THE EFFECTS OF TRAVEL BEHAVIOUR CHANGE ON ONLINE ACTIVITY PATTERNS DURING THE COVID19 PANDEMIC

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CIVIL ENGINEERING
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by

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Dissertation submitted in partial fulfilment of

the requirements for the

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CERTIFICATION OF APPROVAL

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A project dissertation submitted to the
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Approved by,

_____
(Dr Dimas Bayu Endrayana)

Date: _____

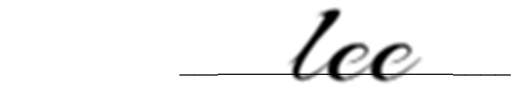
UNIVERSITI TEKNOLOGI PETRONAS

SERI ISKANDAR, PERAK

SEPTEMBER 2022

CERTIFICATION OF ORIGINALITY

This is to certify that I am responsible for the work submitted in this project, that the original work is my own except as specified in the references and acknowledgments, and that the original work contained herein has not been undertaken or done by unspecified sources or persons.



CHEE YANG LEE

Date: 20 JUNE 2022

ABSTRACT

This research focusses in analysis on travel behaviour is affected by the constraints on online activities pattern during covid 19 pandemic in Thailand . The ongoing COVID-19 pandemic has created significant disruption in our daily lives and has triggered massive changes in how we schedule and perform activities and travel. The constraint due to the pandemic covid 19 disrupted the people travel to participate out-of-home activities are replacing with virtual-based. Studies during the pandemic showed the online activity pattern people will be influenced by changes in travel behaviour while their online activity could be a resource to satisfy their needs and desires.

Form Thailand 2021 dataset, statistical technique for bivariate and multivariate analysis are used to evaluate the result of this research. With that analysis, a model of One's travel behaviour and activity-travel decisions that are made while taking the mentioned constraints into considerations will be studied with Space-Time Prism (STP) Theory developed by Hagerstrand to determine individual online activity pattern during the pandemic of covid 19 . Understanding the travel behaviour changes during such global crisis and the reasons behind is crucial for developing suitable strategies for our current development planning and management. Hence, effective rectifying measures can be applied to help mitigate the fault in our current planning system so that a more inclusive, effective, and sustainable environment can be built for the society in the future.

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First and foremost, I would like to express my heartfelt gratitude to my Final Year Project supervisor, Dr. Dimas Bayu Endrayana and Civil and Environmental Engineering department, for all of his guidance, advice, support, and effort on my behalf throughout the project's completion process. His expertise and contribution were really helpful in finishing this research project. I couldn't have finished my FYP without his advice.

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CHAPTER 1

INTRODUCTION

This chapter covered the principles of the research study. It includes a thorough background analysis and a concise explanation of the problem statement and its objectives. The scope of the study for the project is also included in this chapter.

1.1 Background Study

The first reported case of the coronavirus was confirmed in November 2019. After having been recognized as a "Public Health Emergency of International Concern", the COVID-19 disease was declared by the World Health Organization a pandemic in March 2020 (Jiang et al., 2020).Since then, Coronavirus has infected several million individuals, with recent data (November 2020) reporting more than 53 million confirmed cases globally, including over 1 million deaths (WHO, 2020).The World Health Organisation (WHO) characterised the new coronavirus as a pandemic and advised governments worldwide to take urgent and aggressive action (WHO, 2020)Various national and international public health organizations, including the U.S. Centers for Diseases and Control and Prevention (CDC) and WHO have been closely monitoring this situation, and recommending preventative measures to limit or slow down the spread of the virus (CDC, 2020; WHO, 2020). Due to the lack of any effective therapeutics or vaccines and given the way of transmission of the virus, social distancing, along with other mobility restriction measures, emerged as key mitigation strategies. By the end of March 2020, more than a hundred countries had implemented some form mobility restriction, ranging from full or partial mandatory quarantines (usually referred to as lockdowns) to non-binding requests for activity restrictions, such as stay-at-home requests, closing certain types of businesses, cancelling events . (BBC, 2020). The overall aim of these measures was to control the spread of the disease by reducing interactions between people and restricting mobility in order to mitigate the risk of healthcare system capacities being exceeded (Askitas et al., 2020). The mobility restriction policies imposed in response to the galloping

COVID-19 pandemic have brought about radical changes in people's travel behaviour, both at global and local level. In fact, transportation demand and traveler behaviour are intrinsically linked to societal activity.

Drastic change in government polices during pandemic covid 19 have demonstrated the effect of individuals' travel behaviour on online activity. The preventive measures issued by advisory and regulatory agencies such as social distancing, coupled with public fear of contagion, have caused a significant fraction of people affecting their daily routines. The unique circumstances introduced by this pandemic have caused many to re-examine their habits and priorities, resulting in considerable changes in the way people perform their everyday tasks

During external environment may change people's demands and obligations, thereby affecting their participation in activities of daily life. For example, the pandemic has eliminated the obligation for students to attend university; instead, many continue to study at home via online learning. In addition, policies vary in response to the external environment, affecting the options that individuals have available to them. In addition, to avoid mass gatherings in closed spaces, shops restaurants, educational and companies were urged to continue their activities remotely Recently, the mobility restrictions aiming to minimise the COVID-19 spread have influenced the increase of used in information and communication technology (ICT) causing a variety of changes in travel behaviour. All these measures were implemented in most countries to reduce possible travel while allowing society to keep functioning.

Travel has become a need in our daily life. Every day, people travel in different ways for various reasons. we need to travel to do our daily activities. According to Hagerstrand (1970), It is a necessity for people to travel in order to fulfil their needs and desires. Each one of us will have different needs to satisfy ourselves in daily life. For instance, some go to work or school, and some travel for leisure or to engage in activities such as passions, sports, or just going out to eat. These

activity participation at different location are done out of their home hence travelling is essential in our everyday life in order to accomplish our needs and desires.

Meanwhile, resources also play important role in determining travel behaviour. In time space prism, the available of resources such as internet , money, cars, and infrastructure are also important to make the travel happens. There might be people with a lot of money, and some others may not. There are also people exposed with a good network of public transport and some groups may have limited access to the privileges. People with more money can travel further than people with less money. This shows that travel behaviour will be limited to the resources that they have. Consequently, those are the factors that will provide an opportunity to individuals in order to perform a particular activity within a particular space and time while resulting in human decision making for travelling.

Based on Hägerstrand time and space prism, stated that variability in travel behaviours is caused by interaction among constraints, resources , and needs within specified time and space.According to Hägerstrand argued that an individual is subject to 3 type of constraint that lead to human travel behaviour ,which are capability constraint, coupling constraint, and authority constraint. By considering these constraints, it will help us to understand the way individuals compose their daily activity-travel pattern and adapt to changes time (Dharmowijoyo, D. B. E., Susilo, Y. O., & Karlström, A., 2016). Unfortunately, due to constraint their needs and desires cannot be fulfilled every single time. For example, people maybe want to do some recreational activities or meeting their friends at other places, but the authorities' constraints set by government movement restriction will limit it. Firstly, Capability constraints is a constraint that limit an individual to do other activity since he restricts his time to meet his basic needs like sleep, eating and personal care. Old people might not be able to walk too far compared to young people Meanwhile coupling constraint is a constraint that made the individual to interact with another human or objects where he need to spend his time to achieve both essential functions like made a groceries or a transaction. For example, the student has to work in a group for specified project. They need at least set a meeting, once or twice a week to discuss the project progress within corresponding time and place that satisfy all of them. Another

one is authority constraints which a constraint that the authority made to limit the access for the individual to be at the specific space. As example, The government sector may have shorter working days and time compare to private sector. From the arguments, it is understandable that every individual's action must be reliant on the constraints.

To combat the spread of the COVID-19 virus, Movement Control Order (MCO) measures included restrictions on mobility, assembly, international travel, as well as the shutdown of businesses, industries, government agencies, and educational institutions.

Before the pandemic, most people travelled every day for various reasons such as going to work, school, shopping, sports, hobbies, socialising, etc. Some of the activities are out-of-home activities, hence travelling is one of the necessities in life for people to fulfil their needs and desires. During the pandemic, studies revealed that office work is being replaced by teleworking, while in-store shopping is being replaced by teleshopping (Irawan et al., 2021). Thus, these mobility restrictions during the pandemic had a significant impact on people's participation in out-of-home activities.

Thus, this study aims to investigate the effects of changes in socialising trips and discretionary trips during COVID-19 pandemics on affective well-being because understanding the individual's affective well-being state during the pandemic is crucial for predicting future travel-activity patterns after the lockdown is lifted. At the end of this study, new information on how individuals having less discretionary and socialising trips during the pandemic would impact individuals' affective well-being and future travel activity patterns. This information will be very beneficial in future to visualize the pattern of humans' activity and traffic planning analysis.

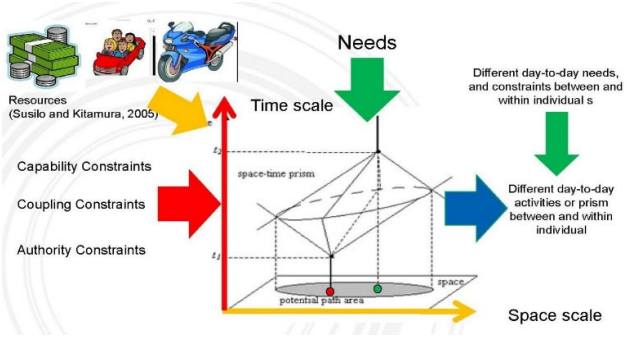


Figure 1: Time Space Prism by Hagerstrand (1970).

1.2 Problem Statement

There are many issues about travel behaviour during the pandemic of covid 19 .The authority constraint on lockdown and policy on activity and business restriction implemented by government policies as preventive measure of spread disease give resulted in significant infer the demand and travel behaviour of an individual at location. The ongoing COVID-19 pandemic has created significant disruption in our daily lives and has triggered massive changes in how we schedule and perform activities and travel. The constraint due to the pandemic covid 19 disrupted the people travel to participate out-of-home activities are replacing with virtual-based. Studies during the pandemic showed the online activity pattern people will be influenced by changes in travel behaviour while their online activity could be a resource to satisfy their needs and desires. Understanding the travel behaviour changes during such global crisis and the reasons behind is crucial for developing suitable strategies for our current development planning and management. Hence, effective rectifying measures can be applied to help mitigate the fault in our current planning system so that a more inclusive, effective, and sustainable environment can be built for the society in the future.

1.3 Objectives

The objectives of this study are:

1. To correlate the effects of travel behaviour change on online activity patterns during the COVID19 pandemic using bivariate analysis
2. To correlate the effects of travel behaviour change on online activity patterns during the COVID19 pandemic using multivariate analysis

1.4 Scope Of Study

This research focusses in analysis on travel behaviour is affected by the constraints on online activities pattern during covid 19 pandemic in Thailand . Form Thailand 2021 dataset, an analysis of data can be processed to provide a statistical data by using bivariate and multivariate analysis. With that analysis, a model between the travel location and the activity made can be constructed to show the activity pattern and the distribution of the visited locations over space in period of time. One's travel behaviour and activity-travel decisions that are made while taking the mentioned constraints into considerations will be studied with Space-Time Prism (STP) Theory developed by Hagerstrand to determine individual online activity pattern during the pandemic of covid 19 . All significant findings are documented for further study.

CHAPTER 2

LITERATURE REVIEW

2.1 Time Geography and Time Space Prism

Time-space prism or time-space geography is a conceptual framework proposed by Hägerstrand (1970). Hagerstrand's (1970) time space prism is a powerful and elegant perspective to analyse human participation in activities. This prism can be defined as framework that recognizes the activity participation involves both spatial and temporal dimensions. To simplify the definition, activities occur at specific locations for limited time periods. Therefore, a transportation mode allow human to trade time for space to travel and participate in activities at dispersed locations. It also shows that human travel anchored by certain activities that are relatively fixed in space and time.

Hägerstrand was the one who introduced the time-space prisms which comprises of theory in social-psychology and sociology into geography science.Every people have their own personal and social identities. Personal identities demonstrate the individual's age, gender, employment type and physical disability while social identities demonstrate the individual's social part such as being a part of a household, a neighbourhood, a company, a citizen, or a certain community. The personal and social identities could show how an individual interact with other individuals and materials, and with rules applied within his/her societies in economic, social-cultural, temporal, and geographical context. Hence, every single people have different needs and desires depending on their personal and social identities.

Figure 1 shows that the space time prism. The volume in space and time in which the individual's physical presence is possible is called prism (Susilo, 2005), which envelope of all possible space-time paths between known locations and times (Miller, 2017). Based on (Hagerstrand, 1970) time geographic approach, individual's space-time prism group theses constraint as three classes: capability

constraint, coupling constraint, and authority constraint. Hägerstrand (1970) also recognized These constraints are said to be inter-related limitation for an individual in activity travel pattern. Capability constraint limits human activities through physical limitations and available resources. Among capability constraint, human health, including physical, social and mental health, may also one of the key factors that influence individual activity-travel participation. As example, people must conduct activities such as eating and sleeping daily. Coupling constraint limits human's decisions in view of the need of being at the same area in the meantime to meet different people or materials. For example, discussion meeting can only be carried out with particulars individuals. Authority constraint is the limitation of travel that requires human to fulfil specific times and particular spaces. For instance, some people are not allowed to travel during movement order control without the authorities approval permit from police. Hence, these constraints associate with people's needs within a time and space scale. Therefore, these interactions between needs and constraints are important to be considered so that the better understanding towards individual's daily activity-travel pattern could be gained (Dharmowijoyo & Joewono, 2020) .

Next, Resources also play important role in determining activity travel pattern and behaviour. (Susilo &Kitamura, 2005). resources in time space prism often refer to financial ability, availability and service level of the infrastructure and public transport network. . Another example is that individuals with extra resources such as private cars can generally travel faster than those who use public transportation. With different types of roles and characteristics, people tend to make different decision based on their needs, constraints and resources. Therefore, this would provide individuals with opportunities to engage in more or less activities within possible time constraints. (Dharmowijoyo & Joewono, 2020)

In short Different people have different prisms depending on their behaviour based on the interaction between needs and constraints. Online activity can comprises the interactions between resources and needs. Online activity is one of the resource in any individual's life because it can help to ease the activity participation in a time at different locations during pandemic of covid 19. Last

but not least, the three categories of constraints also should be considered when in travel because different people have different constraints depending on their activity-travel behaviour.

2.2 THE RELATIONSHIP BETWEEN Travel Behaviour And Online Activity Pattern During Pandemic Covid 19

The COVID-19 pandemic has had an unprecedented effect on people's mobility across the globe. By the end of March 2020, more than a hundred countries had implemented some form mobility restriction, ranging from full or partial mandatory quarantines (usually referred to as lockdowns) to non-binding requests for activity restrictions, such as stay-at-home requests, closing certain types of businesses, canceling events, etc. (BBC, 2020).

In the case of Wuhan, China, where the first cases were reported, control measures were drastic, but it has been shown that these measures substantially mitigated the spread of COVID-19 (Kraemer et al., 2020; Zhang et al., 2020).These strict measures and travel restrictions have had a noticeable impact on the lifestyle of many people; specifically, on their daily travel. The google mobility report reveals a 42.94% decrease in activities in public spaces such as retail locations and public transit stations from March to May of 2020 (De Vos, J., 2020).Long-distance travel has also been significantly impacted by COVID-19, with only 59% of the average commercial air traffic flying in the last two weeks of March of 2020 (De Vos, J., 2020). It is evident that individuals' daily activities including travel and activity pattern have changed during COVID-19. However, due to the novelty of these pandemic restrictions, limited understanding exists on how individuals initially responded to the COVID-19 has forced individuals to spend more time at home with the closure of businesses, recreation facilities, workplaces, and schools, as well as local and international travel restrictions. As a result, individuals have started to find ways to replace or complement their out-of-home activities with in-home activities. For example, people have adapted to working and learning from a distance, eliminating their commutes as many physical workplaces and schools are closed (Concerns About COVID-19 – April 21, 2020 – Leger, 2020). Furthermore, online shopping has emerged as a viable

alternative to avoiding travel for in-store purchases (As Online Orders Surge, Grocers Struggle to Deliver - The Globe and Mail, 2020).

As discussed above, the Covid-19 pandemic has greatly increased the quantity and quality of ICT use over the past two years, and the capabilities of these technologies are being used around the world to overcome the constraints caused by this pandemic.During this period, telecommuting and teleworking, e-learning, online shopping, online entertainment, tele-activities,decades, like many other digitalised activities (e.g. online entertainment, distance learning), the adoption of such online activities has been relatively increase that it can be said that dramatic changes have taken place in human lifestyle, especially in citie (Van Wee, 2020). As such, in the context , the changing one's travel patterns and online activities pattern fall squarely into the realm of travel behavior analysis. .The understanding the interaction between ICT and urban travel is necessary for the planning and management of urban transportation

CHAPTER 3

METHODOLOGY

Project Flowchart

The flowchart of methodology is a set of plans that have been set up step by step to produce a successful result. The purpose of this flowchart is basically to briefly explain the design methodology throughout this research. According to sequence of flowchart project , it is important to ensure every phases of this research is completed executed in the best quality according to the schedule set prior to project execution.

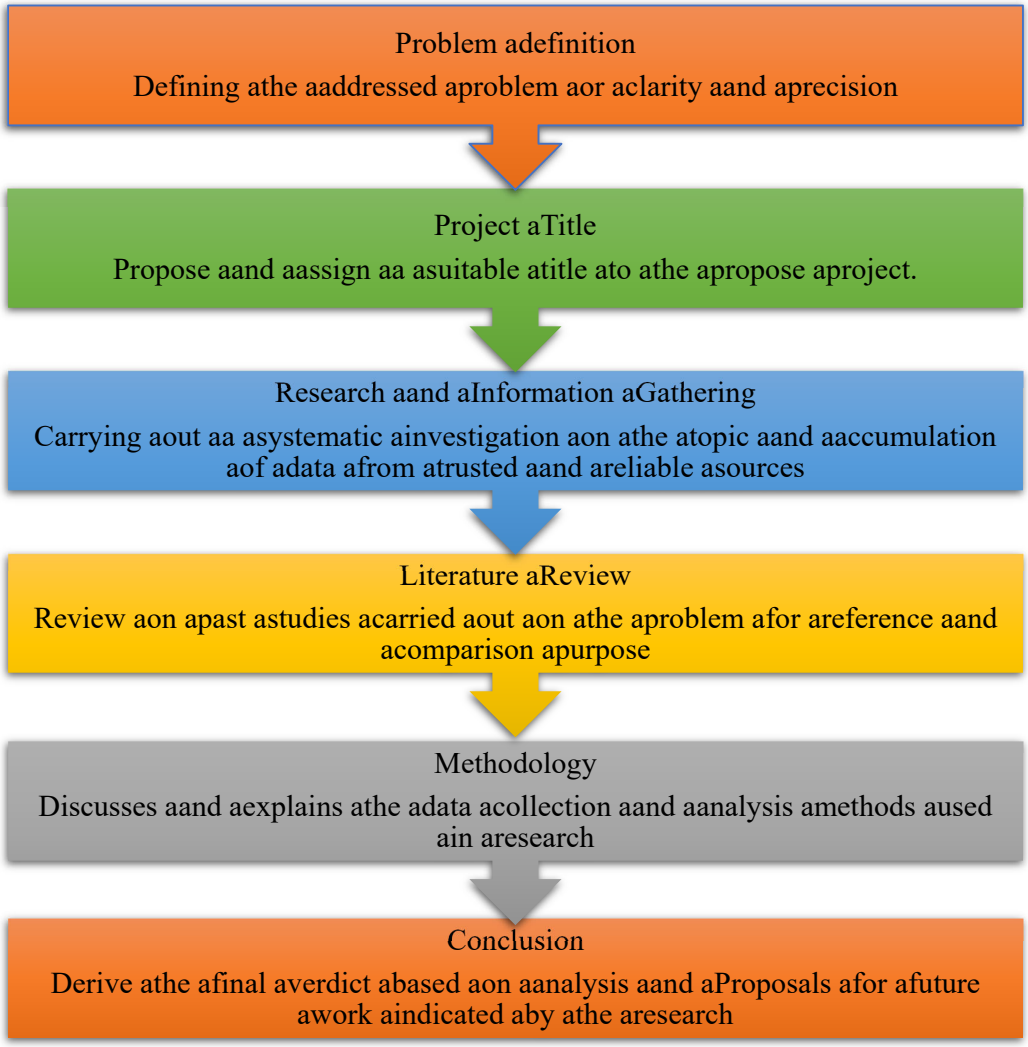


FIGURE 0.1: Flowchart of The Project

Methods of Information Collection

In this research, variety of resources from the journals and articles as well as online researches have been used to collect information on the topic especially in writing literature review and enhancing understanding of the objective research project .All the information's are gained from the trusted and updated sources to ensure that every information is reliable and relevant to be analyzed in this researches . All the journals and articles have been reviewed by author to get the better understanding about the topic.

RESEARCH METHODOLOGY

This research will be studying the relationship between travel behaviour and online activity participation of the citizens of Thailand and the effect of travel behaviour on online activity pattern during pandemic covid 19. This research incorporates the variables to be used will be extracted based on the datasets that have been collected from the study which is the Thailand 2021 dataset. The design of the questionnaire consists of information related to socio demographic variables, travel habits and the assessment of certain factors conducive to online activity of resident in Thailand during pandemic covid 19.Socio-demographic characteristics consisted of gender, age, country of residence, marital status, monthly household income ,car ownership, motorbike ownership, number of members in the household, education level, employment status, and whether or not the respondent is an essential service worker. The primary purpose of travel was defined as the purpose for which people mainly undertake their trips. People may be able to reduce other less important trips during a pandemic, however, they may be compelled to travel for a certain primary trip purpose. Hence, it is vital to focus specifically on the primary purpose of travel as it determines the regular or main trips performed, distance traveled, and mode chosen. A section of the questionnaire contained questions on the primary purpose of traveling before and during the COVID-19 pandemic. The information on distance covered, the number of trips made, and mode choice for the primary trip purpose were also inquired.

Utilizing the variables from the dataset, statistical technique for bivariate and multivariate analysis are used to evaluate the result of this research. The evaluation of the sample of dataset carried out in order to assess the frequency of displacement as well as the different perceptions connected to the displacements in the time frames. In particular, the propensity for online activity, during the pandemic phases - during and after the lockdown was analyzed. In addition, the study examines whether pandemic covid is perceived as a barrier to individual to perform their daily task and needs. Besides, as to what extent the spread of pandemic covid 19 can influence the frequency of travel behaviour and online activity pattern. Finally, the variation of traffic congestion in the monitored areas was evaluated by comparing available 2021 Thailand dataset, highlighting the reduction of mobility in the different phases. This study includes observations regarding travel behaviour before, during and after the imposed lockdown. This study deals with both independent and paired observations about travel behaviour before and during COVID-19. Therefore, proper attention was paid while carrying out statistical analyses on the data.

3.1.1 Research Tools

I. Microsoft Excel

The survey findings were recorded using Microsoft Office Excel as the tools. Aside from that, it assists the user in organising, calculating, and formatting any data that incorporates equations and employing a spreadsheet system that is divided into columns and rows. The data can also be displayed in the form of tabular data and graphs.

II. IBM SPSS

SPSS Statistics was utilised for data storage and statistical analysis. Aside from statistical analysis, it is highly useful in data management and data documentation since it allows a case to be picked, a file to be reshaped, and derived data to be created. It can also do statistical analyses such as descriptive statistics such as cross tabulation and frequencies,

bivariate statistics such as t-test and ANOVA, numerical result prediction such as linear regression, and group identification such as component analysis and cluster analysis.

Data Input

after the data is extracted, the information that is needed for this research paper will be transferred to the computer. This process is important as good data will produce good results. For this study, the data will be transferred into Microsoft Excel. After that, they will be transferred again into SSPS software to be interpreted and analyzed.

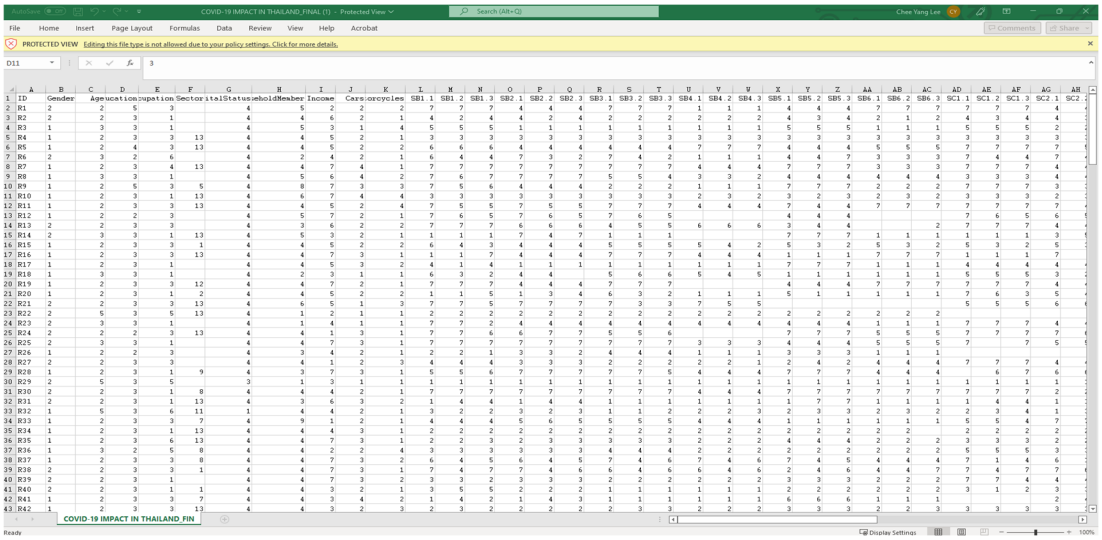
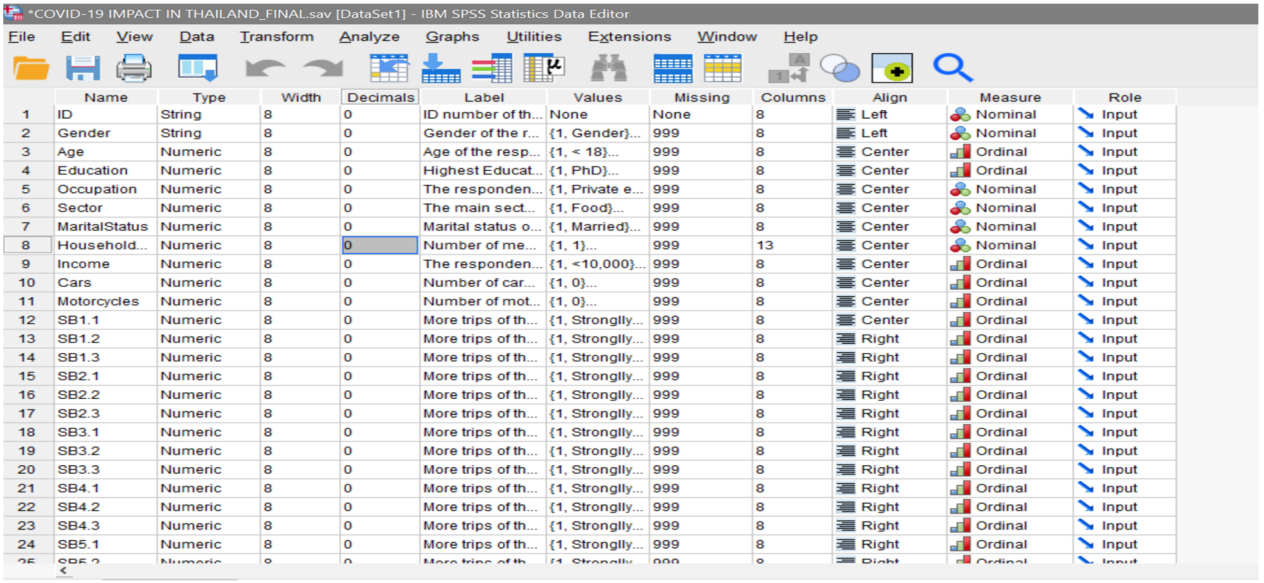


Figure 2 :Data input by using Microsoft Excel



	Name	Type	Width	Decimals	Label	Values	Missing	Columns	Align	Measure	Role
1	ID	String	8	0	ID number of th...	None	None	8	Left	Nominal	Input
2	Gender	String	8	0	Gender of the r...	{1, Gender}...	999	8	Left	Nominal	Input
3	Age	Numeric	8	0	Age of the resp...	{1, < 18}...	999	8	Center	Ordinal	Input
4	Education	Numeric	8	0	Highest Educat...	{1, PhD}...	999	8	Center	Ordinal	Input
5	Occupation	Numeric	8	0	The responden...	{1, Private e...	999	8	Center	Nominal	Input
6	Sector	Numeric	8	0	The main sect...	{1, Food}...	999	8	Center	Nominal	Input
7	MaritalStatus	Numeric	8	0	Marital status o...	{1, Married}...	999	8	Center	Nominal	Input
8	Household...	Numeric	8	0	Number of me...	{1, 1}...	999	13	Center	Nominal	Input
9	Income	Numeric	8	0	The responden...	{1, <10,000}...	999	8	Center	Ordinal	Input
10	Cars	Numeric	8	0	Number of car...	{1, 0}...	999	8	Center	Ordinal	Input
11	Motorcycles	Numeric	8	0	Number of mot...	{1, 0}...	999	8	Center	Ordinal	Input
12	SB1.1	Numeric	8	0	More trips of th...	{1, Stronglly...	999	8	Center	Ordinal	Input
13	SB1.2	Numeric	8	0	More trips of th...	{1, Stronglly...	999	8	Right	Ordinal	Input
14	SB1.3	Numeric	8	0	More trips of th...	{1, Stronglly...	999	8	Right	Ordinal	Input
15	SB2.1	Numeric	8	0	More trips of th...	{1, Stronglly...	999	8	Right	Ordinal	Input
16	SB2.2	Numeric	8	0	More trips of th...	{1, Stronglly...	999	8	Right	Ordinal	Input
17	SB2.3	Numeric	8	0	More trips of th...	{1, Stronglly...	999	8	Right	Ordinal	Input
18	SB3.1	Numeric	8	0	More trips of th...	{1, Stronglly...	999	8	Right	Ordinal	Input
19	SB3.2	Numeric	8	0	More trips of th...	{1, Stronglly...	999	8	Right	Ordinal	Input
20	SB3.3	Numeric	8	0	More trips of th...	{1, Stronglly...	999	8	Right	Ordinal	Input
21	SB4.1	Numeric	8	0	More trips of th...	{1, Stronglly...	999	8	Right	Ordinal	Input
22	SB4.2	Numeric	8	0	More trips of th...	{1, Stronglly...	999	8	Right	Ordinal	Input
23	SB4.3	Numeric	8	0	More trips of th...	{1, Stronglly...	999	8	Right	Ordinal	Input
24	SB5.1	Numeric	8	0	More trips of th...	{1, Stronglly...	999	8	Right	Ordinal	Input

Figure 3:Data input by using SPSS software

Data Extraction

The factors in this study are classified into three categories: sociodemographic, activity-travel behaviour, and social and mental health state. These groups will next be investigated to determine the relationship between the factors. Sociodemographic statistics aid in characterising the categories of respondents in this study. Furthermore, sociodemographic data will alter the time-space prism indirectly. Table 1 shows the sociodemographic questions asked in the survey. The response alternatives in Table 1 are unique to the Thailand dataset. While the Thailand dataset possibilities are changing Thai people's attributes.

Category	No	Answer Options
Gender	1	Male
	2	Female
Age	1	18-23
	2	24-45
	3	46-60
	4	>60
Highest Education	1	Master
	2	Bachelor
	3	Diploma
	4	Secondary Education
Occupation	1	Private employee
	2	Government employee
	3	Student
	4	Self-employed
	5	Not employed
Marital Status	1	Married
	2	Divorced
	3	Widowed
	4	Single

Household Member	1	1
	2	2
	3	3
	4	4
	5	5
	6	6
	7	7
	8	8
	9	>9
Total Household Income (Thai Bath)	1	<10,000
	2	10,001-15,000
	3	15,001-30,000
	4	30,001-50,000
	5	50,001-70,000
	6	70,001-100,000
	8	>100,000
Number of Private Car(s) in Household	1	0
	2	1-2
	3	3-4
	4	>4
Number of Private Motorbike(s) in Household	1	0
	2	1
	3	2
	4	>2

Table 1 :Sociodemographic Group

Category	Variable	Question Indicator
Daily Trips	T1	Average number of daily trips on weekdays
	T2	Average number of daily trips on weekends
Mode Choice of Trips	T3	Private car / motorcycle
	T4	Public transport
	T5	Ride hailing
	T6	Walking or cycling
Mandatory out-of-home activities	T7	Working/ Study trips
	T8	Groceries shopping trips
	T9	Food trips
	T10	Sport trips
	T11	Visit relatives' trips
	T12	Meeting close friends
	T13	Social Trip
Social out-of-home activities	OA1	Using Youtube
	OA2	Using Twitter
	OA3	Using Instagram
	OA4	Using Facebook
	OA5	Using Tiktok
	OA6	Using Tinder
Online Activities	OA7	Online investing or trading
	OA8	Blogging or microblogging
	OA9	Online gaming
	OA10	Work/study from home
	OA11	Online meeting
	OA12	Movie streaming
	OA13	Online grocery shopping
	OA14	Online shopping activities
	OA15	Ride-hailing services

Table 2 : Trip and Online Activities Variables

INTERPRETATION OF DATA

After inputting the data into the computer, the data will be interpreted. This process aims to provide a broader picture and understanding of the overall research findings. Data interpretation will sort out the key and important data that is required to achieve the objectives of the research. For instance, the software will interpret the mode of transportation of respondents and other relevant variables..

The Statistical Package for the Social Scientist (SPSS) programme will be used to examine all of the data that has been interpreted. SPSS is a data management and statistical analysis application with a wide range of data processing capabilities. It can investigate the association between an individual's travel behaviour and their level of well-being. It may also generate graphical displays of questionnaire data for use in reporting, presentations, and publishing. All of the information is electronically saved in a spreadsheet-like table. Multivariate analysis will be employed in this study to further investigate the effects of an individual's time-space restrictions and variability in activity-travel patterns. Multivariate analysis may examine several variables at the same time. The equation is as follows: $Y'_i = b_0 + b_1X_{1i} + b_2X_{2i}$

1.7 GANTT CHART

NO.	RESEARCH ACTIVITIES	MAY 2022 SEMESTER (FYP I)											
		W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12
1	Submission of Project Topic												
2	Background Study												
3	Problem statement & objectives												
4	Scope of Study												
5	Literature Review												
6	Methodology												
7	Preparation of Proposal Defense												
8	Submission of Proposal Defense												
9	Preparation of Interim Report												
9	Submission of Interim Report Draft												
10	Correction of Interim Report												
11	Submission of Final Interim Report												

Table 3 :Gantt Chart For FYP1

NO.	RESEARCH ACTIVITIES	SEPTEMBER 2022 SEMESTER (FYP II)													
		W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	W13	W14	W15
1	Project Work Continues															
2	Data Extraction and Input															
3	Submission of Progress Assessment 1															
4	Result Interpretation and Analysis															
5	Submission of Progress Assessment 2															
6	Draft Dissertation Submission (soft bound)															
7	Viva Presentation															
8	Final Dissertation Submission (hard bound)															

Table 4:Gantt Chart for Project

CHAPTER 4

Thailand's dataset 2021 is a survey that was undertaken to capture people's behaviour in multidimensional perceptions and how it relates to people's activities with time and space constraints. Thailand's dataset was compiled with up to 247 respondents in the Bangkok Metropolitan Area. The data part was divided into three components. The first portion asked respondents to provide information about their gender, age, employment, highest education, number of households, and household income. The next section contains travel behaviour-related questions that collected information on the respondent's travel behaviour during the epidemic stage. The last segment includes online actions carried out to meet individuals' needs and desires throughout the epidemic stage.

This dataset's individual sociodemographic characteristics are shown in the table below. More than half of the responses are women, and it is evident that the majority of respondents are single. Furthermore, respondents aged 18-23 years old had the biggest percentage in the respondents' age group, followed by those aged 24-45 years old.

The most prevalent educational background among respondents is a bachelor's degree (70%), followed by a master's degree (25%). While just 1.6% of persons have a diploma. Secondary education has 3.2% of responses. Furthermore, the majority of respondents (38.9%) work as private workers. It is followed by 30.8% of students and 10.1% of self-employed respondents. Finally, 12.5% of respondents were unemployed.

The table shows the differences in household income. It reveals that the majority of respondents were from upper-income households. In contrast, less than 10% of households are low-income. The majority of them have access to 1-2 private vehicles but no private motorcycles. Those with 3-4 automobiles and one motorbike in their families have the highest proportion of respondents with access to private vehicles. The average household size of responders is four individuals.

Category	No	Answer Options	Frequency	Percentage
Gender	1	Male	116	46.9
	2	Female	131	53
Age	1	18-23	120	48.6
	2	24-45	83	33.6
	3	46-60	32	13.0
	4	>60	12	4.9
Highest Education	1	Master	62	25.1
	2	Bachelor	173	70.0
	3	Diploma	4	1.6
	4	Secondary Education	8	3.2
Occupation	1	Private employee	96	38.9
	2	Government employee	19	7.7
	3	Student	76	30.8
	4	Self-employed	25	10.1
	5	Not employed	31	12.5
Marital Status	1	Married	30	12.1
	2	Divorced	1	0.4
	3	Widowed	4	1.6
	4	Single	212	85.8
Household Member	1	1	9	3.6
	2	2	15	6.1
	3	3	38	15.4
	4	4	109	44.1
	5	5	37	15.0
	6	6	20	8.1
	7	7	6	2.4
	8	8	4	1.6

	9	>9	9	3.6
Total Household Income (Thai Bath)	1	<10,000	8	3.2
	2	10,001-15,000	12	4.9
	3	15,001-30,000	33	13.4
	4	30,001-50,000	28	11.3
	5	50,001-70,000	42	17.0
	6	70,001-100,000	36	14.6
	8	>100,000	88	35.6
Number of Private Car(s) in Household	1	0	26	10.5
	2	1-2	128	51.8
	3	3-4	65	26.3
	4	>4	28	11.3
Number of Private Motorbike(s) in Household	1	0	115	46.6
	2	1	65	26.3
	3	2	39	15.8
	4	>2	28	11.3

Table 5:sociodemographic characteristics

The graph depicts the number of factors investigated for the Thailand dataset using the Screen Test criteria. This criterion is used following factor analysis using Kaiser's (1960) Rule, which removes the five components in the steep descending line to prevent multiple factor loadings in this dataset.

The component numbers in Figure are then altered depending on the commonalities of different variables in each component to make it easier to follow. Every variable's name represents one of three separate comparison periods: nationwide lockdown, partial lockdown, and currently.

The five extracted components are "Social Media Lovers," "E-Shoppers," "Conservative Users," "Work-oriented Users," and "Gamers," as illustrated in Table 6. Social Media Lovers are those who enjoy watching videos on YouTube,

Twitter, Instagram, Facebook, and Tiktok. Movie streaming, online shopping, online groceries, and ride-hailing services are all examples of E-Shoppers. Work-oriented users are those who work/study from home and meet for both work/study and non-work/study purposes. Finally, Gamers represents persons who are heavily involved in online gaming. The KMO and Bartlett's test for the Thailand dataset are shown in Table 6. The KMO score is more than 0.90, indicating that the data is excellent (Kaiser & Rice, 1974). A significant value greater than 0.5 expressing the following factor analysis is highlighted for further investigation.

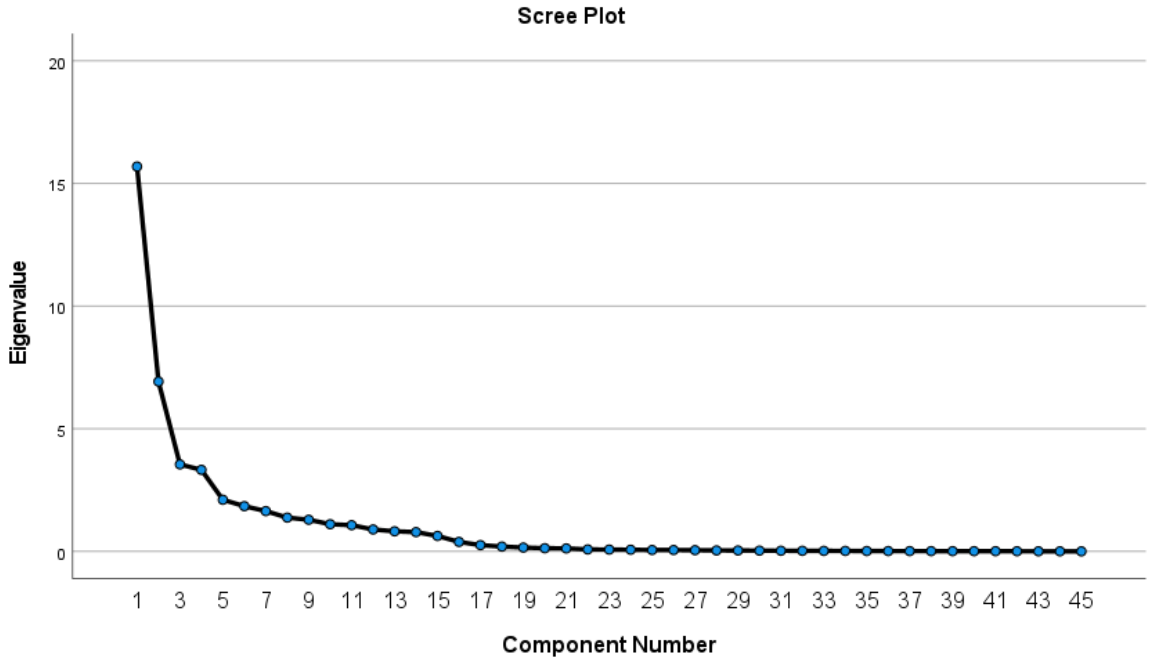


Figure 4:Scree Plot for Thailand Dataset

Variable	Component				
	Social Media Lovers	E-shopper	Conservative User	Work-oriented Users	Gamers
Youtubing activities	**0.825**	-0.135	0.003	0.178	0.191
Youtubing activities	**0.835**	-0.136	-0.030	0.141	0.188
Youtubing activities	**0.804**	-0.143	0.009	0.146	0.231
Twittering activities	**0.673**	0.323	0.302	-0.126	0.153

Twittering activities	**0.694**	0.279	0.301	-0.117	0.158
Twittering activities	**0.675**	0.296	0.307	-0.127	0.172
Instagram activities	**0.835**	0.010	0.193	0.162	0.089
Instagram activities	**0.827**	0.036	0.228	0.146	0.130
Instagram activities	**0.840**	0.038	0.189	0.157	0.101
Facebook activities	**0.767**	0.008	0.213	0.234	-0.070
Facebook activities	**0.751**	0.025	0.212	0.227	-0.057
Facebook activities	**0.750**	0.038	0.175	0.264	-0.070
Tik Tok activities	0.363	**0.689**	0.030	0.051	0.275
Tik Tok activities	0.353	**0.689**	0.034	0.077	0.299
Tik Tok activities	0.372	**0.679**	0.021	0.079	0.287
Tinder activities	-0.051	**0.899**	0.003	0.004	-0.025
Tinder activities	-0.050	**0.903**	0.002	0.007	-0.025
Tinder activities	-0.084	**0.903**	-0.013	0.020	-0.050
Stock and foreign currency trading or investment activities	0.126	0.437	**0.586**	0.101	-0.359
Stock and foreign currency trading or investment activities	0.182	0.424	**0.601**	0.161	-0.368
Stock and foreign currency trading or investment activities	0.153	0.351	**0.602**	0.171	-0.392
Blogging activities	-0.047	**0.807**	0.287	0.098	-0.068
Blogging activities	-0.075	**0.785**	0.296	0.100	-0.065
Blogging activities	-0.074	**0.796**	0.273	0.088	-0.076
Online game activities	0.285	0.266	0.135	0.316	**0.636**
Online game activities	0.307	0.249	0.121	0.334	**0.609**
Online game activities	0.294	0.249	0.121	0.333	**0.618**

Working/studying online activities	0.151	0.059	0.071	**0.765**	-0.009
Working/studying online activities	0.149	-0.024	0.080	**0.811**	0.156
Working/studying online activities	0.185	-0.003	-0.043	**0.797**	0.190
Meeting online	0.149	0.172	0.121	**0.728**	0.131
Meeting online	0.261	0.130	0.163	**0.749**	0.160
Meeting online	0.299	0.086	0.170	**0.757**	0.171
Movie streaming activities	**0.654**	0.059	0.173	0.395	0.117
Movie streaming activities	**0.652**	0.068	0.152	0.404	0.093
Movie streaming activities	**0.652**	0.098	0.107	0.391	0.092
Online grocery shopping activities	0.098	0.185	**0.743**	0.035	0.230
Online grocery shopping activities	0.140	0.188	**0.795**	0.040	0.165
Online grocery shopping activities	0.148	0.204	**0.786**	0.034	0.193
Online shopping activities	0.413	0.002	**0.693**	0.157	0.140
Online shopping activities	0.389	-0.029	**0.704**	0.149	0.138
Online shopping activities	0.396	-0.044	**0.699**	0.159	0.140
Ride-hailing services	0.141	-0.216	0.415	0.357	**0.515**
Ride-hailing services	0.162	-0.238	0.415	0.337	**0.545**
Ride-hailing services	0.205	-0.272	0.387	0.307	**0.561**
Extraction Method: Principal Component Analysis. Rotation Method: Promax with Kaiser Normalization					

Table 6 :Factor Analysis Result for Thailand Dataset

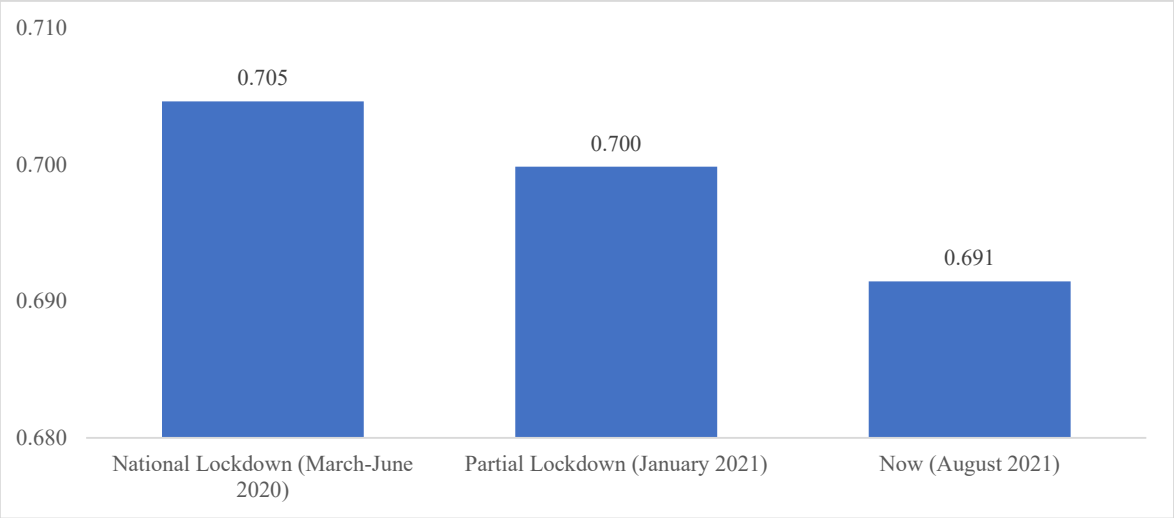


Figure 5 :Changes in Overall Online Activities in Thailand

The factor score analysis findings are analysed by producing a graph in Figure 6 that shows the comparison of online activities with each stage of Thailand's lockdown period. The largest variations occurred during the nationwide lockdown, when the mean scores differed by 0.705. It is possible to conclude that during the national lockdown, online activity increased. This is because some movement restrictions have been relaxed in comparison to now, when mobility limits are stricter. Most industries can reopen if they adhere to the government's SOPs. As can be seen, respondents' online activities have been lower than during the partial lockdown.

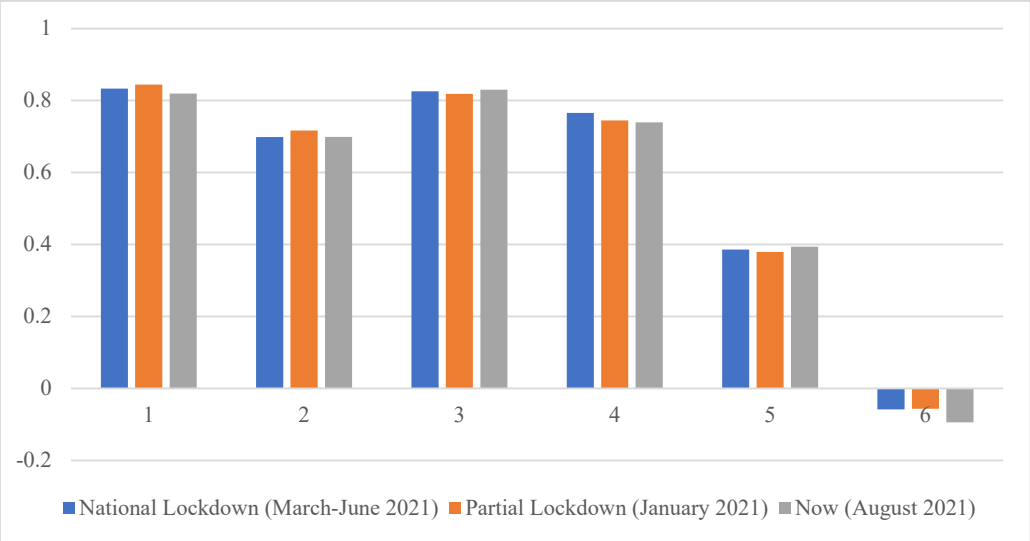


Figure 6:Changes in Different Online Activities in Thailand (1)

	1	2	3	4	5	6
	Youtubing activities	Twittering activities	Instagram activities	Facebook activities	Tik Tok activities	Tinder activities
National Lockdown (March-June 2021)	0.833	0.698	0.826	0.765	0.386	-0.058
Partial Lockdown (January 2021)	0.845	0.717	0.818	0.745	0.379	-0.056
Now (August 2021)	0.819	0.699	0.830	0.739	0.394	-0.094

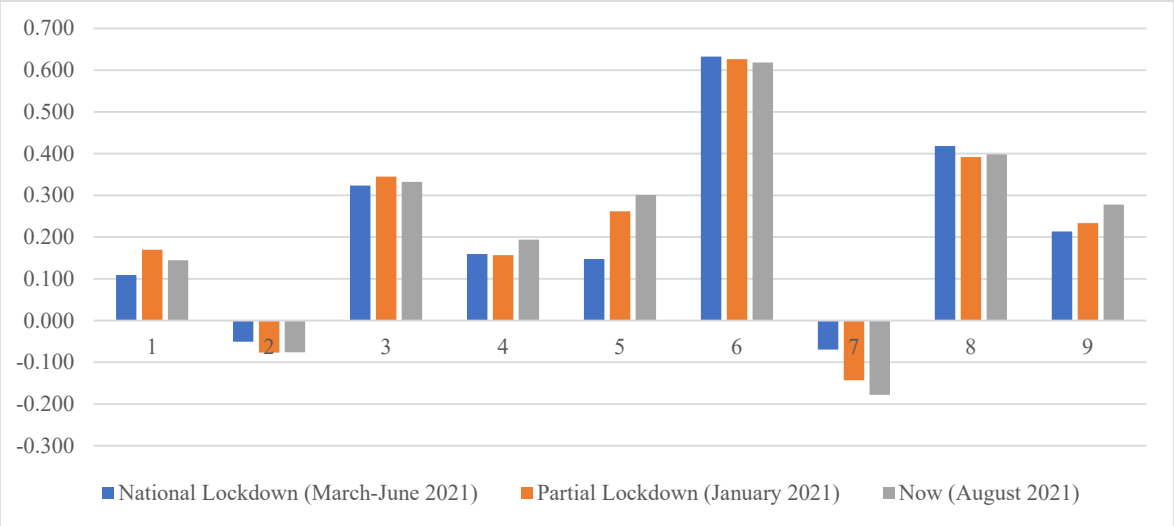


Figure 7:Changes in Different Online Activities in Thailand (2)

	1	2	3	4	5	6	7	8	9
	Investment activities	Blogging activities	Online game activities	Working/studying online activities	Meeting online	Movie streaming activities	Online grocery shopping activities	Online shopping activities	Ride-hailing services
National Lockdown (March-June 2021)	0.109	-0.051	0.323	0.160	0.148	0.633	-0.069	0.418	0.214
Partial Lockdown (January 2021)	0.170	-0.077	0.345	0.157	0.262	0.627	-0.143	0.392	0.233
Now (August 2021)	0.144	-0.076	0.332	0.194	0.301	0.618	-0.178	0.398	0.278

Figures 7 and 8 depict the results of respondents' engagement in various sorts of online activity. Based on such numbers, it is possible to deduce that various online activities fluctuate significantly across the three time periods. Some online activities stand out, such as online grocery buying, ride hailing services, tinder activities, and online dating. Other online activities, on the other hand, do not show significant variations between the three time periods studied.

Based on the results in Figures7 and 8, it can be observed that all of the mean scores were in the positive range, indicating that the use of all social media platforms was more intense than before the epidemic. For example, YouTube, Twitter, Instagram, Facebook, TikTok, Investment, Online Games, Online Meetings, Movie Streaming, Online Shopping, Ride Hailing Service, and Online Working/Studying Activities Other internet hobbies such as blogging, online grocery shopping, and Tinder are in the bad category.

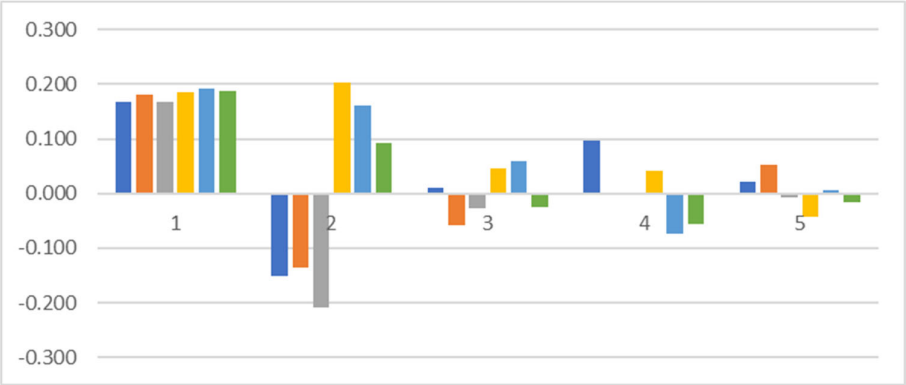


Figure 8:Trip activities on weekday and weekend in Thailand

	1	2	3	4	5
	Social Media Lovers	E-shopper	Conservative User	Work-oriented Users	Gamers
trips on weekdays before National lockdown	0.168	-0.152	0.011	0.098	0.023
trips on weekdays before Partial lockdown	0.181	-0.135	-0.057	0.000	0.053
trips on weekdays Now	0.167	-0.208	-0.027	-0.003	-0.007
trips on weekendsbefore National lockdown	0.185	0.202	0.046	0.042	-0.042
trips on weekends before Partial lockdown	0.193	0.161	0.059	-0.073	0.007
trips on weekendss Now	0.188	0.093	-0.025	-0.056	-0.016

Figure showed that trip activities on weekday and weekend in Thailand., it can be concluded that the overall social media lover were the highest usage compare to the other. While gamer and work oriented user have the lowest among other In the three stages of the pandemic in Thailand. Meanwhile e shopper and conservative user have less trip on weekday and more trip on weekend it may due to constraint limit. This is because weekend is a public holiday . This may affect by individuals travel and activity participation

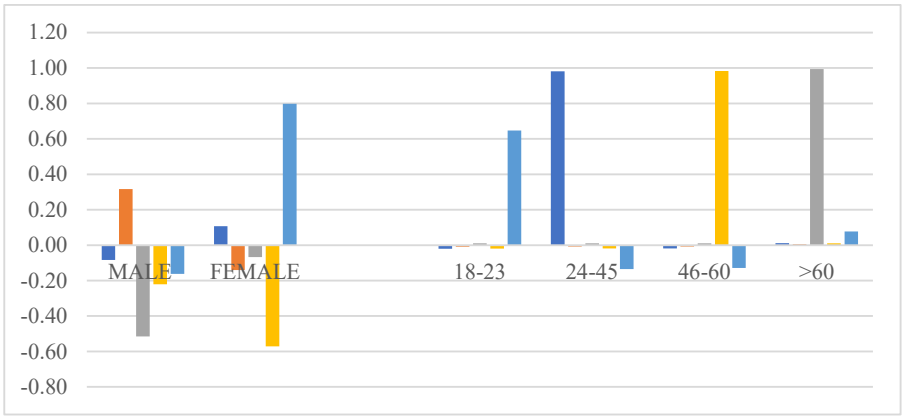


Figure 9 :Changes of Online Activity-pattern based on Sociodemographic in Thailand (1)

	GENDER			AGE			
	MALE	FEMALE		18-23	24-45	46-60	>60
Social Media Lovers	-0.08	0.11		-0.02	0.98	-0.02	0.01
E-shopper	0.32	-0.14		-0.01	-0.01	-0.01	0.00
Conservative User	-0.52	-0.07		0.01	0.01	0.01	0.99
Work-oriented Users	-0.22	-0.57		-0.02	-0.02	0.98	0.01
Gamers	-0.16	0.80		0.65	-0.13	-0.13	0.08

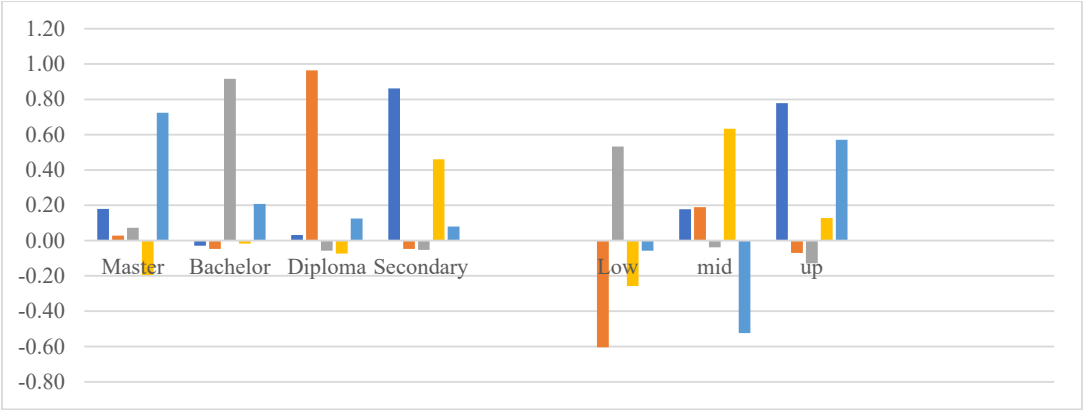


Figure 10:Changes of Online Activity-pattern based on Sociodemographic in Thailand (2)

	Highest Education					Income		
	Master	Bachelor	Diploma	Secondary		Low	mid	up
Social Media Lovers	0.18	-0.03	0.03	0.86		0.00	0.18	0.78
E-shopper	0.03	-0.05	0.96	-0.05		-0.60	0.19	-0.07
Conservative User	0.07	0.92	-0.06	-0.05		0.53	-0.04	-0.13
Gamers	-0.20	-0.02	-0.07	0.46		-0.26	0.63	0.13
Work-oriented	0.72	0.21	0.13	0.08		-0.06	-0.52	0.57

Figures 9 and 10 illustrate of various online activities based on individual characteristics. It can be observed that older persons have a greater frequency of most internet activities than younger people in three distinct eras since the COVID-19 pandemic attack. This is because elderly individuals have retired and have a lot of free time to engage in internet activities. Based on their gender, the results show that females are more involved in online activities than males. This is due to the fact that the number of male respondents who travel to undertake out-of-home activities is larger than the number of female respondents who do not do a lot of out-of-home activities. Furthermore, it is in a male's nature to engage in out-of-home activities because the majority of responders have a family and it is their responsibility to go out to work and support their family. Meanwhile, female respondents do not tend to travel to undertake out-of-home activities since we can assume that the majority of female respondents are full-time housewives who would engage in more online activities because they have a lot of free time. Furthermore, respondents with higher incomes appear to engage in more online activity than those with middle or lower incomes. This situation may occur because low-income respondents work the majority of the time and lack the resources and money to engage in online activities.

CHAPTER 5

CONCLUSION

The COVID-19 pandemic has caused many to re-examine their habits and priorities, and thereby, brought considerable changes to how people perform their everyday tasks. The mobility restrictions enforced by the government during the pandemic, people took less discretionary and socialising trips due to remarkable spatial and temporal constraints. The present research has set out to shed light on the dynamics of people's mobility-styles—including habits, predispositions, and higher-level orientations towards online activities and travels during the COVID-19 pandemic. As expected, work and study habits evolved from office and school to telework and e-learning, significantly cutting back out-of-home activities. This study effectively evaluated people's travel behaviour during the COVID-19 pandemic from the time-space prism perspective. Aside from that, certain variables will be taken from 2021 Thailand dataset and will be analyzed using multivariate analysis.

The results show that this preliminary research has successfully shown an overview of the interaction between travel behaviour and online acyivty pattern . Based on the results obtained, it shows that the relationship between single variable is not straight forward and significant. In fact, the variables affect each other in different ways. In short, we can deduce that the research outcomes shown the effect of socio-demographic on travel is relatively to online activity participated due to the remarkable spatial and temporal constraints. From the analysis, it can be seen spatiotemporal variables can also contribute on individual travel behaviour during the pandemic. In fact, they may influence each other coherent.

The current study offers useful and practical information for the government to take measures to efficiently control the current situation and also when a new pandemic breaks out.In addition, the ICT proliferation has brought new stakeholders into transportation planning and expanded its delivery scope, previously dominated by planning . Realising and quantifying the impact of teleworking on citizens' travel behaviour and consequently on traffic can be useful to policy makers and urban planners when reassessing and redesigning cities in a post-pandemic era. An improved transport planning system can definitely benefit us in the future by providing a more accurate transport system that can properly cater to our needs and demands. More research should be done to further enhance this idea so that we can develop more understanding and can hopefully incorporate the findings from this research into our transport planning analysis and system. With in-depth studies and accurate predictions of changes in travel behaviour we can co-create a future suited to our changing needs.

Future Works

In terms of future work, several steps can be taken to improve the research and increase its prominence, including emphasising the study's main point, collecting additional articles on the research topic, and reviewing case studies on the effects of changes of travel behaviour on online activity pattern during pandemic covid 19 . so the knowledge in these area can be increased. Other than that, the research can be more accurate if the survey conducts for a longer time and more respondents can participate in it. Apart from that, in order to further contribute to the research gap, the survey and analysis can be made with more detailed and complete data.Besides that, the knowledge to understand the analysis of the model must be learn faster as it can help to save time when to discuss the results later. so that the outcome of the results will be more variability

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