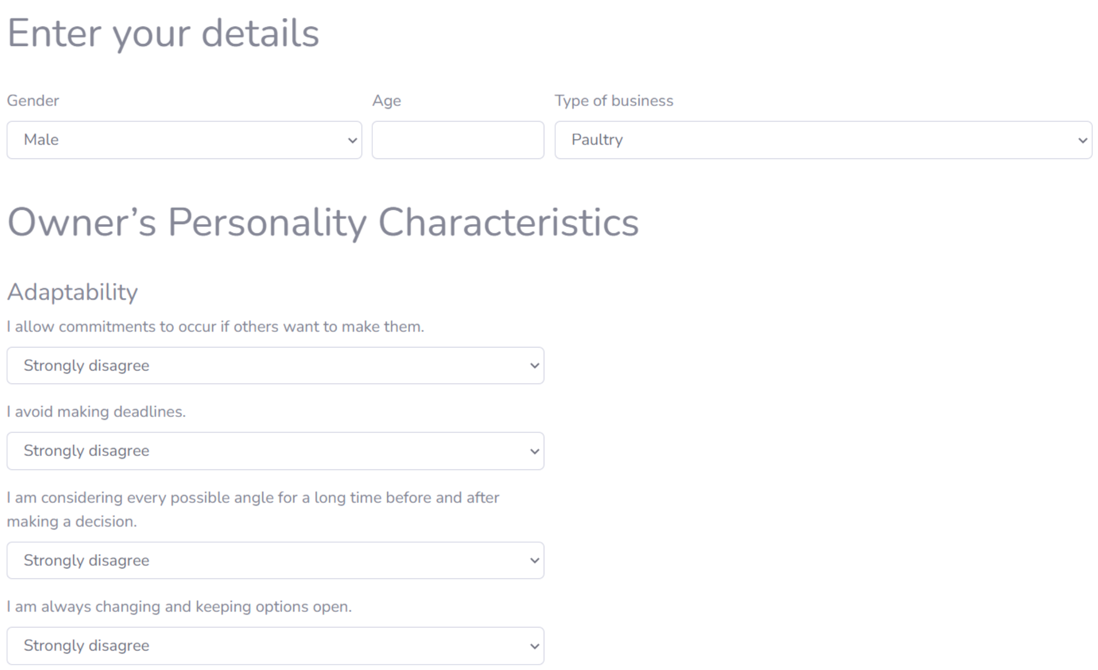
Read:sdc_1; //Product diversification helped me to survive in business during pandemic;
Read:sdc_2; //I used online marketing channels to survive in business during pandemic home delivery;
Read:sdc_3; //I used home delivery system to survive in business during pandemic;
Read:sdc_4; //I used my social and business connection and network more and more to survive during pandemic;
Read:sdc_5; //I did not use any special non-financial rescue strategy for my business during pandemic;

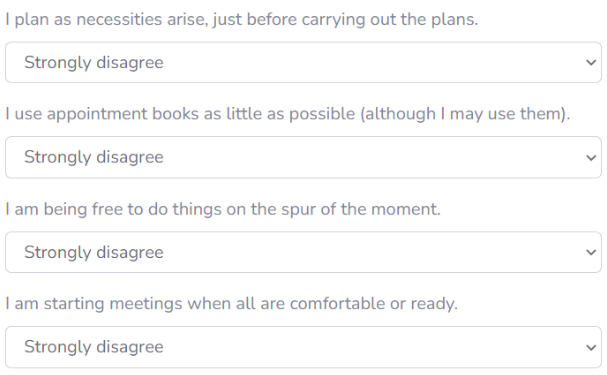
```
if sdc_5==2
                        then
   if sdc_1 == 1 and sdc_3==1
```

```
                                then

        non_financial_strategies_message = "used Good non_financial_strategies";

 else if sdc_1 == 1 and sdc_3==2 and sdc_4==1
                              then

        non_financial_strategies_message = "used Good non_financial_strategies";

      else
        non_financial_strategies_message = "used bad non_financial_strategies ";

                             end if

    else
      non_financial_strategies_message = "used bad non_financial_strategies";

                             end if
End
```

Appendix F

Apllication Interface





Propensity to take risks

I am being called imaginative or intuitive.

Strongly disagree

I try to think of new methods of doing tasks when confronted with them.

Strongly disagree

I am thinking about possibilities.

Strongly disagree

I am an abstract or theoretical person.

Strongly disagree

I always have possible views of the whole.

Strongly disagree

I belive in ideas.

Strongly disagree

I plan and structure without necessarily carrying them out.

Strongly disagree

I can imagine the non-existent.

Strongly disagree

Autonomy

I am making decisions without consulting others

Strongly disagree

I am quiet, thoughtful time alone.

Strongly disagree

I am talking while and then thinking to myself about the subject.

Strongly disagree

My inner thoughts and feelings others cannot see.

Strongly disagree

I communicate little of my inner thinking and feelings.

Strongly disagree

I like to be alone, or with one person I know well

Strongly disagree

I am puzzling out issues in my mind, then sharing the results with another person.

Strongly disagree

I like to be reserved.

Strongly disagree

Competitiveness

I am pushing for definite commitments to ensure that they are made.

Strongly disagree

I am pushing for definite commitments to ensure that they are made.

Strongly disagree

I am seeking a schedule and sticking to it.

Strongly disagree

Normally I get the information I need, considering it for a while, and then making a fairly quick, firm decision.

Strongly disagree

I like to Predictability and knowing in advance.

Strongly disagree

I plan ahead based on projections.

Strongly disagree

I know well in advance what I am expected to do.

Strongly disagree

I always start meetings at a pre-arranged time.

Strongly disagree

Emotional Resilience

I make decisions about people in organizations based on available data and systematic analysis of situations.

Strongly disagree

I draw conclusions based on unemotional logic and careful step-by-step analysis.

Strongly disagree

I am being thought of as a thinking person.

Strongly disagree

I help others to make logical decisions.

Strongly disagree

I use data, analysis, and reason to make decisions.

Strongly disagree

I prefer verifiable conclusions.

Strongly disagree

I am a logical person

Strongly disagree

I use my ability to analyse situations.

Strongly disagree

Impacts of COVID-19 and Adopted Business Strategies (Multiple choice)

I used my personal savings as a financial rescue strategy for my business during pandemic

Yes

I asked friends for borrowings as a financial rescue strategy for my business during pandemic

Yes

I asked for bank loans as a financial rescue strategy for my business during pandemic

Yes

I did not use any special financial rescue strategy for my business during pandemic

Yes

What are the non-financial strategies, resources or tactics (such as business networking, products diversification, marketing, etc.) that help your company survive during COVID -19?

Product diversification helped me to survive in business during pandemic

Yes

I used online marketing channels to survive in business during pandemic home delivery

Yes

I used home delivery system to survive in business during pandemic

Yes

I used my social and business connection and network more and more to survive during pandemic

Yes

I did not use any special non-financial rescue strategy for my business during pandemic

Yes

Submit

Appendix G

Sample Output

Propormance limitaions

Weak in adapatability
Weak in competitiveness
Weak in emotional resilience
Weak in risk taking
Weak in autonomy
Used bad financial strategies
Used bad non financial strategies

Suggetions

Suggestion to improve your adaptability:
you have to allow more commitment
Have to consider every possible angle before and after making desision
Have to Keep option open
Have to make a plane before necessities arias

Suggestion to improve your Cometitiveness:
Have to stick in the schedule
Have to Predict and knowing in advance before some thing happend

Suggestion to improve your emotional resilience:
Try to drow conclusions based carefull step by step analysis
Try to use data analysis for decission making

Suggestion to improve your propensity to take risks:
Try to Think new Methods of doing task
Be positive and have to belive in ideas

Suggestion to improve your Autonomy:
Try to think to yourself before taking a decission
Try to puzzle out issues in mind before sharring the outcomes

Suggestion to improve your finacial strategies:
Seek a Bank loan if it is possible.
You can use your personal savings if possible

Suggestion to improve your non financial strategies:
Think possibilities for product diversification
You can try home dilivery system
Try to use social and bussiness network when it needed

ok