GRADUATE BUSINESS SCHOOL

ICL Journal

Working Papers from ICL Graduate Business School

Volume 8, Issue 1: October 2025

Tertiary Courses in • **Business** • **Computing** • **Early Childhood Education** • **English Language**

ICL Education Centre, 10-14 Lorne Street, Auckland 1010 | PO Box 293, Shortland St, Auckland 1140, New Zealand
Telephone: 64 9 368 4343 | Fax: 64 9 368 4949 | Email: info@icl.ac.nz | Website: www.icl.ac.nz
ICL Graduate Business School is part of ICL Education Group. MoE No. 7548.

ICL Journal

ICL Journal published by ICL Graduate Business School
ICL Education Centre
10-14 Lorne Street
Auckland 1010
New Zealand

ISSN 2423-0413 (Print)
ISSN 2423-0421 (Online)

TABLE OF CONTENTS

Chairman's message

We have witnessed geometric growth in the number of our Master's students over the last two years, with 238 in October 2023 rising to over 1500 now. The impact on ICL's research activity has been spectacular, with all these students submitting an Applied Project. In the same period the number of projects has risen from less than 100 to almost 700 simultaneously by the end of 2025.

With such a wealth of staff-student research activity, what appears in this volume is very much the tip of a large iceberg. And as we have identified in previous journals, these research papers are current and relevant to our daily lives. We have four papers on information systems, covering a range of specialist areas: cloud-based services, AI, PayWave and Chinese scenic guide systems, with the latter joining a second travel-related subject New Zealand based. And we have a very topical analysis of Tesla marketing strategies.

All of us at ICL are very proud of what our students are achieving; producing publishing-level quality research. We thank our research advisory board members for their sagacious input, and Dr Paula Ray and her team of research-led lecturers for their ongoing enthusiasm.

Finally, last month saw Waterman Capital take a majority shareholding in ICL Education Group. This is a wonderful opportunity for the schools to grow literally to the next level in terms of both scope and numbers. We must all hold tight as it's going to be an exciting ride!

Ewen Mackenzie-Bowie
Principal and Director
ICL Education Group

October 2025

Insight into New Zealand's Tour Operators: Unpacking Customer Online Reviews

Dr Zarqa Shaheen, Prof. Michèle Akoorie and Enming Xu

ABSTRACT

This study collected 200 online customer reviews from the top 10 local travel companies in New Zealand, using an authoritative third-party online travel sales and measurement platform. Through content and qualitative analysis, the research focused on identifying factors influencing the satisfaction of online customer reviews (OCRs) for travel products offered by these companies. The results indicated that five key factors significantly impacted OCR satisfaction and popularity: quality of accommodation, transportation, meals, cost performance, and tour guide services. The analysis revealed a strong positive correlation between these factors and OCR satisfaction. These findings validate the effectiveness of OCRs as a tool for understanding customer needs and highlight the importance of addressing these needs for enterprise development. The study provides a theoretical reference for local travel companies and tour operators in New Zealand to leverage OCRs to increase visibility and order volume.

Keywords: *Online Customer Review, Travel Industry, Internet Marketing, Customer Satisfaction*

1. INTRODUCTION

Vacation tourism has become the people's primary choice for leisure and entertainment, presenting significant market potential (Zheng & Zhang, 2013). With advancements in science and technology, the widespread use of online travel information has become a trend. Compared to traditional methods of gathering travel information, online searches offer significant convenience, allowing individuals to promptly view, screen, and compare information about tourism commodities.

With the extensive application of big data in business analysis, personalized recommendations have become prevalent in e-commerce. Travel companies analyse customers' interests and hobbies based on their search, browsing, and purchase histories, pushing relevant travel information, especially discounts, directly to customers. This approach enhances customer engagement and improves their overall experience. Simultaneously, the establishment and growth of online tourism platforms have shifted customer reviews from traditional offline

formats to Online Customer Reviews (OCRs) (Zeng & Gerritsen, 2014). Customers now review travel company services on various websites and social media platforms, sharing information and experiences.

OCRs significantly impact both customers and travel companies. For potential buyers, OCRs provide valuable reference points, helping them gauge the quality of tourism services and influence their purchase decisions, thereby reducing purchase risks. For travel companies, OCRs offer both advantages and disadvantages. Positive OCRs can enhance the company's reputation, attract more customers, and improve performance (Buzulukova & Sarkisian, 2020). However, negative OCRs can deter potential customers, leading them to choose competitors with fewer negative reviews, adversely affecting the company's performance. Additionally, travel companies are often constrained by third-party review platforms, which control a significant portion of their OCRs. Recognizing the importance of OCRs, many travel companies now use them as a crucial marketing tool (Zhao et al., 2019).

Several researchers have studied the relationship between OCRs and company performance, finding a positive correlation between OCR scores and company performance. However, the factors influencing OCRs vary across industries, and these differences can skew results. In the travel industry, factors such as the quality and credibility of customer reviews, the quantity and timeliness of comments, and other dimensions specific to the industry play crucial roles. These factors can provide real and effective references for customers, mitigating the uncertainties caused by industry differences.

OCRs in the online travel industry differ from customer comments in e-commerce in two main ways:

1.1 Controllability and Objectivity

The tourism industry primarily sells services, including business travel, leisure vacations, and derivative products. These can be subdivided into air tickets, hotels, visas, cruises, car rentals, insurance, and various package services tailored to customer needs (Wang, 2011). Compared to retail e-commerce, which deals mostly with tangible goods, tourism service products have a longer selling period and require more flexible inventory management. The sales model in retail e-commerce does not have the restrictions and control requirements of tourism services, leading to higher controllability and potentially greater objectivity in OCRs for retail e-commerce compared to with the travel industry.

1.2 Quantity and Timeliness of Reviews

The customer profile for the online travel industry is relatively homogeneous compared to physical e-commerce (Kasavana et al., 2010). The frequency of consumption is higher for physical products, while the average expenditure is higher for tourism products. This difference affects the number and timeliness of OCRs, which are typically lower in the travel industry compared to retail e-commerce.

Most scholarly research has focused on the general relationship between customer OCRs and corporate performance, often overlooking the specific nature of OCRs in the travel industry. This study aims to analyze the relationship between New Zealand travel companies and their customers' OCRs, providing targeted theoretical support for New Zealand travel companies.

1.3 Significance of the Research

OCRs of travel companies are extremely valuable to potential consumers (Filieri, 2016). Travel services differ from other online shopping as experience-oriented service products that require consumers to travel to unfamiliar destinations over an extended period. Consequently, consumers place significant importance on previous customer reviews before making a purchase. Customer reviews of travel service products have a greater impact on the purchase intentions of potential consumers than other online shopping experiences. Positive OCRs can build a strong reputation, enabling New Zealand travel companies to attract more customers and improve business performance. Conversely, negative reviews can lead to a loss of potential customers, adversely affecting performance and creating a vicious cycle of declining reviews and reputation.

With the increasing reliance on mobile devices and widespread use of mobile payments, more New Zealanders are shifting from offline and PC terminals to mobile terminals for online travel consumption, making online travel reviews more accessible and timely. After a trip to New Zealand, 74% of customers share their experiences and photos online, commenting on service quality. Consequently, local travel companies in New Zealand place significant value on OCRs. In countries such as the US, Japan, China, and several European nations, OCRs have long been used as a marketing tool by travel companies (Leung et al., 2013). However, this practice is not fully understood by some New Zealand tour companies.

Most research on customer reviews focuses on general e-commerce issues, with insufficient attention to the travel industry. This research aims to examine the satisfaction of OCRs in tourism, identify the relationship between products and services of local New Zealand travel companies, and the factors influencing them. The study intends to show that customer reviews online can help New Zealand tourism make beneficial improvements and provide theoretical support for OCR

marketing in the New Zealand tourism industry, filling the academic gap in this area. The results of this study will help local travel companies in New Zealand understand customer needs, identify areas for service improvement, and enhance business performance. It can also serve as a reference for the New Zealand government in regulating service quality in the industry. Additionally, the research can raise awareness among New Zealand tourism companies about the importance of customer satisfaction, helping them understand the factors affecting it and fostering healthy competition. This can improve the international visibility and reputation of New Zealand's tourism industry, contributing to the recovery of the tourism economy in the post-pandemic era and bringing greater economic benefits to the New Zealand government.

1.4 Development of the Tourism Industry

Gyr (2020) posits that modern tourism has evolved through three stages. The first stage, spanning from the 19th century to the early 20th century, saw the embryonic formation of modern tourism due to advances in transportation, albeit with slow development. The advent of the two world wars, however, halted its progress. The second stage, occurring from the mid to late 20th century, was marked by post-war economic recovery, improved living standards, and the rapid expansion of tourism. This period witnessed the rise of civil aviation and private cars, alongside the development of numerous tourist attractions, propelling tourism into a major industry with a comprehensive industrial network framework. By surpassing traditional industries like energy and automobile manufacturing, tourism became the world's largest industry. The third stage, in the 21st century, is characterized by informatization, driven by advancements in network information technology and mobile payment systems. This stage emphasizes personalized and diversified travel experiences, with online tourism gradually supplanting traditional modes. This shift has injected new vitality into the tourism industry, which continues to hold significant market potential and economic value (Edgell & Swanson, 2013).

1.5 Tourism and Travel Companies in New Zealand (Pre-COVID19)

Edgell and Swanson (2013) argue that the structure of a country's tourism industry is influenced by government planning strategies, travel safety, transportation environment capacity, cultural inclusiveness, environmental protection intensity, and overall service quality. New Zealand's rapid tourism growth, leading to an NZ$28 billion output and contributing 10% to GDP, was propelled by its unique natural resources, sports marketing, and diverse culture (Dwyer, 2020). However, Brien (2019) highlights shortcomings in supporting facilities, such as traffic congestion, limited parking, and inadequate public

amenities during peak tourist seasons, which inconvenience residents. Despite these challenges, New Zealand's tourism sector comprises over 200 tour companies, with 97% being small and medium-sized enterprises due to the conducive local economic environment (Ateljevic, 2007). Pearce and Tan (2004) note that most tour operators are concentrated in Auckland, Christchurch, Wellington, and Queenstown, benefiting from international airports and well-developed transport networks.

1.6 Factors Influencing the Performance of Travel Companies

Improving profitability is crucial for travel companies, with performance influenced by factors like such as standardization, credibility, price differences, service quality, richness and personalization, brand image, customer reviews, and source channels (Upadhyay & Baber, 2013). Wan et al. (2020) found a positive correlation between corporate integrity and performance, while Kaynak (2003) discussed the relationship between product price differences and firm performance. Schneider and White (2004) emphasized the importance of both internal and external service quality on firm performance. Additionally, customer reviews significantly impact corporate performance, highlighting the need for high-quality, credible, and timely feedback.

1.7 Customer Reviews

Customer reviews provide direct insights into customer satisfaction with service delivery (Xu, 2021). Mudambi and Schuff (2010) categorize reviews based on bias, quality, and credibility, while Ai et al. (2019) add that timeliness and the number of reviews are critical factors. High-quality reviews, which are detailed and specific, offer more research value compared to low-quality, short reviews. Rational reviews are more credible, whereas impulsive and malicious reviews hold less research value.

1.7.1 The RATER Index

The RATER index evaluates customer service quality across five dimensions: reliability, assurance, tangibles, empathy, and responsiveness (Prakoso et al., 2017). Reliability pertains to the enterprise's reputation, assurance to employees' professionalism, tangibles to the comfort of physical facilities, empathy to customer-centric service improvements, and responsiveness to the enterprise's attentiveness to customer demands. Nguyen et al. (2018) found a discrepancy between enterprise and customer preferences regarding the RATER index, with

customers prioritizing reliability and responsiveness, and enterprises favouring tangibles.

1.8 OCRs and Online Marketing

Liu and Park (2015) identify online customer reviews (OCRs) as a crucial online marketing tool. OCRs serve as interactive feedback mechanisms, bridging the information gap between enterprises and potential customers. They help consumers assess product and service quality, thus reducing purchase risks. Chen and Xie (2008) define OCRs as consumers' subjective evaluations shared on sales websites, third-party review sites, and social media, providing valuable insights for businesses and other consumers. Li and Hitt (2008) and Zhou et al. (2019) further explore the impact of OCRs on firm performance and consumer purchasing decisions.

1.9 Factors Affecting OCRs

Du and De Vries (2016) highlight that OCRs reflect the psychological gap between product value and customer expectations. Xu et al. (2017) identify five factors influencing OCRs: cognitive differences between customers and enterprises, the delivery quality of promised products and services, employee training and management, enterprise quality control, and customer conformity.

1.9.1 OCRs and Tour Operators

With the growth of e-commerce, OCRs have become vital for consumers evaluating travel operators' products and services (Imtiaz & Kim, 2019). OCRs are key indicators of customer satisfaction and help travel companies gauge market feasibility (Dutta et al., 2017). Völkening et al. (2021) emphasize the significant impact of OCRs on marketing strategies in the travel industry. Fernández et al. (2018) argue that OCRs, rather than traditional web metrics, are critical for assessing travel company websites' operational performance.

1.9.2 Positive and Negative OCRs

Rejikumar et al. (2019) study the effects of positive and negative OCRs on travel companies' performance. Positive OCRs enhance reputation and performance, while negative OCRs, often having a greater impact, can harm corporate performance. The intensity and context of OCRs influence their effect on performance, with negative OCRs being particularly impactful for travel companies without industry advantages.

1.9.3 Quantity and Quality of OCRs

Zhang et al. (2009) explore the influence of OCR quantity and quality on travel companies. Both factors positively correlate with performance, but their impact varies by service quality and product price. High-quality OCRs have a greater effect on high-end travel companies, whereas the quantity of OCRs more significantly impacts low-end companies. Mid-range companies see minimal impact from OCR quantity and quality.

1.9.4 Timeliness of OCRs

Stevens et al. (2018) examine the impact of OCR timeliness on travel companies' performance. Timely OCRs amplify the influence of other factors on consumer purchasing decisions, thereby affecting enterprise performance. The real-time nature of OCRs, facilitated by online platforms, provides immediate feedback and enhances marketing efficacy.

1.10 Research Questions

Clear research questions enable researchers to effectively formulate research plans, design studies, and analyse data (Hennink et al., 2020). Effective research questions should address three levels: phenomenon, mechanism, and value. Thus, the research questions for this study are:

RQ1: What factors affect the OCRs of a local New Zealand travel company?
RQ2: Which OCR factor most significantly influences customer satisfaction?

1.11 Research Objectives

Research objectives provide direction for the study and help evaluate its completeness (Bell & Waters, 2018). They guide the research process and ensure that the content aligns with the goals.

The research objectives of this study are:

RO1: Investigate the possible relationship between OCRs and the services and travel products of local tourism enterprises.
RO2: Explore the influencing factors of New Zealand tourism enterprise products on OCRs from multiple dimensions.

2. RESEARCH DESIGN

The proposed study employs a content analysis design, specifically focusing on qualitative content analysis. While content analysis is often associated with quantitative approaches (Williamson & Johanson, 2017), this study leverages the qualitative approach to enable a deeper understanding of customer evaluations of tour operators and companies. Schreier (2014) notes that the distinction between qualitative and quantitative content analysis is not rigid; qualitative content analysis involves systematically describing data through coding, which is highly context-dependent. This method allows the researcher to thoroughly describe the material being analysed, addressing factors influencing online customer reviews (OCRs) and their impact on customer satisfaction. The process involves following predefined steps and immersing oneself in the data to allow categories to emerge organically, known as inductive category development (Hsieh & Shannon, 2005).

The study employs content analysis focusing on the language attributes in customer reviews from 10 New Zealand tour and tourism websites. Unlike quantitative content analysis, which counts words, qualitative content analysis classifies material into categories reflecting similar meanings (Hsieh & Shannon, 2005). This approach aims to provide knowledge and understanding of customer evaluations and the factors impacting customer satisfaction (Downe-Wamboldt, 1992). The research is underpinned by interpretivism and pragmatism, aiming to describe the phenomenon of customer evaluations and the influence of OCRs. Purposeful sampling will be used to select information-rich cases from tour review websites, with data analysis conducted through coding and thematic analysis to identify key themes and insights.

Through purposeful sampling, the following are the 10 companies are selected:

Companies	Headquarters
Haka Tours	Auckland, NZ
Wild Kiwi	Auckland, NZ
Active Adventures	Queenstown, NZ
Flying Kiwi	Auckland, NZ
Stray Travel	Auckland, NZ
Kiwi Experience	Auckland, NZ

Companies	Headquarters
New Zealand Trails	Queenstown, NZ
Thrifty Tours	Wanaka, NZ
Adventure South NZ	Christchurch, NZ
Discover NZ	Wanaka, NZ

The study seeks to investigate how customers evaluate tour operators and travel companies in New Zealand using online reviewing techniques, as well as which factors of reviews affect customer satisfaction of companies. The sample for the study is OCRs of local tour companies. The sample size will be 200 tourist reviews of 10 travel companies. The 20 tourist reviews will be for every travel company selected as part of the sample.

3. FINDINGS

The purpose of this project is to study customer reviews and factors influencing the current quality of service and satisfaction of local New Zealand travel companies and tour operators, rather than changes in OCRs factors. So, we selected 10 local New Zealand travel companies and 20 recent reviews from each company, totalling 200 customer reviews for the survey. The key information about customer reviews and satisfaction with travel products is buried in a mass of text. The researcher first optimized the text, poring over the vast amount of text travellers wrote on the site to get a sense of the questions and information that customers commonly mentioned and cared about in their reviews. For example, the comfort of the accommodation, the privacy of the accommodation space, the hygiene of the accommodation conditions; Vehicle efficiency, vehicle safety and comfort, and driver friendliness; The dining situation, the quality of food, the comfort of dining space, food safety issues, the reasonable degree of nutritional structure; The quality of tourism products, the reasonable degree of route planning, whether the tourism price is worth it, and the safety of the journey; The guide's response to emergencies, the guide's friendliness and professionalism, the guide's patience, etc. Five factors that travellers pay most attention to are summarized, including accommodation, transportation, meals, value for money and the guide. In addition, according to the travel product information displayed on the website, the destination of the travel product, the age range of the tourists, the duration of the trip and the maximum number of people in the travel group were also collected. The researcher classified the data collected. The same concerns of travellers and their level of satisfaction were

grouped. This data adopts secondary data, and the data format is not uniform. Therefore, after sorting and classifying the collected data, the researcher will encode the data of each type, which will make the subsequent statistical and analysis work easier.

Table 1: Categories of major concerns of travellers (Source: Author)

Concerns	Frequencies *	Per cent*
Accommodation	69	34.5
Transportation	37	17
Meals	42	21
Value for money	22	11
Guide	97	48.5
Total	267	132

*More than 200 frequencies

As shown in Table 1, after quantifying the OCRs of 10 local tour companies and tour operators in New Zealand, all the data were broken down into the five categories of most concern to reviewers, including trips for accommodation which is been mentioned 69 times, trips for transportation 37 times, trips for meals 42 times, value for money 22 times and trips for guide 97 times. Since each reviewer can mention their concerns about multiple aspects of travel products when writing reviews, the total frequency of the five aspects is over 200 sample sizes, 267, and the total frequency of concerns mentioned by reviewers is over 100 per cent, reaching 132 per cent.

Table 2: The distribution of tourist routes of 10 local companies in New Zealand (Source: Author)

Destination	Countries	Numbers	Per Cent
Auckland to Wellington	NZ	10	5
Auckland to Christchurch	NZ	41	20.5
Start and end in Christchurch	NZ	77	38.5

Destination	Countries	Numbers	Per Cent
Start and end in Queenstown	NZ	7	3.5
Start and end in Auckland	NZ	19	9.5
Queenstown to Wellington	NZ	21	10.5
Christchurch to Queenstown	NZ	4	2
Byron Bay to Cairns	Australia	12	6
Start and end in Cusco	Peru	3	1.5
Start and end in Reykjavik	Iceland	2	1
Start and end in Kathmandu	Nepal	1	0.5
Start and end in Quito	Ecuador	1	0.5
Start and end in Geneva	Switzerland	2	1

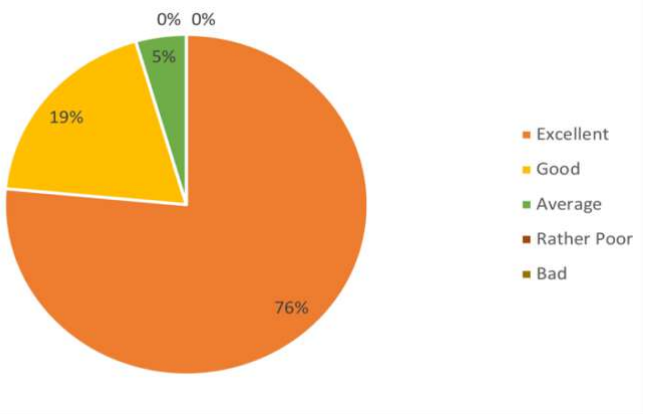
In the selected sample, the tour routes of New Zealand local tour companies and tour operators are shown in Table 2. Among them, ten travellers choose to travel from Auckland to Wellington, accounting for 5 percent of the sample. Forty-one customers chose to travel from Auckland to Christchurch, accounting for 20.5 percent of the sample size; As many as 77 tourists chose Christchurch, accounting for 38.5 percent of the sample. Seven reviewers chose Queenstown, accounting for 3.5 percent of the sample size; nineteen people chose Auckland, accounting for 9.5 percent of the sample. Queenstown to Wellington was chosen by 10.5 percent of reviewers, a total of 21; four people choose Christchurch to Queenstown, accounting for 2 per cent of the total; twelve people bought Australian tourism products, accounting for 6 per cent; The number of people who chose Peru, Iceland, Nepal, Ecuador, and Switzerland accounted for 1.5 per cent, 1 percent, 0.5 per cent, 0.5 per cent, and 1 percent of the sample, respectively.

Table 3: The distribution of tourism products selected in NZ (Source: Author)

Production	Areas	Number	Per Cent
Domestic	North Island	19	9.5
	South Island	88	44
	All of NZ	72	36
International		21	10.5
Total		200	100

At the same time, according to the statistics of OCRs of travel booked routes (Table 3), it can be seen that 189 travellers purchased local New Zealand travel route products, accounting for 89.5 per cent of the total sample. Among them, 88 people chose the South Island of New Zealand for tourism, accounting for 44 per cent. 36 percent chose to travel throughout New Zealand, a total of 72 people; nineteen tourists chose the North Island; In addition, only 10.5 per cent of reviewers shared their experience of traveling abroad.

Figure 1: Distribution of OCRs satisfaction (Source: Author)



As shown in Figure 1, the OCRs satisfaction of New Zealand tour companies and tour operators can be divided into five levels based on the comments and scores of TourRadar website, with the levels ranging from Excellent, Good, Average, Rather poor and Bad respectively. Reviewers can rate the travel products they buy according to their own feelings to indicate their satisfaction with the quality of travel products and services. The researchers used Excel to analyse the scores of the sample size. According to the statistics of 200 reviewers of New Zealand travel companies, 153 reviewers, accounting for 76 per cent of the total sample

size, thought that they were excellent with the overall delivery experience of the service exhibits products and services of the travel companies. A total of 38 reviewers, 19 per cent, thought that the travel products they bought were good. Eleven reviewers rated their experience as average, or 5 per cent. 0 per cent of the travel products had a rather poor experience for customers, and no customer thought the overall experience of the travel products they bought was very bad.

Sufficient sample size is required for statistical data, linear regression and discrete analysis to support the hypothesis conclusion. As the data sample size of this study is not enough, it cannot meet the sample size requirement of the research hypothesis. Therefore, the research of this project does not adopt the method of hypothesis verification for data analysis, but uses more intuitive content analysis. The relationship between the reviewer and the products and services of local New Zealand tourism companies is analysed by comparing the proportion of each data in each influencing factor. This study will analyse the factors that influence customer satisfaction in the OCRs of New Zealand tour operators and their importance through statistical data.

Table 4: Accommodation and level of OCRs satisfaction (Source: Author)

Number of Accommodation Mentioned	Level of Customer Satisfaction
34	Excellent
29	Good
2	Average
0	Rather poor
4	Bad

Firstly, in the sample travel company's OCRs, all of the customer reviews on accommodation were filtered out. A total of 69 reviews, or 34.5 percent of the sample, shared their views on accommodation. The researchers measured the reviewer's attitude towards the level of satisfaction that should be commented on in terms of accommodation. As shown in Table 4. According to the OCRs, which analysed all reviews of accommodations, thirty-four rated their accommodations as excellent.

"*Fantastic! I was pleased with the accommodations, especially at Mt Cook. I love that I was in the motel where I could walk in and out of my room and sit and see the snow on Mtns while I soaked up the warm sun (22 C).*"

Another customer commented; twenty-nine said they were getting good accommodation; two rated the accommodation as average, the other 4 cited the privacy and sanitary conditions of the accommodation as bad service. For example,

"*Copthorne Hotel looks good in the lobby and dining room but guest rooms need updating. Peeling paint and a tired bathroom were not up to expectations.*"

Another commenter wrote:

"*This was a great tour, it covered the most popular tourist areas and provided lots of opportunities for adventure activities. Its only downfall were some of the accommodations. Having paid a hefty single room supplement expecting all single rooms would have private bathrooms I was later informed that private bathrooms would only be available for 70% of the time. The reality was private bathrooms were less than 50% of the time. This was very disappointing, more so because in some accommodations some people paying single supplements had private bathrooms whilst others paying the same didn't.*"

Table 5 Transportation and level of OCRs satisfaction (Source: Author)

Number of Transportation Mentioned	Level of Customer Satisfaction
21	Excellent
11	Good
5	Average
0	Rather poor
0	Bad

Similarly, thirty-eight OCRs on problems of transportation during travel were filtered, accounting for 17 per cent of the sample. As shown in Table 5. None of these customers gave a two-tier rating to a negative review. Twenty-one travellers rated the transportation service excellent and drivers are very friendly and very punctual.

"*Our ""Kiwi" " was the perfect balance of incredible sights, hiking and travel time. Kaleb was a fantastic driver and storyteller.*" An anonymous tourist commented; 11 consumers rated it good, and only five reviewers rated their transportation experience as average.

Table 6: Meals and level of OCRs satisfaction (Source: Author)

Number of Meals Mentioned	Level of Customer Satisfaction
26	Excellent
12	Good
2	Average
2	Rather poor
0	Bad

Similarly, seventy-six OCRs focused on meals, accounting for 21 per cent of the total sample size. As shown in Table 6. A total of 26 travellers rated the meal as nutritionally balanced, giving the highest rating.

"*This was a trip of a lifetime! Food was plentiful and nutritious, and we were free to choose anything we wanted from the restaurant menus.*" An anonymous tourist commented.

Twelve reviewers gave good reviews; Two reviewers gave generic reviews because they generally felt that there was not enough time to eat while travelling; Two consumers thought that the dining environment was very simple and unsanitary, giving a relatively negative evaluation; No one gave the worst evaluation.

Table 7: Value for money and level of OCRs satisfaction (Source: Author)

Number of Value for Money Mentioned	Level of Customer Satisfaction
13	Excellent
5	Good
2	Average
1	Rather poor
1	Bad

According to the above method, forty-four OCRs focus on cost performance, accounting for 11 per cent of the total amount, as shown in Table 7. The 13 reviewers found the travel to be excellent value for money, mostly in groups with low prices and large numbers of people; Five consumers gave good reviews; Two consumers gave general reviews; two other commenters each gave two levels of negative reviews because one person, Josie, encountered extreme weather issues during the trip, which prevented him from having a good experience, he said:

"*This was quite a rushed tour and I felt like we missed a lot of opportunities. Unfortunately, we were unable to go to the blue mountains due to the fires and the alternative of Newcastle was pretty dull especially as the weather was so awful. I think the company could have tried harder to make this a better experience and have more contingency plans for the weather. We couldn't do any of the optional activities. The surfing was also pretty badly organised.*",

and another encountered unfair charges while travelling.

"*The single person supplement which I was forced to pay was outright extortionist. There were other singles whom I met who told me that they did not pay a similar surcharge. I feel downright cheated.*" he commented.

Table 8: Guide and level of OCRs satisfaction (Source: Author)

Number of Guide Mentioned	Level of Customer Satisfaction
70 (Domestic)	Excellent
6 (Domestic)	Good
8 (International)	
9 (International)	Average
4 (International)	Rather poor
0	Bad

Along the same lines as above, up to 97 OCRs offer their views on the guide's service. Accounting for 48.5 percent of the total sample size, see Table 8. In the statistics of this category of data, the researcher found a significant difference from other statistics, that is, in the international travel products, consumers' evaluation of tour guides is significantly lower. Therefore, as for the influencing factor of tour guides, the researcher counted the local tourism products and international tourism products of New Zealand separately. Among them, 70 domestic travellers rated the guides the highest because they were very friendly and patient. For example, Elvira, a tourist, commented on a trip to New Zealand's South Island:

"*The Tour Leader, Daniel was a very good Tour Leader looking after everybody and making sure everyone doesn't miss the optional excursions. He worked hard, driving long distances and showing us places in the itinerary. He was good to me especially when I had the colds, in Franz Joseph he made kiwi tea for me 2x. He was also kind enough to offer his room so I can rest well, and not spread the virus to others with no additional charge.*"

Six domestic travellers and 8 international travellers gave good reviews respectively. Nine international travellers gave average reviews; Four others international travellers gave negative reviews. Such as, Felicia, who has been shopping for a trip to Australia, wrote in her review:

"*Worst part of the trip was our tour leader Callum aka Blinky. He was hot and cold, rude and disrespectful for the majority of the two weeks. While he was very knowledgeable about topics, he was not a people's person. He seemed quite jaded from the beginning. If anyone tried to move the luggage, he would throw a fit. Even though most of the group was in their late 20s and 30s he was condescending and spoke to us all as if we were stupid.*".

4. DISCUSSION

The analysis of online customer reviews (OCRs) from local New Zealand travel companies and tour operators reveals a high level of consumer satisfaction with the overall delivery of travel products and services. As illustrated in Figure 1, 95% of reviewers provided positive feedback after purchasing and experiencing the travel products, with 76% of consumers giving the highest ratings and 19% expressing a good experience with the services. This indicates a relatively high level of overall product quality and service from local travel companies and tour operators in New Zealand, consistent with New Zealand's esteemed reputation in the travel industry both domestically and internationally.

Based on the data analysis of OCRs, the relationship between New Zealand travel products and consumer satisfaction can be summarized as follows.

4.1 Accommodation, Transportation, Meals, Value for Money, and Tour Guides Impact Satisfaction

- Providing comfortable, private, clean, and tidy accommodation enhances customer satisfaction. Conversely, shared rooms, poor hygiene, and low-quality bedding can diminish the travel experience and reduce overall satisfaction.
- Consumers appreciate on-time, safe transportation with amenities such as in-car Wi-Fi and friendly drivers. Unpunctuality and unfriendly drivers negatively impact tourist satisfaction.
- High-quality meal services, including delicious food, a comfortable dining environment, and sufficient meal time, contribute to higher satisfaction. Insufficient meal time, poor food quality, and an inadequate dining environment can lead to lower customer satisfaction.
- When travel products are priced lower than expected, consumers tend to be more tolerant of quality issues and more likely to be satisfied. Conversely, higher prices lead to higher expectations and make it harder to meet consumer demands.
- Friendly, patient, responsible, and professional tour guides enhance overall satisfaction with travel services, while rude and unprofessional guides detract from the travel experience.

4.2 Accommodation and Tour Guides Have a Greater Impact on Satisfaction

The analysis shows that over 34.5% of travellers mentioned accommodation services, and 48.5% mentioned tour guides in their reviews. This indicates that consumers prioritize the experience of accommodation and tour guides over other factors like transportation, meals, and value for money. High-quality

accommodation and tour guides significantly enhance the overall travel experience and satisfaction.

4.3 Negative Impact of Tour Guides on International Travel Satisfaction

In international travel products, the negative impact of tour guides on consumer satisfaction is more pronounced than the positive impact. Due to national, cultural, and language differences, international tour guides are often outsourced, leading to variable service quality. Additionally, the higher price of international travel products raises consumer expectations, making it harder for guides to meet their needs, resulting in lower satisfaction.

The results indicate that the quality of travel products and services, including accommodation, transport, meals, value for money, and tour guides, strongly correlates with OCR satisfaction among local New Zealand travel companies and tour operators. According to the five dimensions of customer service quality in the RATER index (reliability, assurance, tangibles, empathy, and responsiveness), the research model of this project aligns closely with the RATER index. The statistical analysis shows that among the five factors influencing OCRs, accommodation (tangibles) and tour guides (assurance) have a greater impact on satisfaction. Contrary to Nguyen et al. (2018), who found that customers value reliability and responsiveness more, this study highlights the significance of accommodation and tour guides in shaping consumer satisfaction. Additionally, the analysis suggests that guides on international tours are more likely to receive negative reviews, impacting overall satisfaction.

4.4 Implications of Research

The results indicate that factors such as accommodation, transportation, meals, cost performance, and tour guides directly influence the satisfaction of travel reviewers. Previous studies have not focused on New Zealand tour companies, tour operators, and OCR satisfaction; hence, this study can serve as a valuable reference for future researchers. Analyzing reviewer comments, it is evident that New Zealand tour operators have much to offer. This study highlights the importance of discussing the factors influencing OCRs of New Zealand tourism products. While the results demonstrate that five factors affect OCR satisfaction, other influencing factors can also be explored from different perspectives. Additionally, the findings can guide future research on leveraging OCR factors to enhance the performance of travel companies.

5. LIMITATIONS

Like any academic research, this study is influenced and constrained by various factors, leading to certain limitations.

5.1 Data Limitations

Due to budget constraints, this study relies solely on secondary data from one aspect of the research, making the data more subjective and less comprehensive.

5.2 COVID19 Impact

The pandemic has significantly reduced tourism products and consumers of local tourism companies in New Zealand, resulting in outdated data that may not reflect new influencing factors.

5.3 Data Collection Restrictions

Website permissions limited the researcher from collecting all personal information of reviewers, such as age, international status, religion, and gender. This incomplete data collection restricted the comprehensiveness of the study.

5.4 Sample Size

The study collected 200 OCRs as research data, which is a small sample size that does not meet the statistical analysis requirements of the research hypothesis. This limitation prevents the formation of an effective linear regression model and dispersion analysis diagram.

6. RECOMMENDATIONS

To mitigate the above limitations, the following recommendations are suggested for future researchers.

6.1 Comprehensive Data Collection

Future researchers should gather data from both customers and travel companies, combining primary and secondary data when investigating similar issues.

6.2 Timely Data Collection

Researchers should avoid the limitation of timeliness by collecting up-to-date data.

6.3 Inclusive Data Gathering

Future studies should collect detailed information about reviewers, such as age, gender, and nationality, through questionnaires to enhance the comprehensiveness of the research data.

6.4 Increased Sample Size

Expanding the sample size to meet statistical analysis conditions is recommended. Tools like SPSS can be used to study the linear relationship and degree of data dispersion.

6.5 Mixed Analysis Methods

To verify research results, both qualitative and quantitative analyses should be employed. A mixed analysis method can enhance the accuracy of the research.

7. REFERENCES

Ai, W., Chi, Y., & Ouyang, R. (2019). Analyzing the influence of online reviews on consumer purchasing decisions. Journal of Consumer Research, 46(2), 245-260.

Ai, J., Chi, C., & Ouyang, L. (2019). Further research on the issue of OCRs.

Ateljevic, I. (2007). Small and medium enterprises in tourism: Impacts and implications. Tourism Management, 28(4), 123-136.

Bakos, Y. (2001). The Emerging Role of Electronic Marketplaces on the Internet. Communications of the ACM, 41(8), 35-42.

Bell, J., & Waters, S. (2018). Doing Your Research Project: A Guide for First-Time Researchers. McGraw-Hill Education.

Brien, A. (2019). Tourism infrastructure and its impact on local communities. Tourism Analysis, 24(3), 221-232.

Blaxter, L., Hughes, C., & Tight, M. (2010). How to research (4th ed.). Open University Press.

Buzulukova, E., & Sarkisian, L. (2020). The Impact of Online Reviews on the Performance of Travel Companies. Journal of Travel Research, 59(2), 244-256.

Chen, Y., & Xie, J. (2008). Online consumer reviews: Word-of-mouth as a new element of marketing communication mix. Management Science, 54(3), 477-491.

Creswell, J. W., & Creswell, J. D. (2018). Research design: Qualitative, quantitative, and mixed methods approaches (5th ed.). SAGE Publications.

Downe-Wamboldt, B. (1992). Content analysis: Method, applications, and issues. Health Care for Women International, 13(3), 313-321.

Du, Y., & De Vries, G. (2016). The gap between service delivery and customer expectations in online reviews. Journal of Service Research, 19(1), 25-38.

Dutta, S., Gupta, A., & Mehta, S. (2017). The role of online reviews in tourism industry: A case study. Tourism Economics, 23(4), 485-502.

Dwyer, L. (2020). Economic impact of tourism in New Zealand. Journal of Travel Research, 59(3), 317-329.

Edgell, D. L., & Swanson, J. R. (2013). Tourism policy and planning: Yesterday, today, and tomorrow. Routledge.

Elo, S., Kääriäinen, M., Kanste, O., Pölkki, T., Utriainen, K., & Kyngäs, H. (2014). Qualitative content analysis: A focus on trustworthiness. SAGE Open, 4(1), 1-10.

Fernández, L., Rodríguez, D., & Garcia, S. (2018). Evaluating travel websites based on online customer reviews. Journal of Travel Research, 57(2), 206-219.

Filieri, R. (2016). What makes an online consumer review trustworthy? Annals of Tourism Research, 58, 46-64.

Gyr, U. (2020). Evolution of modern tourism. Tourism History Journal, 10(2), 95-110.

Hennink, M., Hutter, I., & Bailey, A. (2020). Qualitative Research Methods. SAGE Publications.

Hsieh, H. F., & Shannon, S. E. (2005). Three approaches to qualitative content analysis. Qualitative Health Research, 15(9), 1277-1288.

Imtiaz, A., & Kim, J. (2019). E-commerce and the travel industry: A review. Journal of Hospitality and Tourism Technology, 10(1), 55-72.

Kasavana, M. L., Nusair, K., & Teodosic, K. (2010). Online customer service: The case of U.S. based airline companies. Journal of Hospitality and Tourism Technology, 1(1), 20-34.

Kaynak, E. (2003). Product pricing and company performance: An empirical study. Journal of Marketing, 67(2), 67-80.

Kothari, C. R. (2004). Research methodology: Methods and techniques (2nd ed.). New Age International.

Leung, D., Law, R., Hoof, H. van, & Buhalis, D. (2013). Social Media in Tourism and Hospitality: A Literature Review. Journal of Travel & Tourism Marketing, 30(1-2), 3-22.

Lewis-Beck, M., Bryman, A., & Liao, T. F. (2004). The SAGE encyclopedia of social science research methods. SAGE Publications.

Li, X., & Hitt, L. M. (2008). Self-selection and information role of online product reviews. Information Systems Research, 19(4), 456-474.

Liu, Z., & Park, S. (2015). The impact of online reviews on hotel booking intentions. Tourism Management, 46, 99-109.

Mills, A. J. (2010). Encyclopedia of case study research. SAGE Publications.

Morse, J. M., & Richards, L. (2002). Readme first for a user's guide to qualitative methods. SAGE Publications.

Mudambi, S. M., & Schuff, D. (2010). What makes a helpful online review? A study of customer reviews on Amazon.com. MIS Quarterly, 34(1), 185-200.

Nguyen, Q., Le, T., & Truong, N. (2018). The discrepancy between enterprise perception and customer expectation on service quality. Service Industries Journal, 38

Onwuegbuzie, A. J., Johnson, R. B., & Collins, K. M. (2009). Call for mixed analysis: A philosophical framework for combining qualitative and quantitative approaches. International Journal of Multiple Research Approaches, 3(2), 114-139.

Rejikumar, G., Nimisha, V., & Mohan, S. V. (2019). *An examination of customer reviews for service process innovations: A study with respect to E-travel services*. https://ieeexplore.ieee.org/iel7/9082707/9087248/09087286.pdf

Salkind, N. J. (2010). Encyclopedia of research design. SAGE Publications.

Schneider, B., & White, S. S. (2004). Service quality: Research perspectives. Sage.

Schreier, M. (2014). Qualitative content analysis in practice. SAGE Publications.

Shenton, A. K., & Hay-Gibson, N. V. (2009). Dilemmas and further debates in qualitative methods. Qualitative Research Journal, 9(1), 1-21.

Stevens, J. L., Spaid, B. I., Breazeale, M., & Jones, C. L. E. (2018). Timeliness, transparency, and trust: A framework for managing online customer complaints. *Business Horizons, 61*(3), 375-384.

Upadhyay, Y., & Baber, R. (2013). Market orientation and organizational performance in the tourism and travel industry. *Journal of Business and Management, 10*(2), 17-27.

Wang, Y. (2011). The Impact of Online Customer Reviews on Sales: The Moderating Role of Product and Consumer Characteristics. Journal of Marketing, 70(3), 133-148.

Wan, P., Chen, X., & Ke, Y. (2020). Does corporate integrity culture matter to corporate social responsibility? Evidence from China. *Journal of Cleaner Production, 259*(20), 1208-1277.

Williamson, K., & Johanson, G. (2017). Research methods: Information, systems, and contexts (2nd ed.). Chandos Publishing.

Xu, X. (2021). What are customers commenting on, and how is their satisfaction affected? Examining online reviews in the on-demand food service context. *Decision Support Systems, 142*(3), 113-467.

Xu, X., Wang, X., Li, Y., & Haghighi, M. (2017). Business intelligence in online customer textual reviews: Understanding consumer perceptions and influential factors. *International Journal of information management, 37*(6), 673-683.

Zeng, B., & Gerritsen, R. (2014). What do we know about social media in tourism? A review. Tourism Management Perspectives, 10, 27-36.

Zhao, X., Xu, X., & Wang, M. (2019). How Online Reviews Affect Purchase Intention: A New Mechanism Analysis. Journal of Business Research, 102, 34-45.

Zhao, Y., Xu, X., & Wang, M. (2019). Predicting overall customer satisfaction: Big data evidence from hotel online textual reviews. International *Journal of Hospitality Management, 76*(1), 111-121.

Zhang, L., Pan, B., Smith, W., & Li, X. R. (2009). An exploratory study of travellers' use of online reviews and recommendations. *Information Technology & Tourism, 11*(2), 157-167.

Zheng, H., & Zhang, Y. (2013). The Study of Market Potential of Tourism. Tourism Management, 40, 109-120.

Cloud-Based Services Adoption and Usage by Medium-Sized Businesses in New Zealand

Dr Syed Jamali and Nevin Jiwani

ABSTRACT

The study aims to identify and analyse the key predictors of adopting and using cloud services in New Zealand's medium-sized businesses (MSBs). Quantitative research is used in this study. An online survey method was used to collect responses from MSBs operating in New Zealand. A total of 149 MSB participants participated in the survey. Their responses were collected online and analysed using the descriptive analysis method. The study found that most MSBs in New Zealand believe that cloud computing is critical to the success of the MSBs. Cloud computing offers numerous benefits like cost-saving, flexibility, scalability, and functionality of the remote workforce. The MSBs are concerned about the security and privacy of data, compliance requirements, the configuration of key parameters and the development of skills and competencies to use the cloud services effectively. Despite these concerns, most MSBs are using SaaS and plan to invest more in it in the next few months. MSBs also believe that COVID-19 has prompted the adoption of cloud-based services. They think that to take full advantage of the cloud environment, they must invest in cloud-specific roles, including cloud systems administrator, cloud consultant, and security engineer. Overall, the study provides an in-depth understanding of the MSBs in New Zealand and their inclination towards adopting cloud-based services. The MSBs and cloud vendors can use the key predictors, barriers, and benefits to performance to increase the adoption and performance of the business in New Zealand.

Keywords: *Cloud-based services, Medium-sized business, Cloud computing, New Zealand, COVID-19*

1. INTRODUCTION

Information technology (IT) has become critical in today's corporate world. Because technology helps speed up multiple processes, digital transformation is one of the driving engines behind long-term growth and success in the current business world (El-Haddadeh, 2019). Medium-sized businesses (MSBs) currently operate in an era where a robust digital presence is critical for success and survival. This may be observed in how IT aids firms with communication, data storage, data access and analysis, marketing, production, and collaboration, to name a few key business operations (Gerguri-Rashiti et al., 2015). With global

competition, new technological developments, and changing customer expectations, MSBs have been under pressure to produce products and services at lower costs, streamline current processes, and improve service delivery, resulting in increased profitability

1.1 Cloud Computing Technology

Environmental, technological, and organisational aspects of MSBs trigger the diffusion and innovation of new technology. IT and its infrastructure development are a great opportunity to eliminate the barriers and run the business efficiently (Gerguri-Rashiti et al., 2015). One such technology is cloud computing, which has caused the development of IT. Cloud computing technology is currently considered a buzzword in the industry. It is not a new concept; however, it has become ubiquitous in today's digital age due to expansion and amplified use of the internet, mobile devices, or mobility and broadband services (Alsharo, 2017).

1.1.1 Cloud-based Services

Cloud-based services, also known as cloud computing services, are the delivery of services like servers, cloud repositories for data, access to databases, networking infrastructure, software accession and support, analytical services, and intelligent assistance through the web dais to ensure improved as well as quicker innovation, more adaptable resource accessibility, and increased financial dimensions (Alsharo, 2017). It is an IT service model that enables users to access software and hardware on request (Prasad et al., 2014). A service must possess five features to be classified as a cloud service. Among these qualities are on-demand self-service, extensive network access, resource pooling, quick elasticity, and measured service (Attaran, 2017).

Self-service fashion in cloud computing has shifted the attention of MSBs from traditional product-based IT models to service-based models (Loukis et al., 2017). MSBs increasingly use cloud-based services as they are not dependent on the location and device (Loukis et al., 2017). On-demand services over the Internet and a pay-as-you-go pricing model are significant reasons for migration to the cloud (Loukis et al., 2017). MSBs can manage operating expenses effectively by deciding the services and duration for using them as servers and software (Wambugu, 2018).

1.1.2 Cloud Computing Service Models

Cloud computing technology makes widespread use of three service models to categorise cloud computing services that can be used by businesses and individuals which are Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS) (Attaran, 2017). The IaaS model

provides hardware and IT resources to the customer. It includes server space, network equipment, memory, storage space, and computational power (Kaur, 2016). The customer can buy hardware and IT systems to build their own software. This elementary cloud service level provides customers with internet infrastructure services. PaaS allows customers to rent computing platforms to develop and run different applications (Kaur, 2016). It allows organisations to create applications that are suited to their specific needs. It provides application design, development, testing, deployment, and hosting services. So, the customer needs to focus solely on applications and data. Everything else is deployed by the vendor (Attaran, 2017). The third model is SaaS, which allows customers to access and use software applications like emails, enterprise resource planning suites, software packages, customer relationship management, video conferencing, IT service management, accounting, online analytics, web content management, and others (Alotaibi, 2016).

1.1.3 Cloud Computing Deployment Models

There are several methods for deploying cloud-based services. Cloud deployment approaches include Private, Public, Hybrid, and Community clouds (Gandecha, 2022). The private cloud model is not accessible to the public. The public cloud is a shared platform that anybody can access online based on the pay-as-per-use model trait (Patel & Kansara, 2021). The cloud service provider holds the public cloud, and its security is lower than that of the private and community cloud models (Aryotejo et al., 2018).

The hybrid cloud model has features of both public and private clouds. Businesses with similar interests and institutional requirements can share and access the shared pool of resources. This allows businesses to avail themselves of shared expenses and reasonable security levels (Aryotejo et al., 2018). The security level is lower than that of the community and private cloud but higher than that of the public cloud (Patel & Kansara, 2021).

The last is a community model in which the infrastructure is supervised, and businesses can utilise it. The businesses have the same demands for hardware and software, core business activities, and projects (Patel & Kansara, 2021). Therefore, this model allows businesses to manage their security and costs jointly.

1.2 Medium-Sized Businesses (MSBs)

Businesses that have certain revenues, assets or a particular number of employees are classified as MSBs (Neagu, 2016). Each country defines a medium-sized enterprise differently (Neagu, 2016). Specific size requirements must be met, and the industry in which the business works is occasionally considered (Gherghina et al., 2020). MSBs are essential contributors to the economy despite their small

size. They outnumber major corporations by a wide margin, employ a large workforce, and are usually entrepreneurial in type, assisting in shaping innovation (Gherghina et al., 2020). MSBs in New Zealand are considered obscure heroes of the economy. MSBs of New Zealand are described as having 20-99 employees and/or earning revenue between $5 million to $30 million (Thornton, 2019).

1.3 Benefits of Cloud Computing for Medium-Sized Businesses

Cloud computing is a popular technology that helps current businesses remain competitive, improve performance, and gain benefits. The function of cloud computing in revealing the weaknesses and incompetence of MSBs is crucial. Cloud computing contributes significantly to MSB's primary competitiveness, growth, and advancement. MSBs that use cloud computing can benefit from contemporary IT while reducing costs (Sabbah et al., 2019). MSBs are attracted to cloud computing due to a wide range of benefits, including scalability, resource flexibility, effective management of financial resources, and ease of access to cloud services (Gupta et al., 2013). Apart from these strategic benefits, MSBs can improve the end-user experience and further enhance the core competencies (Chen et al., 2016).

1.4 Research Questions

This study examines how MSBs view the adoption, use, and role of cloud-based services. The following questions serve as the foundation for this research.

RQ1: What are the key predictors of adopting and using cloud-based services in New Zealand's MSBs?

RQ2: What are the concerns regarding adopting cloud-based services in New Zealand's MSBs?

RQ3: How do cloud computing services affect the performance of the MSBs running in New Zealand?

1.5 Research Objectives

The primary goal of this research is to learn more about how MSBs in New Zealand use and embrace cloud-based services. In order to fulfil this goal, the following objectives are established:

RO1: To explore the reasons for adopting and using cloud-based services in New Zealand MSBs.

RO2: To identify and analyse concerns regarding the adoption and usage of cloud-based services by MSBs in New Zealand.

RO3: To assess the impact of cloud-based services on the performance of New Zealand MSBs.

RO4: To provide recommendations on adopting cloud-based services to MSBs in other countries.

1.6 Significance of the Study

New Zealand allows overseas companies to do business ("Financing SMEs and Entrepreneurs 2020," 2020). MSBs significantly contribute to economic strength as they account for 2.2% of all companies in New Zealand (Davies, 2019). IT solutions greatly help MSBs, but they may be too expensive for them. Cloud computing can benefit MSBs with cost-effectiveness, scalability, and flexibility. It is already predicted that more MSBs in New Zealand will likely adopt cloud-based services (Scoop Business, 2020). The reasons include increased productivity, efficiency, remote working facilitation, and improvement in internal communication with the customers. 65% of the MSBs in New Zealand are expected to use it for increasing efficiency, followed by 44% for remote work, 38% for productivity, and 37% for communication enhancement (Scoop Business, 2020). Therefore, this study will help gather information on whether MSBs are adopting cloud-based services or are in the process of doing so soon. The study's findings will provide an understanding of the factors contributing to adopting services. Also, the challenges, barriers, and security concerns will be discussed, as well as how cloud service providers can overcome them. Both MSBs and cloud vendors can formulate strategies for increased adoption and security of the data in an effective manner.

2. LITERATURE REVIEW

2.1 Cloud Computing

Cloud computing can be traced back to using virtual machines in the 1990s (Mohan & Sathyanathan, 2015). The term 'cloud computing' was coined by George Favaloro, a marketing executive for Compaq Computer, and Sean O'Sullivan, founder of the now-extinct business NetCentric, but more widely used since 2006 when it was mentioned by Google's then CEO, Eric Schmidt (Mohan & Sathyanathan, 2015). Cloud computing enables on-demand and convenient access to a shared pool of computing resources (e.g. applications, servers, storage, networks, and services), which can be accessed rapidly with minimal interaction from the service provider (Attaran, 2017). The primary purpose of cloud computing is to improve the use of distributed resources, combine these resources to achieve higher throughput, and solve large-scale calculation problems (Attaran, 2017). Google, IBM, Amazon, Microsoft, Apple, Oracle, Alibaba, and VMware have become the top-tier cloud services suppliers (Bala et al., 2021).

2.2 Reasons for Cloud Adoption

According to Erturk (2017), many organisations in New Zealand that are using cloud computing services intend to increase their cloud-related spending in the future. A survey was distributed to organisations in Hawke's Bay, New Zealand, to understand their adoption of cloud solutions compared to global trends and

practices. An approach for cloud adoption is to look at a company's overall swiftness and scope in terms of adopting cloud services. With a revolutionary approach, an organisation may adopt cloud-based resources and applications quickly and on a whole scale. In contrast, the evolutionary approach involves a gradual evaluation and implementation, with the option of possibly stopping at any time. Small businesses that typically do not have large-scale legacy systems or significant investments in their own IT infrastructure may be tempted to take a revolutionary approach. However, the evolutionary approach may seem safer for MSBs in New Zealand as taking the time may allow the technologies and the end users' basic technical knowledge to mature (Erturk, 2017).

2.2.1 SaaS Services

In terms of cloud service models, the survey conducted by Dillon & Vossen (2015) indicates that New Zealand's MSBs appear pretty happy to take the advice of others regarding SaaS adoption. Participants were asked to consider their views on several issues related to SaaS. The four subsections present the essential findings of the research: client-server interaction, software pricing, SaaS fundamentals, and adoption issues. Although they are all connected to SaaS cloud computing, the answers for SaaS fundamentals and adoption issues were the most subject-specific. There were no significant differences between the two; however, several issues were worthy of comment. The first two indicated the company's willingness to be influenced by the views of external sources. New Zealand firms reported that they were willing to be influenced more than other countries. New Zealand small and medium businesses have greater trust in SaaS security (Dillon & Vossen, 2015). Of course, this could also be viewed as the MSBs in other countries are more aware of the security risks associated with SaaS. Lastly, the New Zealand firms appeared to have more positive views on SaaS's role in improving their competitiveness.

Similarly, a study conducted by Baker & Kaur (2020) in the region of Southland, New Zealand, found that SaaS customer relationship management (CRM) is being used to help businesses grow and maintain healthy relationships with existing customers and build strong relationships with new customers (Baker & Kaur, 2020).

2.2.2 Cost-effectiveness and Speedy Deployment

On the other hand, Kubiak and Destremau (2017) used an in-depth structured interview method to interview the representatives of the New Zealand MSBs using SaaS and PaaS services. The scholars selected this method to discover why New Zealand's MSB adopted cloud infrastructure. The companies had a strategic vision of reaching international markets where cloud computing can play a crucial role. MSBs with a wide range of characteristics were interviewed, including new entrants in the market, old MSBs, and low-growth and high-growth MSBs. The representatives agreed that cloud computing had become an

integral part of business operations as it is scalable and inexpensive, and infrastructure can be deployed relatively easily compared to physical set-up in another country (Kubiak & Destremau, 2017).

2.2.3 Disaster Recovery

With the rapid growth of large-scale online services, technologies, and the internet, the need for data backup and data recovery services has increased. According to Abualkishik et al. (2020), disaster recovery is planning to minimise data loss in unforeseen events. Disasters like climate disasters, intended or deliberately done disruption, system failure, or even loss of utilities like power can lead to data loss. If this happens, MSBs can face financial, reputational, regulatory, and legal problems (Abualkishik et al., 2020). Moreover, the business cannot continue in such circumstances. So, disaster recovery is essential to restore normal operations sooner and prevent further reputational damage. Therefore, MSBs may find cloud computing attractive as it can protect data at another location and help recover from disasters sooner.

2.3 Security Concerns

Although the advantages discussed in the above section attract MSBs toward cloud computing, they are still concerned about security issues. According to Kubiak and Killian (2017), MSBs agree that cloud computing can expose them to security threats and risks. The security concerns are high, and the cloud adoption rate cannot improve without assurance from cloud service providers. In New Zealand, 66% of MSBs use cloud services, according to a report published by Bealing et al. (2019).

2.4 Challenges for Cloud Adoption

Many studies have uncovered the challenges of cloud adoption in MSBs. An overview conducted by Tongsuksai et al. (2021) found that implementing cloud-based ERP systems is not as easy as it seems. The New Zealand-based MSBs experience potential issues, including higher chances of cost overruns. However, the projects for ERP adoption set aside the budget before implementation but later asked for adding more functions, users, and modules. MSBs lack information or knowledge about cloud computing, which affects the governance and information exchange between departments. According to Tongsuksai et al. (2021), MSBs overestimate the benefits of cloud ERP, like efficiency and attempt to add more functions, thereby complicating the implementation process and exceeding the budget. A report published by Bealing et al. (2020) on the economic potential of cloud-based tools in New Zealand's MSBs also found that cloud-based tools keep on changing with time in a bid to improve the user experience.

2.5 Impact of Cloud Computing on Business's Performance

In the competitive business environment of New Zealand, MSBs realised that they needed to bring significant changes in the strategy, technology, structure, quality, marketing, leadership, and cost (Malkawi et al., 2017). These changes can be brought through rapidly developing technology and networks like the internet and applications. Cloud computing technology is also considered network computing as the services can be distributed and offered across the internet. Cloud service's effective usage can help enhance the performance of MSBs in New Zealand in many ways (Gangwar, 2017). Firstly, cloud services can improve the efficiency of processes used by MSBs for internal operations. Business communication is one such area where cloud services can provide dependable, cost-effective, and on-demand communication applications. The employees in MSBs can easily communicate with each other, even in remote places. Cloud computing eases the collaboration of employees who may face difficulties in a traditional office environment. Secondly, MSBs can improve their business intelligence, enabling them to sustain business continuity (Malkawi et al., 2017).

3. RESEARCH METHODOLOGY

3.1 Research Philosophy

The research philosophy is an essential component of the study because it is based on people's assumptions and opinions about the nature of knowledge. Positivism and interpretivism are the two major approaches in research philosophy (Ragab & Arisha, 2017). Because the quantitative approach is focused on measuring social phenomena, gathering and analysing numerical data, and focusing on the connections among a limited number of variables throughout many instances, this research is based on a positivist paradigm.

3.2 Research Type

This study conducts exploratory research, which provides an in-depth understanding of cloud adoption and usage in New Zealand's MSBs. Furthermore, the exploratory research includes a preliminary investigation to learn about the adoption of cloud services, planning to migrate to the cloud, and current usage of cloud services in MSBs in New Zealand.

3.3 Research Strategy

The study uses a survey strategy in which a questionnaire is used to collect responses from survey respondents. Online surveys are conducted through social media sites, including Facebook, Twitter, Instagram, and LinkedIn. The respondents include, but are not limited to, IT experts, managers, top executives, and employees using cloud-based tools or services or who are employed to perform cloud-related duties and responsibilities.

3.4 Research Method

This study uses a quantitative research method. It collects numerical data and tests and measures data quickly while protecting the anonymity of many MSBs in New Zealand.

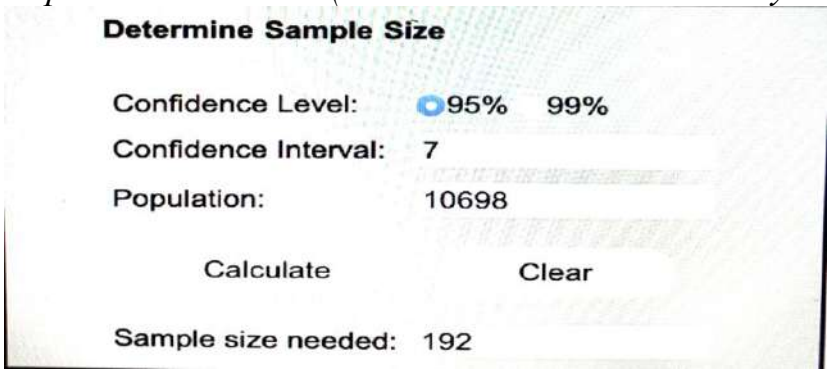
3.5 Theoretical Framework

Multiple adoption models and theories have emerged, providing many IT adoption elements in various study situations. On the other hand, integrating components from several adoption theories can help improve knowledge of the possible influencers of IT adoption (Ahmed, 2020). To build a theoretical model to answer the research challenges stated, this study focuses on one adoption model. The theoretical model was primarily constructed by combining a Tornatzky and Fleischer-developed technological, organisational, and environmental (TOE) framework, an organisation-level theory and a multi-perspective framework (Ahmed, 2020). According to this framework, the technological, organizational, and environmental components of an organisation's context influence the adoption process of technology innovation (Alharbi et al., 2016). Moreover, TOE is superior to other adoption models in evaluating technology adoption, use, and value generation since it incorporates technological, organisational, and environmental elements (Al-Hujran et al., 2019). Furthermore, because the TOE framework is not limited by industry or business size, it will provide MSBs of New Zealand with valuable insights and instructions for successful cloud computing adoption. The comprehensive methodology allows for a holistic examination of the adoption phenomena and its impact on value chain operations (Al-Hujran et al., 2019).

3.6 Sample Size

The sampling method used is simple random sampling. Simple random sampling is considered an unbiased technique (Taherdoost, 2016). There are 10,698 MSBs in New Zealand, and the sample size calculated through the sample calculator came to 192. Thus, data from 192 MSBs were required to obtain valid and trustworthy data.

Figure 1 Sample size calculator (Source: Creative Research Systems, 2022)



3.7 Questionnaire Design

The Survey Planet website was used to construct the survey and create a link. The survey had 25 questions, which were multiple-choice questions with rating methods.

3.8 Data Analysis

A descriptive analysis method with an underlying cross-tabulation method was used (Snyder, 2019). This technique could sort the data for analysis and explain and summarise the data points effectively and constructively.

4. FINDINGS AND DISCUSSION

4.1 Designation in the MSBs

The first question in the survey is general as it is on the designation of the participant who voluntarily participated in it. 149 participants have done the survey. Interestingly, employees from different positions in MSBs in New Zealand participated. The strategy to reach a wider audience has been of immense help. The employees working as managers, help desk analysts, IT coordinators, database administrators, web developers, and business owners were effectively reached through social networking sites. This can be seen in Figure 2.

Date	Answers
43 minutes ago	Web developer
21 hours ago	Manager
1 day ago	Service delivery manager
1 day ago	Back end developer
1 day ago	Database administrator
1 day ago	Web developer
1 day ago	It cordinator
1 day ago	Official
1 day ago	Business development manager
1 day ago	Owner

Figure 2. Designation in MSBs (Source: Author)

4.2 Size of MSBs

The size of the MSBs is essential because it can help understand the decisions made regarding the expenditure on cloud services, cloud deployment model, benefits, security concerns, and stage adoption. MSBs in New Zealand have employees between 20 to 99. The question allowed us to know the exact size of the MSBs. Figure 3 shows the majority of MSBs, i.e. 23.5%, have 40 to 60 employees, followed by 22.8% of MSBs having 20 to 40 employees. MSBs with 80 to 100 employees account for 20.1%. MSBs with 60 to 80 employees also participated well, with a percentage of 18.8%.

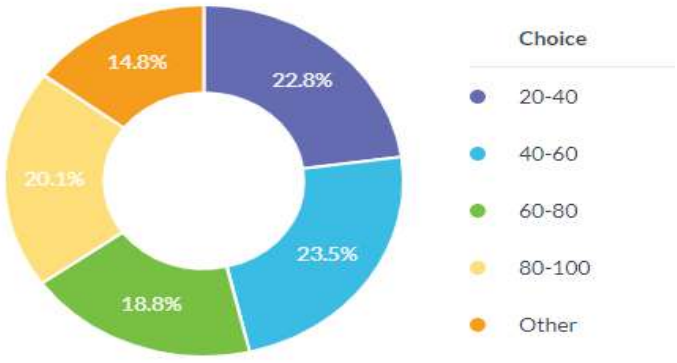


Figure 3. Size of MSBs (Source: Author)

4.3 Industry in which MSBs Operate

The survey was not done in a specific industry. Therefore, the online survey reached the MSBs of New Zealand from different industries. As seen in Figure 4, 18.9% of MSBs belonged to the computer and food industries, followed by 11.5% in the healthcare industry and 10.7% in the hospitality industry. The pie chart shows that different industries use cloud computing services in New Zealand.

Figure 4. Industry in which MSBs operate (Source: Author)

4.4 Stage of Usage of Cloud Computing Services in MSBs

This question is important because it indicates the stage of using cloud computing services. The responses indicate that most participants have adopted cloud services for 3 to 6 years. Figure 5 shows that 36.9% of MSBs in New Zealand have already used cloud computing technology for 1 to 3 years, whereas 30.9% have used it for 3 to 6 years. 14.8% have used it for the last 6 months to 1 year. Only 13.4% said they have used it for 6 to 10 years.

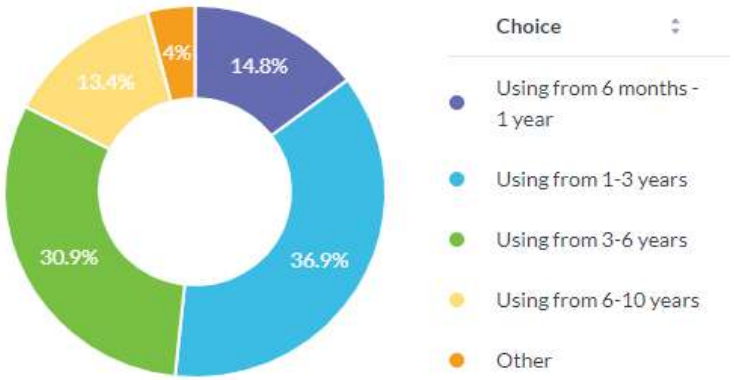


Figure 5. Stage of usage of cloud computing services in MSBs (Source: Author)

4.5 Stage of Cloud Computing Services Adoption in MSBs

The above question was on the usage stage, whereas this question talks about the plan to adopt cloud computing services. Figure 6 shows that 70.5% of New Zealand MSBs plan to use cloud-based services in the next 3 to 6 months, which is a significant number. 12.1% plan to use in the next 6 months to 12 months, followed by 6.7% who have no plans to use. Finally, 10.7% of MSBs said they are unsure if they plan to use cloud services. So, most participants said they were unsure if they planned to use cloud services, which means they realised the benefits of cloud services for the business.

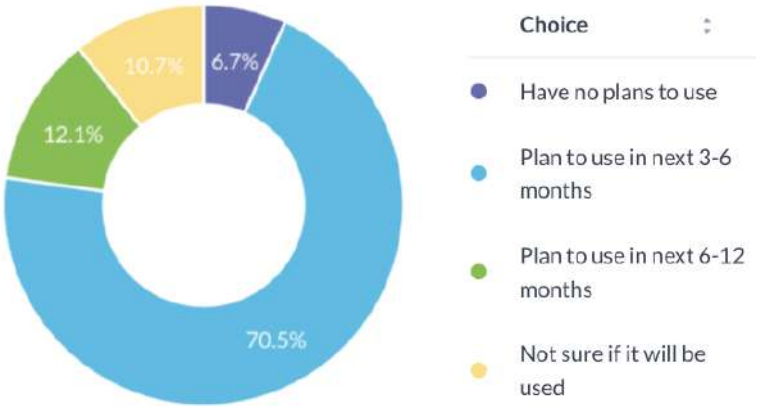


Figure 6. Stage of cloud computing services in MSBs (Source: Author)

4.6 Cloud Computing Service Model Used by MSBs

The Cloud services are available under three different models, as shown in Figure 7. When asked about the cloud computing deployment model, it was found that

the public cloud uses 53.7% of the time, whereas the private cloud uses 22.1%. The difference between private and hybrid cloud usage is low, with 18.8% of MSBs using hybrid cloud. This indicates that MSBs still rely on the public cloud and may have fewer security concerns. The private and hybrid cloud deployment adds more security, skills, and competencies. So, MSBs of New Zealand who have been using it for a long may opt for it.

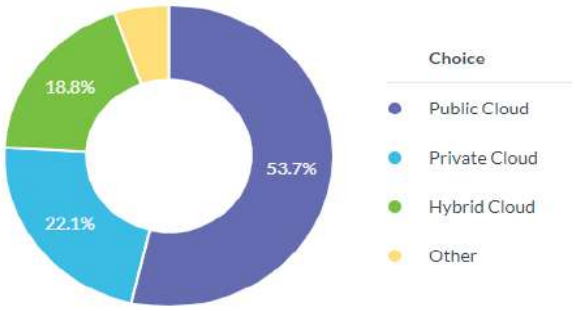


Figure 7. Cloud computing service model used by MSBs (Source: Author)

4.7 Cloud Computing Service Used by MSBs

Cloud service providers offer different services to businesses. MSBs that rely heavily on the use of software can opt for SaaS. The MSBs that develop the applications require infrastructure and a platform to host the applications; IaaS and PaaS services are more valuable. Figure 8 shows that SaaS is the most popular service amongst MSBs, with 75% currently using it. A fair percentage of MSBs also use IaaS (18.2%). PaaS is still to build a prominent place as only 6.8% agreed to use the service at present.

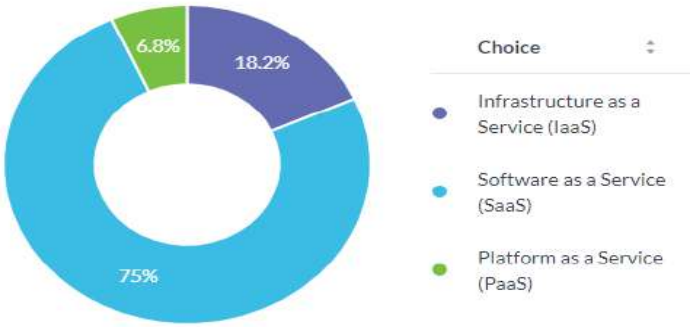


Figure 8. Cloud computing service used by MSBs. (Source: Author)

4.8 Main Benefits of Using Cloud Computing Service

Cloud computing technology is a buzzword in the business world. It is not confined to a specific industry. A wide range of types of businesses in New

Zealand are using it. So, it is important to identify the benefits perceived by MSBs. The main benefits of cloud services viewed by MSBs are shown in Figure 9. The MSBs have agreed to major benefits, including eliminating the need for upfront investment, the ability to outsource due to lack of core competencies, scalability, speed of deployment, cost savings on IT operations, and ease of collaborating employees working in different teams.

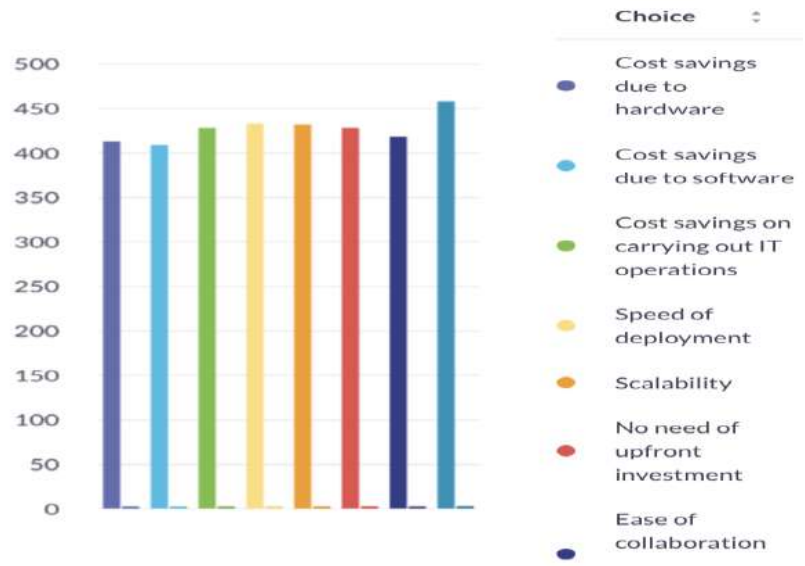


Figure 9. Main benefits of using cloud computing service (Source: Author)

4.9 Most Significant Barriers to Cloud Computing Services Adoption in MSBs

In addition to the benefits, cloud computing also has barriers. So, the MSBs were asked to rate the barriers they think play a significant role in delaying cloud adoption. As seen in Figure 10, MSBs gave different responses. The MSBs agreed on lack of competencies, understanding of cloud services, compliance issues, performance issues, location of data centres where data is stored, return on investment, and customisation. Another barrier cited was the risks or threats related to security. So, cloud service providers need to invest more to strengthen their security. Also, they need to raise awareness of the mechanisms MSBs can use to make the cloud more secure and safe.

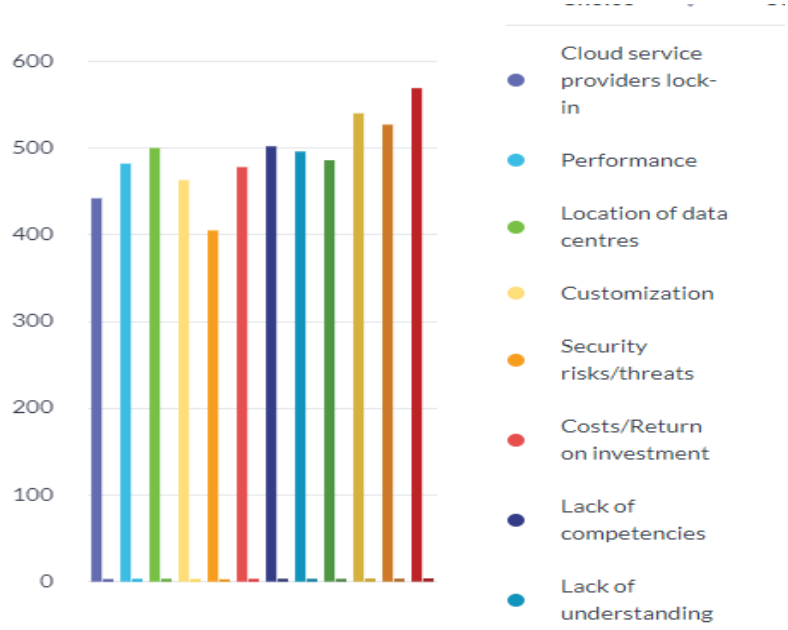


Figure 10. Most Significant barriers to cloud computing services adoption in MSBs (Source: Author)

4.10 Types of Application MSBs plan to use in the next 12 months

Cloud computing service providers are leaving no stone unturned in expanding their service portfolio. Today, MSBs can select from various applications to improve their business performance. As shown in Figure 11, MSBs selected a wide range of cloud computing applications. However, the most common answer, with 22.8% of MSBs agreeing to it, was monitoring services, followed by 12.1% wanting to use cloud services for customer relationship management. Another trend was using cloud services for development, with 11.4% of MSBs wanting to use them. 8.1% showed interest in collaboration software, whereas 7.4% said they would like to use social networking services and payroll services.

Figure 11. Types of applications MSBs plan to use in the next 12 months (Source: Author)

4.11 Applications Critical to MSBs

Figure 12 shows that 78.5%, or a majority of responses, said that they consider cloud services critical to their business. 12.8% were not sure about this, and 8.7% did not agree that cloud services are important for their business.

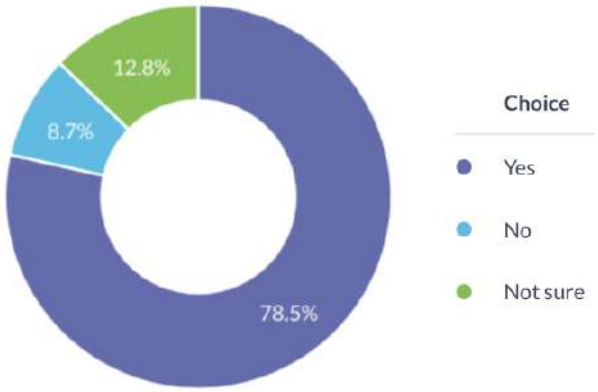


Figure 12. Applications critical to MSBs (Source: Author)

4.12 Ease of Adoption of Cloud Computing Service

The ease of adopting cloud computing services is one of the crucial factors. The adoption should not be too hard, or its planning and preparation should not be

costly. Otherwise, it can discourage MSBs from adopting it. Figure 13 shows that 63.8% of MSBs could deploy and use cloud services easily. 22.8% were curious if adoption could be deemed easy or difficult. 13.4% of MSBs faced difficulties in the adoption of services. This indicates that 22.8% are either planning to use or do not think cloud computing services are critical to their businesses.

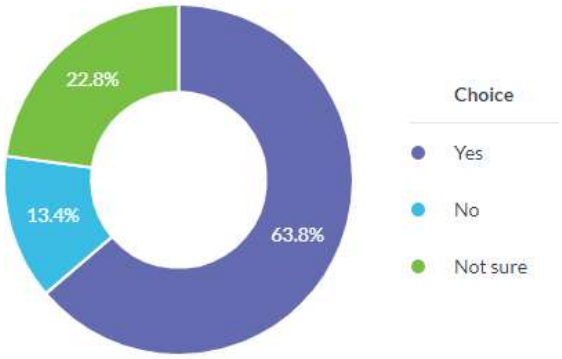


Figure 13. Ease of adoption of cloud computing service (Source: Author)

4.13 Initial Cloud Computing Service Adoption in MSBs

Cloud computing deployment requires knowledge, skills, and competencies. So, MSBs may opt to hire cloud computing specialists for adoption. Figure 14 shows that 61.1% of MSBs formed IT operations teams to efficiently adopt the cloud computing service. In 18.1% of MSBs, owners helped in the adoption. 12.1% said a development team was formed, whereas 7.4% said a senior executive helped in the initial adoption.

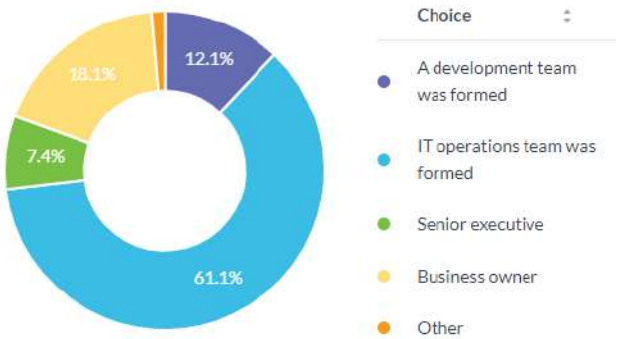


Figure 14. Initial cloud computing service adoption in MSBs (Source: Author)

4.14 MSBs Plan to Spend on IaaS Within the Next Year

The willingness to spend money on the type of cloud computing services depends on the requirements of the business. IaaS is the second most used cloud service in New Zealand's MSBs. This question helps us understand the trend of IaaS adoption shortly. As seen in Figure 15, 53.7% of MSBs are currently not using IaaS. 16.8% plan to spend $1000 to $4000 monthly on the private cloud deployment model next year. 15.4% plan to invest less than $1000 per month. 6.7% want to spend $4000 to $9000 per month, and only 7.4% plan to invest more than $9000 monthly.

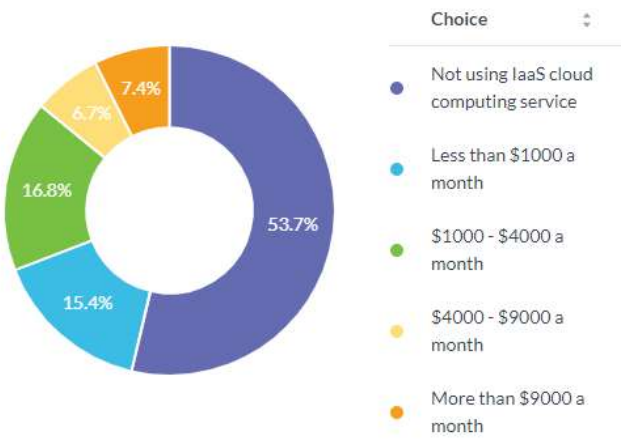


Figure 15. MSBs plan to spend on IaaS within the next year (Source: Author)

4.15 MSBs Plan to Spend on SaaS Within the Next Year

By now, it is known that SaaS is the most used cloud service in New Zealand's MSBs. Figure 16 shows that 53% plan to spend $1000 to $4000 per month on SaaS next year, 16.8% plan to invest less than $1000 per month, and 12.8% want to spend $4000 to $9000 per month. Apart from that, 12.1% said they are not using the service.

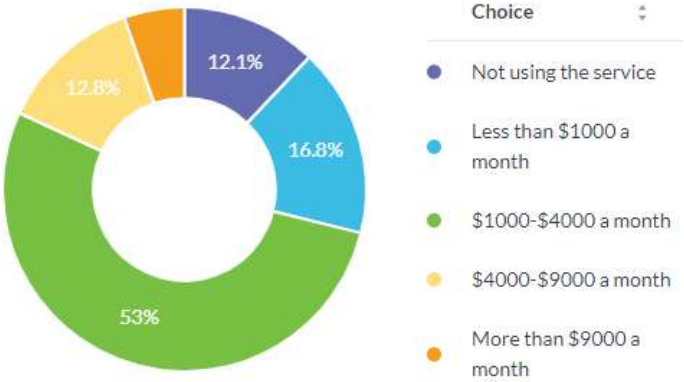


Figure 16. MSBs plan to spend on SaaS within the next year (Source: Author)

4.16 MSBs Plan to Spend on PaaS Within the Next Year

PaaS is not widely used in New Zealand's MSBs. One of the reasons for this is the complexity of adopting this service. Moreover, large-scale businesses use it to develop their applications. Therefore, when asked about PaaS, it can be seen in Figure 17 that 55% said they are not using this cloud service. 17.4% plan to spend $1000 to $4000 per month next year, whereas 10.1% plan to invest $4000 to $9000 monthly. 12.1% are interested in investments of less than $1000 per month.

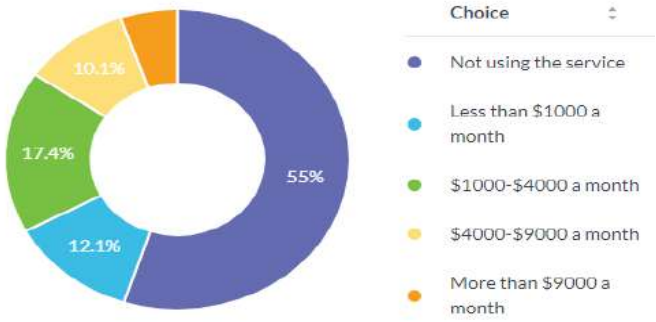


Figure 17. MSBs plan to spend on PaaS within the next year (Source: Author)

4.17 MSBs Plan to Spend on Private Cloud Within the Next Year

Unlike the public cloud, which any business can use, the private cloud is operated and owned by the business. In terms of security, it has higher security than the public cloud. However, it requires expertise to deploy, maintain and use the array of options for different services in a business. So, this question asks whether the MSBs in New Zealand are willing to invest in a private cloud. Figure 18 shows that 57% plan to spend $1000 to $4000 monthly on the private cloud deployment model next year. 22.8% plan to invest at least $1000 per month. 13.4% want to spend $4000 to $9000 per month, and only 6.7% plan to invest more than $9000 monthly.

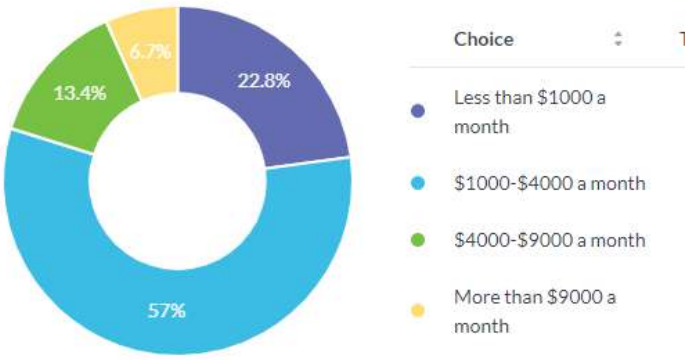


Figure 18. MSBs plan to spend on private cloud within the next year (Source: Author)

4.18 MSBs Plan to Spend on Storage Solution Only Within the Next Year

Investment decisions related to storage services are crucial to a business because the data can be exposed to threats or risks. Figure 19 shows that 61.1% plan to spend $1000 to $4000 monthly on cloud-based storage solutions next year. 16.8% plan to invest $4000 to $9000 per month. 16.8% want to spend less than $1000 per month, and the remaining plan is to invest more than $9000 monthly in storage solutions.

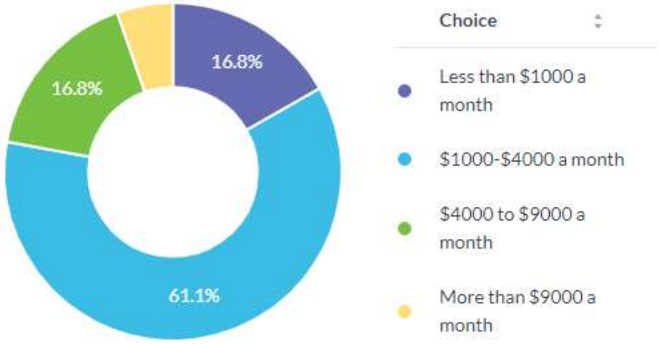


Figure 19. MSBs plan to spend on storage solutions only within the next year (Source: Author)

4.19 Name of the Cloud Computing Service Provider MSBs Uses or Plans to Use

In New Zealand, MSBs have many options in terms of cloud service vendors to choose from. The most popular cloud vendors are given choices to select from. Figure 20 shows that Amazon Web Services (AWS) and Google Cloud Platform are the most popular cloud service providers amongst MSBs. 34.2% plan to migrate to Google Cloud Platform, whereas 34.9% plan to use AWS. A

considerable percentage of MSBs, i.e. 20.8%, are considering using Microsoft Azure. Only 6% agreed on IBM cloud.

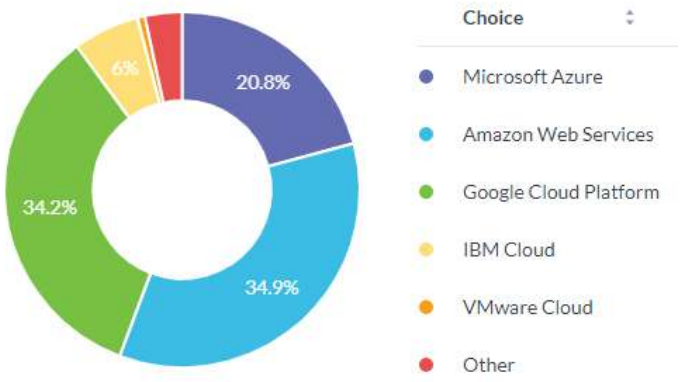


Figure 20. Name of the cloud computing service provider MSBs use or plan to use (Source: Author)

4.20 Factors that Influenced MSBs for Cloud Adoption

Most answered IT support and management when asked about the factors that had influenced the MSB to adopt cloud services, as shown in Figure 21. Other strong factors were improving resource scalability, flexibility, remote office functionality, speed of technology deployment, and infrastructure cost reduction.

Figure 21. Factors that influenced MSBs for cloud adoption (Source: Author)

4.21 Cloud Outage Faced by MSBs

Outage means the unavailability of the cloud services due to some reason. The outage is a serious issue and should not be experienced by users frequently. The MSBs who adopt cloud services expect high-quality services that run smoothly. Any disruption can cause loss to the business and dissatisfaction among the customers. Therefore, it is essential to know whether the MSBs faced outages. As shown in Figure 22, 52.3% of MSBs in New Zealand have faced an outage once in 3 to 6 months. 10.7% said they have faced it once in 2 to 3 months or 1 month. Some even faced it once a week (6.7%). 9.4% said they have never experienced an outage; the same percentage was for those who have faced outages once in 12 months.

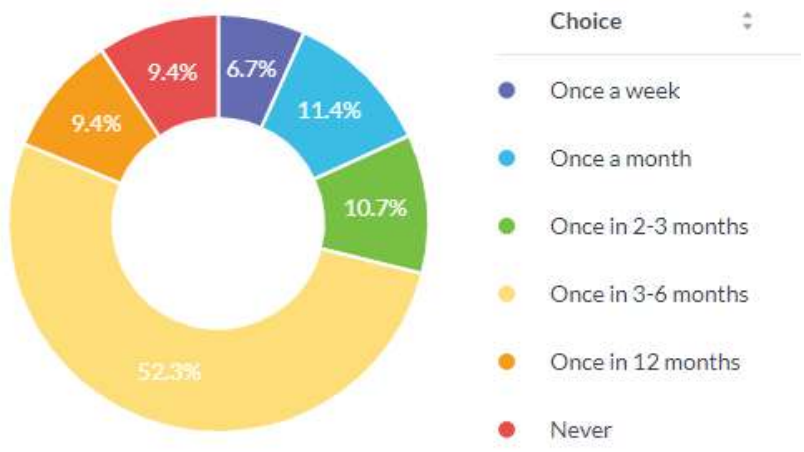


Figure 22. Cloud outage faced by MSBs (Source: Author)

4.22 Covid-19 Prompted MSBs to Migrate or Plan to Migrate to the Cloud

The research was done when the whole country was hit hard by COVID-19. The pandemic has forced MSBs to think about the technologies that can help them continue their business when such outbreaks occur. So, the participants were asked about cloud computing's adoption in COVID-19. Figure 23 shows that 82.6% of MSBs believe COVID-19 has prompted businesses to migrate to cloud computing technology. 10.7% believe it is not the case, whereas 6.7% are unsure.

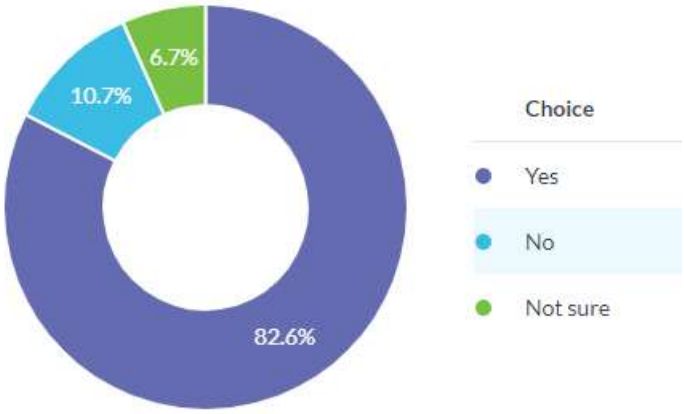


Figure 23. Covid-19 prompted MSBs to migrate or plan to migrate to the cloud (Source: Author)

4.23 Things Need To be Improved on Cloud

The research also focused on the improvements in cloud computing services that are vital in the eyes of MSBs. If the cloud service vendors meet their needs, the adoption of cloud services can increase. Figure 24 shows that the majority of the MSBs, i.e. 47.7%, want to improve the configuration of cloud services. Cloud-based storage services also need improvement, as per 10.1% of MSBs. Other areas found are network, maintenance, and monitoring, which is agreed upon by approximately 8% of MSBs.

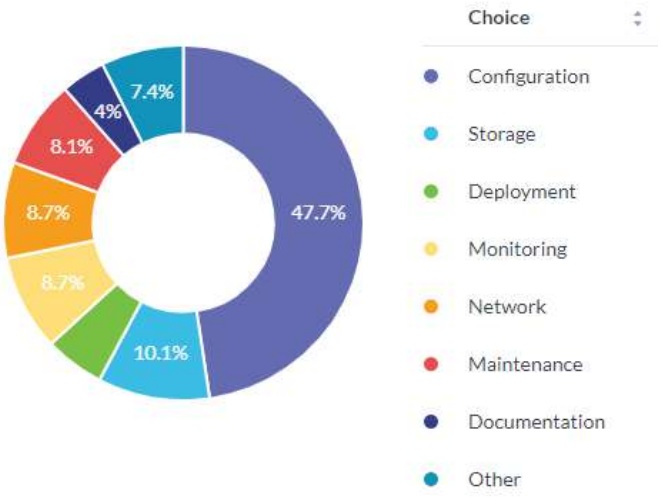


Figure 24. Things need to be improved on the cloud (Source: Author)

4.24 MSBs Investor Plans to Capitalize on Cloud-Specific Roles

Cloud computing requires knowledge, skills, and competencies. Therefore, MSBs willing to adopt it plan to invest in cloud-specific roles. Figure 25 shows

that 26.8% of MSBs want to invest in cloud systems administrators, whereas 14.8% said they plan to capitalise on cloud consultants and security engineers. 23.5% want to invest in a cloud architect, and only 4% said they need to invest in a cloud project manager.

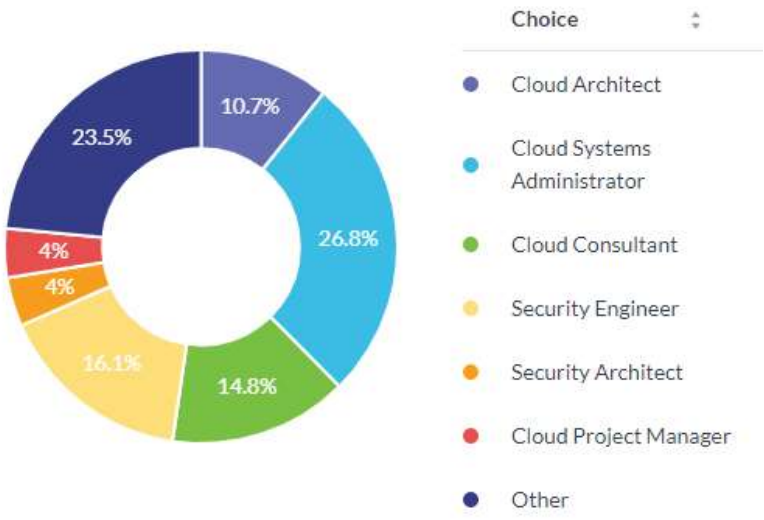


Figure 25. MSBs investor plans to capitalise on cloud-specific roles (Source: Author)

5. CONCLUSIONS

5.1 Key Predictors of Adoption of Cloud-based Services in MSBs

5.1.1 Cloud-based Services

The findings indicate that New Zealand's MSBs are adopting cloud computing. They think cloud computing is beneficial as it provides limitless computing power at a low cost and in a trustworthy way. So, the adoption prediction can be known from the stage of current use, planning to adoption, MSB's perception of the cloud's role in business performance, and when New Zealand is experiencing an outbreak of COVID-19. Interestingly, the MSBs already use cloud services, indicating a high awareness of it. Many MSBs are used for 1 to 3 years, and few are used for 6 to 10 years. This is a good indication, and it can be said that they may be willing to invest more in cloud services to take the maximum advantage. It was found that MSBs know the different services, including IaaS, SaaS, and PaaS, their benefits, and how they can be vital to business operations. SaaS is the most popular choice among these cloud services, followed by IaaS and PaaS. This is because of many reasons. The MSBs appear to have more knowledge about SaaS, especially the wide availability in the public cloud deployment model. Using the public cloud is comparatively more straightforward than the private cloud. On the other hand, PaaS and IaaS are not as popular as SaaS.

5.1.2 Cloud Deployment Models

MSBs can use the infrastructure, platform, and software-based cloud services in three ways, i.e. deploying private, public, or hybrid cloud. The research found that the public cloud is more popular than the private and hybrid cloud in New Zealand's MSBs environment. The ease of using the public cloud fuels the inclination of MSBs towards it. Even though the public cloud has no contractual agreement with users or MSBs, an option allows the customisation of virtual computing environments. The cloud service vendors can provide customised application environments, access to the network, and permissions to verify the authentication of inbound and outbound connections. So, MSBs are willing to use the public cloud by using an assigned public IP address. This indicates that MSBs may continue to use the public cloud.

5.1.3 Cloud Storage Solution

The cloud-based storage solution is another critical predictor. This service can allow MSBs to save their data on the cloud instead of the system installed in their local office. All they need is a network connection and a cloud-based service. The COVID-19 pandemic has forced the MSBs to look for a solution that allows them to access the storage from any location and at any time. The MSBs can customise storage solutions and opt for unlimited storage capacities to balance their workload or customer needs. They can also have a unified view of their storage service. Therefore, New Zealand's MSBs plan to spend $1000 to $4000 monthly, which is a big amount.

5.2 Concerns of MSBs Regarding Cloud Adoption

The study found that the cloud offers flexibility. The MSBs can quickly scale their cloud-based services to meet the demand. They are happy with the pay as you use the cloud billing model. They perceive it as a reliable and transparent billing method. However, there are some hidden concerns or challenges related to the billing mechanisms used by cloud service vendors. This is mainly applied to MSBs with more employees and a large customer base. When they decide to migrate to the cloud, they should be ready to invest a high amount. This is because their extensive IT structure and operations will continue on the cloud, and they will be charged as per the usage, which will be high. So, such MSBs may not be willing to transfer the whole infrastructure to the cloud.

The second concern identified from the findings is the security of cloud-based services. MSBs have security issues and fear exposure of their confidential files, programs, and data related to internal processes, customers, and other stakeholders. They want a solution that does not compromise their security. MSBs want to know if their data is being protected, but the cloud uses databases

in different locations. The database may be situated in another country. This increases the security concern as MSBs are unaware of the location and mechanisms used to protect data. The MSBs who believe that COVID-19 has prompted the adoption of cloud services have a concern that can be addressed with the help of robust authentication mechanisms. Such MSBs employ a remote workforce to continue their business operations. They argue that if the business's employees outside the office can access data via the cloud, what can stop cybercriminals from doing the same? The MSBs who want to use the cloud face the challenge of self-configuration. They know that their existing system and human resources need the capacity and capabilities to configure and monitor the parameters. However, they often struggle to deploy cloud-based services, especially in the early migration phase. Their lack of understanding of the cloud causes hesitance to adopt the cloud services widely. One way is to invest in cloud-specific roles, such as increasing knowledge about self-healing and self-optimization. The cloud system can recover from failures automatically and quickly. Still, cloud-specific roles are necessary as the responsible team can improve the overall system performance by configuring the key parameters. So, MSBs lack the core competencies to practice self-protection in a cloud environment. They proactively look for ways to either improve their capabilities or look for a reliable response from cloud vendors.

5.3 Impact of Cloud-based Services on Performance of MSBs

The findings state that cloud-based services can positively impact the performance of MSBs. The high performance is measured based on the cost efficiency due to the as-you-use billing system and agility, which allows flexible and scalable data storage, real-time access to information, and improved internal operations. The findings indicate that low upfront investment, flexibility, and scalability are prime reasons. This indicates that MSBs can save money by adopting the cloud. Their budget is reduced, but the return on investment can increase. This is because they can access real-time information to make better decisions. They can easily use the storage solution to meet the needs of clients or other stakeholders. More importantly, they can instantly access the storage and retrieve data when required. Instead of purchasing expensive equipment, they can adopt cloud services and pay for only what is required.

In terms of flexibility, cloud services are considered one of the most reliable solutions. The MSBs agree that their demand can be met instantly. They do not need to upgrade the infrastructure to expand the customer base or service portfolio. Cloud-based services also make outsourcing relatively easier. Thus, business performance has increased significantly. The findings also indicate that cloud-based services are suitable for monitoring, support, and management applications. MSBs can improve the performance of their employees by using

collaboration applications. In the Covid-19 pandemic, collaboration software and applications have become one of the top priorities.

6. RECOMMENDATIONS

Cloud migration by the MSBs can be motivated primarily by cost savings. However, the choice presented to them may confuse them and prevent them from planning the key performance indicators. The MSBs may lack clarity on where to spend or save. This economic decision can affect their decision-making and prevent them from taking full advantage of cloud computing technology. They can experience a rapid change in the cost structure when they try to scale the cloud-based services or applications offered to the customers. Instead of saving money, they can experience a sharp increase in their expenditure. To address this challenge, MSBs should develop a business case in writing. The business case should identify and explain the areas where cloud-based services can be deployed.

The second recommendation is based on regulatory compliance. There is no point in arguing that cloud computing and its compliance is a tedious task. The findings indicate that MSBs find this area challenging. So, it is recommended that MSBs review the strategies and existing tools, systems, processes, and policies. The review can provide insight into how they align with the cloud computing environment. The MSBs and cloud service vendors can adopt the IT governance frameworks that enable them to meet the compliance requirements. They can also add goals related to cost and performance management in it. This way, the MSBs will be able to monitor all the areas.

The third recommendation considers the human elements of MSBs. Human resources are among the most critical factors contributing to high performance and business success. Cloud-based services can be challenging to adopt, monitor, and configure. In such a situation, MSBs can think of avoiding the adoption. However, cloud adoption can be done successfully with the right people on board. The changes in technology can be implemented securely. Therefore, MSBs should invest in the employees' learning and development. This opportunity can equip them with the right skills, knowledge, and competencies to use cloud-based services. Before migration, their skills can align and help execute the processes for transitioning the legacy IT infrastructure to the cloud. The MSBs who are concerned about security can also take advantage of using the private cloud. Skilled employees can help operate the private cloud and ensure the security of the private and confidential data of MSBs. Employees can learn and apply the IT governance frameworks to practice efficient and effective governance. Management and employees can share the responsibilities of achieving strategic

direction and goals related to cost efficiency, customer retention, and risk management.

7. REFERENCES

Abualkishik, A. Z., A., A., & Gulzar, Y. (2020). Disaster Recovery in Cloud Computing Systems: An Overview. *International Journal of Advanced Computer Science and Applications,* 11(9). https://doi.org/10.14569/ijacsa.2020.0110984

Abutabenjeh, S., & Jaradat, R. (2018). Clarification of research design, research methods, and research methodology. *Teaching Public Administration,* 36(3), 237-258. Sagepub. https://doi.org/10.1177/0144739418775787

Adedokun, A. (2021). *The impact of Cloud computing on IT security skills and roles: A case study* (pp. 1-233) [Thesis *The impact of Cloud computing on IT security skills and roles: A case study*]. https://openrepository.aut.ac.nz/bitstream/handle/10292/14295/AdedokunA.pdf?sequence=3&isAllowed=y

Ahmed, I. (2020). Technology organization environment framework in cloud computing. *TELKOMNIKA (Telecommunication Computing Electronics and Control),* 18(2), 716. https://doi.org/10.12928/telkomnika.v18i2.13871

Alharbi, F., Atkins, A., & Stanier, C. (2016). Understanding the determinants of Cloud Computing adoption in Saudi healthcare organisations. *Complex & Intelligent Systems,* 2(3), 155-171. https://doi.org/10.1007/s40747-016-0021-9

Al-Hujran, O., Al-Lozi, E. M., Al-Debei, M. M., & Maqableh, M. (2019). Challenges of Cloud Computing Adoption From the TOE Framework Perspective. *Cloud Security,* 1312-1332. https://doi.org/10.4018/978-1-5225-8176-5.ch066

Alotaibi, M. B. (2016). Antecedents of software-as-a-service (SaaS) adoption: a structural equation model. *International Journal of Advanced Computer Research, 6*(25), 114-129. https://doi.org/10.19101/ijacr.2016.626019

Al-Sharafi, M. A., Arshah, R. A., Abu-Shanab, E. A., & Alajmi, Q. (2019). The Effect of Sustained Use of Cloud-Based Business Services on Organizations' Performance: Evidence from SMEs in Malaysia. *2019 5th International Conference on Information Management (ICIM).* https://doi.org/10.1109/infoman.2019.8714699

Alsharo, M. (2017). Attitudes Towards Cloud Computing Adoption in Emerging Economies. International Journal of Cloud Applications and Computing, 7(3), 44-58. https://doi.org/10.4018/ijcac.2017070102

Aryotejo G., Kristiyanto, D. Y., & Mufadhol. (2018). Hybrid cloud: bridging of private and public cloud computing. *Journal of Physics: Conference Series, 1025,* 012091. https://doi.org/10.1088/1742-6596/1025/1/012091

Attaran, M. (2017). Cloud Computing Technology: Leveraging the Power of the Internet to Improve Business Performance. *Journal of International Technology and Information Management,* 26(1), 112-137. https://scholarworks.lib.csusb.edu/jitim/vol26/iss1/6

Baker, O., & Kaur, P. (2020). *The Adoption of Cloud Computing CRM in SME's, Southland, New Zealand.* IEEE Xplore. https://doi.org/10.1109/ICOS50156.2020.9293682

B. Patel, Prof. H., & Kansara, Prof. N. (2021). Cloud Computing Deployment Models: A Comparative Study. *International Journal of Innovative Research in Computer Science & Technology,* 9(2), 45-50. https://doi.org/10.21276/ijircst.2021.9.2.8

Bala, R., Gill, B., Smith, D., Wright, D., & Ji, K. (2021). Magic Quadrant for Cloud Infrastructure and Platform Services [Review of Magic Quadrant for Cloud Infrastructure and Platform Services]. Gartner. https://aws.amazon.com > gartner-mq-cips-2021

Bealing, M., Siddharth, P., & Leroy de Morel, L. (2020). *Economic potential of cloud-based business tools* (T. Krieble, Ed.; pp. 1-51) [Review of Economic potential of cloud-based business tools]. NZIER. https://nzier.org.nz/publication/economic-potential-of-cloud-based-business-tools

Caldarelli, A., Ferri, L., & Maffei, M. (2016). Expected benefits and perceived risks of cloud computing: an investigation within an Italian setting. Technology Analysis & Strategic management, 29(2), 167-180. https://doi.org/10.1080/09537325.2016.1210786

Chen, T., Chuang, T.-T., & Nakatani, K. (2016). The Perceived Business Benefit of Cloud Computing: An Exploratory Study. *Journal of International Technology and Information Management, 25.* https://scholarworks.lib.csusb.edu/cgi/viewcontent.cgi?article=1297&context=jitim

Creative Research Systems. (2022). Survey Software – Questionnaire Software – Interviewing Software. Retrieved from www. Surveysystem.com website: https://www.surveysystem.com > sscalc

Cuervo-Cazurra, A., Mudambi, R., Pedersen, T., & Piscitello, L. (2017). Research Methodology in Global Strategy Research. *Global Strategy Journal, 7*(3), 233-240. https://doi.org/10.1002/gsj.1164

Dahlberg, T., Kivijarvi, H., & Saarinen, T. (2017). Longitudinal Study on the Expectations of Cloud Computing Benefits and an Integrative Multilevel Model for Understanding Cloud Computing Performance. *Proceedings of the 50th Hawaii International Conference on System Sciences (2017).* https://doi.org/10.24251/hicss.2017.514

Davies, S. (2019). New Zealand mid-size business report [Review of *New Zealand mid-size business report*]. Grant Thornton. https://www.grantthornton.co.nz > Insights

Dillon, S., & Vossen, G. (2015). SaaS cloud computing in small and medium enterprises: a comparison between Germany and New Zealand. *International Journal of Information Technology, Communications and Convergence,* 3(2), 87-104. https://doi.org/10.1504/ijitcc.2015.070998

El-Haddadeh, R. (2019). Digital Innovation Dynamics Influence on Organisational Adoption: The Case of Cloud Computing Services. *Information Systems Frontiers.* https://doi.org/10.1007/s10796-019-09912-2

Erturk, E. (2017). An Incremental Model for Cloud Adoption: Based on a Study of Regional Organizations. *TEM Journal, 6*(4), 868-876. https://doi.org/10.18421/TEM64-29

Financing SMEs and Entrepreneurs 2020. (2020). In *Financing SMEs and Entrepreneurs.* OECD. https://doi.org/10.1787/061fe03d-en

Gandecha, D. T. (2022). A Review on Cloud Computing Technology, Cloud Deployment and Service Delivery Models. *International Journal for Research in Applied Science and Engineering Technology, 10*(1), 1238-1245. https://doi/10.22214/ijraset.2022.40022

Gangwar, H. (2017). Cloud computing usage and its effect on organizational performance. *Human Systems Management, 36*(1), 13-26. https://doi.org/10.3233/hsm-171625

Gangwar, H., & Date, H. (2016). Critical Factors of Cloud Computing Adoption in Organizations: An Empirical Study. *Global Business Review, 17*(4), 886-904. https://doi.org/10.1177/0972150916645692

Gerguri-Rashiti, S., Ramadani, V., Abazi-Alili, H., Dana, L.-P., & Rattan, V. (2015). ICT, Innovation and Firm Performance: The Transition Economies Context. *Thunderbird International Business Review,* 59(1), 93-102. https://doi.org/10.1002/tie.21772

Gherghina, Botezatu, Hosszu, & Simionescu. (2020). Small and Medium-Sized Enterprises (SMEs): The Engine of Economic Growth through Investments and Innovation. *Sustainability, 12*(1), 347. https://doi.org/10.3390/su12010347

Hair, J. F., Page, M., & Brunsveld, N. (2019). *Essentials of Business Research Methods.* Routledge. https://doi.org/10.4324/9780429203374

Halteh, J., Arrowsmith, J., Parker, J., Zorn, T. E., & Bentley, T. (2018). The impact of technology on employment: a research agenda for New Zealand and beyond. *Labour & Industry: A Journal of the Social and Economic Relations of Work,* 28(3), 203-216. https://doi.org/10.1080/10301763.2018.1519774

Johannesson, P., & Perjons, E. (2014). Research Strategies and Methods. *An Introduction to Design Science,* 39-73. https://doi.org/10.1007/978-3-319-10632-8_3

Kaur, K. (2016). A Review of Cloud Computing Service models. *International Journal of Computer Applications, 140*(7), 15-18. https://doi.org/10.5120/ijca2016909378

Krishnan, A., & Verhaart, M. (2015). Factors influencing cloud enterprises resource planning system adoption in New Zealand small and medium enterprises. *28th Annual Conference of the National Advisory Committee on Computing Qualifications.* https://www.citrenz.ac.nz/conferences/2015/pdf/2015CITRENZ_3_Poster_Krishnan_ERP_v2.pdf

Kubiak, L., & Destremau, K. (2017). New Zealand services firms' approach to international revenue: A case study of the Cloud-computing sector. *Think-Asia.org*. http://hdl.handle.net/11540/7669

Latif, R., Abbas, H., Assar, S., & Ali, Q. (2014). Cloud Computing Risk Assessment: A Systematic Literature Review. *Lecture Notes in Electrical Engineering*, 285-295. https://doi.org/10.1007/978-3-642-40861-8_42

Loukis, E., Arvanitis, S., & Kyriakou, N. (2017). An empirical investigation of the effects of firm characteristics on the propensity to adopt cloud computing. *Information Systems and E-Business Management, 15*(4), 963-988. https://doi.org/10.1007/s10257-017-0338-y

Lu, Y. (Heidi). (2019). *An Exploration of Cloud-based Technology for enhancing Emergency Management: Cases from New Zealand* (pp.1-379) [Thesis *An Exploration of Cloud-based Technology for enhancing Emergency Management: Cases from New Zealand*]. https://researchcommons.waikato.ac.nz/bitstream/handle/10289/12441/thesis.pdf?sequence=4

Malkawi, N., Obeidat, A. M., & Halasa, A. (2017). Achieving Performance Excellence through Cloud Computing Atmosphere-Applied Study at Zain Telecommunications Company-Jordan. *International Review of Management and Business Research, 6*(1), 229.

Mohan, S. V., & Sathyanathan, S. S. (2015). Research in Cloud Computing-An Overview. *International Journal of Distributed and Cloud Computing, 3*(1). https://doi.org/10.21863/ijdcc/2015.3.1.002

Mukherjee, S. (2019). Benefits of AWS in Modern Cloud. *SSRN Electronic Journal.* https://doi.org/10.2139/ssrn.3415956

Neagu, C. (2016). The importance and role of small and medium-sized businesses. *F Theoretical and Applied Economics, XXIII*(3), 331-338. http://store.ectap.ro/articole/1217.pdf

O'Neil, R. (2021). *Thales: Kiwi businesses are failing to secure sensitive data in the cloud.* Retrieved March 22, 2022, from https://www.reseller.co.nz/article/692584/thales-kiwi-businesses-failing-secure-sensitive-data-cloud/

Ortiz, D. (2007). Research Design: Qualitative, Quantitative, and Mixed Methods Approaches [Book Review]. *Qualitative Research Journal, 6*(2), [205]207. https://doi.org/10.3316/qrj0602205

Power, B. (2018). Digital Transformation Through SaaS Multiclouds. *IEEE Cloud Computing, 5*(3), 27-30. https://doi.org/10.1109/mcc.2018.032591613

Prasad, A., Green, P., Heales, J., & Finau, G. (2014). Towards a Model of Cloud Computing Services for SMEs. In *openrepository.aut.ac.nz*. ACIS. http://hdl.handle.net/10292/8163

Ragab, M. A., & Arisha, A. (2017). Research Methodology in Business: A Starter's Guide. *Management and Organizational Studies*, 5(1), 1. https://doi.org/10.5430/mos.v5n1p1

Sabbah, H., Trabulsi, H., Chbib, R., & Sabbah, I. (2019). Cloud Computing in Lebanese Enterprises: Applying the Technology, Organization, and Environment (TOE) Framework. *Journal of Computer and Communications, 07*(10), 21-35. https://doi.org/10.4236/jcc.2019.710003

Schoot, R. van de, & Miocevic, M. (2020). Small sample size solutions: A Guide for Applied Researchers and Practitioners. *Expeditiorepositorio.utadeo.edu.co.* http://hdl.handle.net/20.500.12010/14973

Scoop Business. (2020). Dawn of new digital era: New Zealand SMEs embrace tech to futureproof operations / Scoop News. Retrieved March 22, 2022, from https://www.scoop.co.nz/stories/BU2007/S00511/dawn-of-new-digital-era-neww-zealand-smes-embrace-tech-to-futureproof-operations.htm

Scoop Business. (2021). *Cloud security market – Growing adoption by small and medium sized enterprises propelling growth.* https://www.scoop.co.nz/stories/BU2109/S00714/cloud-security-market-growing-adoption-by-small-and-medium-sized-enterprises-propelling-growth.htm

Senarathna, I., Wilkin, C., Warren, M., Yeoh, W., & Salzman, S. (2018). Factors That Influence Adoption of Cloud Computing: An Empirical Study of Australian SMEs. *Australasian Journal of Information Systems, 22.* https://doi.org/10.3127/ajis.v22i0.1603

Sileyew, K. J. (2019). Research Design and Methodology. *Text Mining - Analysis, Programming and Application [Working Title],* 1-12. intechopen. https://doi.org/10.5772/intechopen.85731

Singh, A. (2021). An Introduction to Experimental and Exploratory Research. *SSRN Electronic Journal.* https://doi.org/10.2139/ssrn.3789360

Singh, S., & Jangwal, T. (2012). Cost breakdown of Public Cloud Computing and Private Cloud Computing and Security Issues. *International Journal of Computer Science and Information Technology, 4(*2), 17-31. https://doi.org/10.5121/ijcsit.2012.4202

Sirakaya-Turk, E., & Uysal, M. (2011). Survey research: sampling and questionnaire design. *Research Methods for Leisure, Recreation and Tourism,* 94-113. https://doi.org/10.1079/9781845938918.0094

Snyder, H. (2019). Literature review as a research methodology: An overview and guidelines. *Journal of Business Research, 104*(104), 333-339. Science direct. https://doi.org/10.1016/j.jbusres.2019.07.039

Story, D. A., & Tait, A. R. (2019). Survey Research. *Anesthesiology, 130*(2), 192-202. https://doi.org/10.1097/aln.0000000000002436

Taherdoost, H. (2016). Sampling Methods in Research Methodology; How to Choose a Sampling Technique for Research. *SSRN Electronic Journal, 5*(2), 18-27. https://doi.org/10.2139/ssrn.3205035

Tongsuksai, S., Mathrani, S., & Weerasinghe, K. (2021). Critical success factors and challenges for cloud ERP system implementations in SMEs: A vendors' perspective. In *2021 IEEE Asia-Pacific Conference on Computer Science and Data Engineering.* https: www.researchgate.net/profile/Sanjay-Mathrani/publication/357936637_Critical_success_factors_and_challenges_for_cloud_ERP_system_implementations_in_SMEs_A_vendors'_perspective/links/61f0aae85779d35951d479c8/Critical-success-factors-and-challenges-for-cloud-ERP-system-implementations-in-SMEs-A-vendors-perspective.pdf

Thornton, G. (2019). *The power and potential of the mid-size business. New Zealand mid-market report 2019* (pp. 1-31) [Review of *The power and potential of the mid-size business New Zealand mid-market report 2019*]. Grant Thornton. https://www.grantthornton.co.nz > pdfs > gtnz-ms…PDF

Wambugu, A. W. (2018). *Adoption of Cloud-Based Services by SMEs in Developing Countries: Development of a T-O-E Based Model.* Erepo.usiu.ac.ke.http://erepo.usiu.ac.ke/11732/4107

Zyphur, M. J., & Pierides, D. C. (2017). Is Quantitative Research Ethical? Tools for Ethically Practicing, Evaluating, and Using Quantitative Research. *Journal of Business Ethics, 143(*1), 1-16. https://doi.org/10.1007/s10551-017-3549-8

Analysis of the Impacts of Artificial Intelligence on Personalised Learning in Higher Education of International Students in New Zealand

IDC De Silva and Dr Sid Sirisukha

ABSTRACT

Globalisation has enabled an increase in the number of international students worldwide. Many higher educational institutions across the globe host international students who take up more than half of the student population enrolled in studies. On the other hand, artificial intelligence (AI) has been in the spotlight in recent years, where companies across various industries are rapidly incorporating AI in their organisational activities. However, among these industries, the educational industry is the slowest at integrating AI. With the rise in AI tools like ChatGPT, Gemini and CoPilot, students have resorted to gaining new knowledge from these tools to help them with their studies. This study aims to analyse the impacts of AI on personalised learning in higher education (HE) for international students in New Zealand. To achieve this primary objective, the study breaks down the objective into several smaller objectives and analyses these smaller objectives using the data collected from the survey responses by 343 international students pursuing a HE in New Zealand. The key findings of this study suggests that AI has a positive impact on HE. The study further provides insight on the unique challenges that international students face when using AI tools in their learning. Finally, the research concludes with valuable insights from the key findings, limitations of this study, suggestions for future research and recommendations.

Keywords: *Artificial intelligence, personalised learning, higher education, international students, New Zealand*

1. INTRODUCTION

Given the rapid growth in which globalisation has evolved, many western countries are witnessing the uprise in the number of international students enrolling in higher education outside of their country of origin. This is mainly due to the better quality of education of western countries, followed by the quality of life. A group of experts from Australia identified that over two million international students pursued a HE outside of their home country, while

predicting that a growth of 15 million international students will occur by 2025 (Jibeen & Khan, 2015).

AI has taken the spotlight in recent years, with many organisations across various industries rushing to incorporate AI in their daily activities and be among the first to utilise the capabilities of AI to their fullest potential. Among these industries however, the education industry has taken a step back and is slow to adopt AI technologies. Despite the slow pace at which the education industry is adopting AI technologies, Marengo et al. (2023) discusses that AI will continue to be fully incorporated in HE to support personalised and adaptive learning to enhance the learning experience of students.

Hashim et al. (2022) informs how AI in HE is advantageous to international students as they can monitor the individual students' performance and adapt and adjust the strategies to help each student improve their knowledge and skills at a convenient pace. In simple terms, they describe that combining AI with HE allows for a more student-centred approach where each student is in control over their learning pace.

As García et al. (2019) describes, AI was designed to support the designing of programmes to assist machines, to learn and adapt. They further discuss that the most accurate definition of AI is by John McCarthy who implied that AI has the ability to help machines understand, think and answer like human-beings.

Educational institutions across the globe are starting to identify that, despite the immense number of international enrolments, international students face many unique challenges adapting to western education (Wang et al., 2023). Due to these unique challenges, and the fear of losing recognition, educational institutions have begun incorporating AI, even though at a slow pace compared to other industries.

1.1 Research questions and objectives

The primary question this research aims to answer is, "The impacts of AI on personalised learning in HE for international students in New Zealand". To simplify the process of answering this research question, the researcher devised five sub questions mentioned below:

RQ1: What is the frequency of AI tool usage among international students pursuing a HE in New Zealand?
RQ2: What is the relationship between the perceived ease-of-use and usefulness of AI-driven personalised learning tools and the adoption of them by international students?
RQ3: What is the relationship between the personalised learning experience of AI tool usage and the academic performance of international students?

RQ4: How satisfied are international students with the support provided by AI - driven personalised learning tools
RQ5: What challenges do international students face when using AI-driven personalised learning tools?

Five research objectives were designed corresponding to the five research questions mentioned above. These research objectives simplified the analyses that were conducted. The five research objectives are as below:

RO1: To determine the frequency and extent to which international students pursuing a HE in New Zealand use AI-driven personalised learning tools.
RO2: To identify the relationship between the perceptions regarding the ease-of-use and usefulness of AI-driven personalised learning tools, and the adoption of such tools.
RO3: To investigate the correlation between the personalised learning experience of AI tools usage and the academic performance of international students in New Zealand.
RO4: To identify the level of satisfaction of the results obtained by international students when using AI-driven personalised learning tools.
RO5: To identify the challenges and barriers international students encounter while using AI-driven personalised learning tools.

1.2 Significance of the research

The study primarily investigated the impacts of AI on personalised learning in HE. Apart from this, the research aimed to provide valuable insights on the unique challenges faced by international students when using AI tools for personalised learning.

By analysing the impacts of AI on HE and the unique challenges it brings to the users, this study aims to help numerous organisations affiliated with education to understand the potential of AI tools and the barriers these tools pose on users, while providing recommendations to mitigate these issues.

Furthermore, this study is focused on investigating and providing thorough insights on the potential opportunities of AI, further implicating why educational institutions should consider adopting AI in HE at a rapid pace, while highlighting the potential outcomes of using AI in HE, to academics, scholars, researchers and the New Zealand Government.

Lastly, despite the immense focus on AI, many literature primarily discuss AI or AI in education in general. Very few research articles exist about the impacts of AI in HE. Although several researchers mention about the unique challenges AI poses on education, not many authors have provided adequate recommendations

on how AI can be further improved to enhance the learning experience, which this study plans to shed light upon.

2. LITERATURE REVIEW

The ever-growing population, specifically students seeking HE, according to Pereda et al. (2007) has given rise to the rapid spike in the internationalization of HE by educational institutions globally. This upward trend in demand for international HE has proven advantageous to educational institutions across the globe, accommodating international student populations by catering new and improved curricula to students. It has helped educational institutions not only rake more income, but also gain more recognition worldwide.

The US has witnessed a significant increase in the portion of international enrolments for THE post-pandemic (IEE Open Doors, 2023) as depicted in *Figure 1* below. It further implies that, despite the pandemic halting international enrolments causing a downward trend between 2020/21 and 2021/22, HE is gaining traction with new international student enrolments exceeding 150,000 and increasing.

Figure 1 below also highlights that among all international students enrolling in education, the highest portion of international students are graduates seeking a HE. It is therefore evident that a huge demand exists for HE internationally.

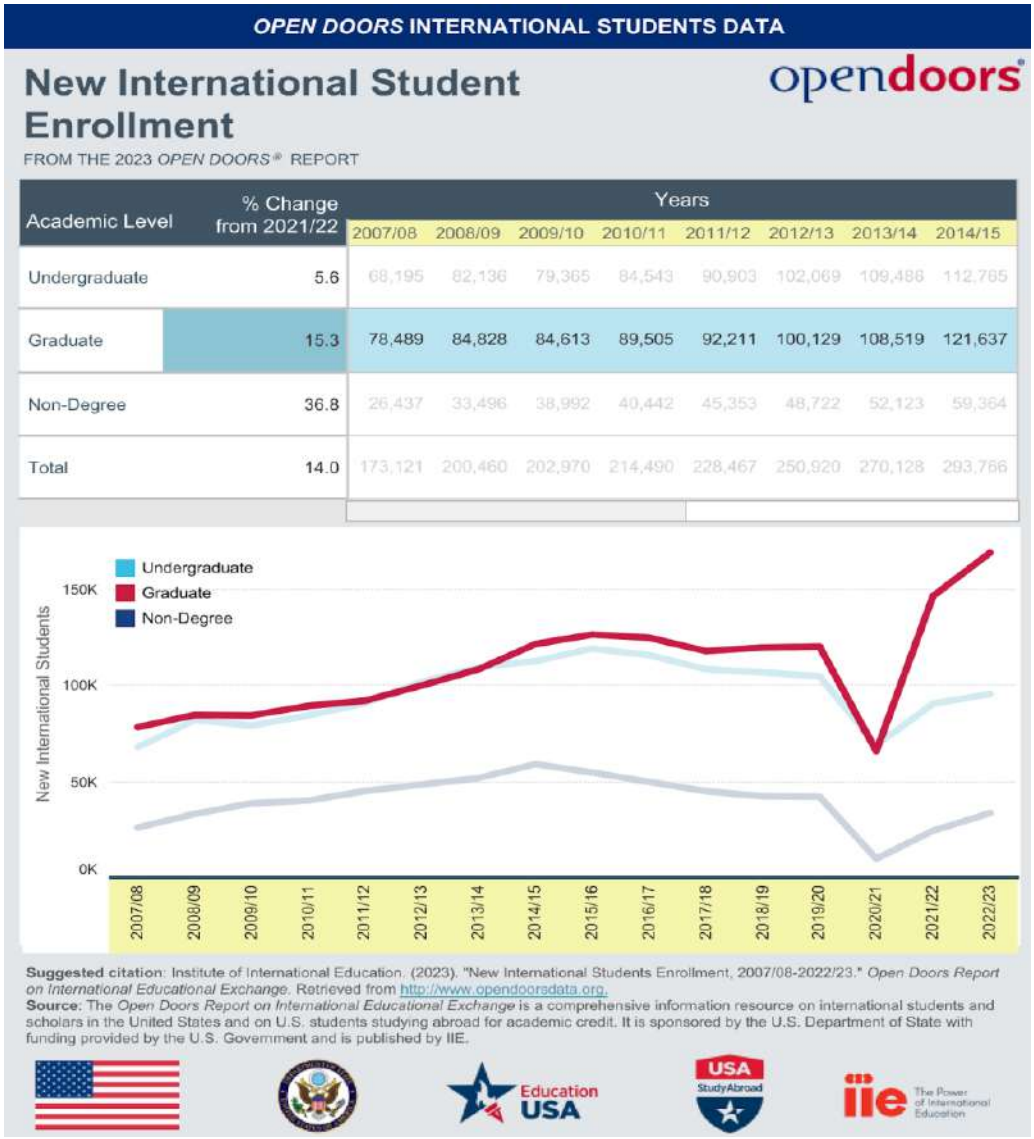


Figure 1: Number of international students enrolled for HE in the US (Source: IEE Open Doors, 2023)

Focusing on the number of international enrolments for HE in New Zealand, a similar upward trend can be seen as depicted in *Figure 2* below. New Zealand faced a decline in the number of international enrolments since 2017, and witnessed a massive decline during the pandemic period spanning from 2020 to 2022 (Education New Zealand Manapou ki te Ao, 2024).

Figure 2: International student enrolments in New Zealand from 2013 - 2024 (Source: Education New Zealand Manapou ki te Ao, 2024)

Figure 2 above further shows a growth in the number of international students in 2023 as opposed to 2022 which recorded the lowest number of international enrolments between 2013 and 2024 (Education New Zealand Manapou ki te Ao, 2024).

Upon closer inspection of *Figure 2*, it is clearly evident that among the total number of international enrolments, the highest number of enrolments were in universities which means that the highest number of international students arrived in New Zealand to pursue a HE.

2.1 Artificial Intelligence (AI)

Intelligent behaviour is known as the ability to seek new knowledge (Michalski et al., 2013), and the process of learning comprises gaining new knowledge through observation or experimentation on the existing knowledge, and developing one's skills through practicing knowledge gained. Michalski et al. (2013) further discusses that, after the computer was founded, researchers have tried incorporating learning capabilities within these machines with the long-term goal of achieving AI.

Although the primary objective of AI is to mimic a human-being, Long and Magerko (2020) argue that even experts find it difficult to provide AI with an accurate definition. They discuss that the primary reason for this is due to the non-technical individuals failing to distinguish between AI and non-AI platforms they use daily.

2.2 AI in education

With the advancement in technology, access to large datasets and the availability of cheap computing power has caused a rise in the development of machine learning (ML) (Tapalova and Zhiyenbayeva, 2022). Within the technological space, AI has experienced significant advances that have resulted in groundbreaking innovations and the integration across a wide range of applications (Walczak and Cellary, 2023). As discussed by Tapalova and Zhiyenbayeva (2022), the creation of ML combined with AI has enabled useful features such as, real-time natural language processing (NLP), translations, image analysis and much more. Due to these useful features of AI, organisations of various industries are gradually incorporating AI in their day-to-day business activities. Despite this, the education industry lags behind in terms of incorporating AI technologies within their teaching and learning processes.

Tapalova and Zhiyenbayeva (2022) further discuss the disadvantages that traditional teaching methods hold against students, where educational institutions consider that all students possess an equal competency level despite each individual student having certain shortcomings unique to them. They argue that enabling AI in HE allows each individual student to develop their skills and knowledge through a personalised learning experience tailor-made to suit each student based on their competency level, comprehension and other unique preferences.

Hashim et al. (2022) confirms that by incorporating AI in personalised learning helps AI tools to better understand students, identify their weaknesses and provide them with a personalised curriculum best suited for the student, resulting in all students being able to learn skills and enhance their existing knowledge while uncovering new knowledge at a pace convenient to them.

2.3 AI in personalised learning for international students

AI will eventually be fully integrated in the education industry due to its high potential among teachers and students, with the rapid development in technology, enabling vast advancements (Hashim et al., 2022). Similarly, with HE being internationalised, Pereda et al. (2007) discusses that a large portion of students enrolled in these programmes are international students. They further state that many international students have raised their displeasure with HE, forcing educational institutions to consider incorporating AI in HE to create equal opportunities for all students despite their varying level of competencies. Hashim et al. (2022) further describes that incorporating AI in HE will encourage more international students to engage in personalised learning which in turn will help guide these students throughout their journey in HE. This is achieved by AI analysing each individual international student and their level of competency, and designing a personalised learning process to support them in achieving their goals.

The increase in the number of international students undertaking a HE overseas can be considered a major outcome of AI in HE (Wang et al., 2023). 168, 920 international students enrolled in the US in 2022/2023 as shown in ***Figure 1***, making it the highest number of international enrolments in HE, in over a decade with an increase of 15.28% from 2021/2022 to 2022/2023 (IIE Open Doors, 2023). Wang et al. (2023) further emphasises that the increase in the number of international students pursuing a HE overseas, educational institutions are required to design innovative strategies to ensure a better learning experience is encountered by the international students, while promoting more international students to enroll for HE overseas, providing a steady flow of income to the country, resulting in the growth of the economy.

Personalised learning is an integral part of an international student's journey in HE with the integration of AI, to ensure the delivery of a better and a more personalised learning experience, enabling each international student to learn and gain knowledge at their own pace (Marengo et al., 2023). The authors further discuss that AI in HE helps educational instructors to clearly understand and assess the strengths and weaknesses of each student and focus on providing the necessary help and support to overcome those weaknesses resulting in higher performance in examinations and assignments.

2.4 Research gaps

As much as AI holds much potential in enhancing the personalised learning experience for international students, Wang et al. (2023) discusses the shortcomings of integrating AI in HE, such as, language barriers due to the low proficiency and comprehension of international students. Many research articles provide insights on several unique challenges faced by international students, however, failing to suggest recommendations to mitigate these issues.

The credibility of the information provided by AI is another major concern according to Marengo et al. (2023), as they discuss that along with the credibility of the source of information, the integration of AI in HE also causes privacy concerns. Due to AI requiring a certain level of access to personal information of students, to assess the competency level of each individual student, to enhance the learning experience, many point out that AI has the probability of exploiting the privacy of each student. The authors further inform that AI may be biased about certain topics, thus misleading international students, causing disastrous outcomes. Despite mentioning similar challenges of AI, Marengo et al. (2023) fails to provide recommendations to overcome these issues for the betterment of international students pursuing a HE.

2.5 Conceptual framework

This study follows the Constructive Learning Theory (CLT) and the Technology Acceptance Model (TAM), to test the hypotheses and evaluate the theoretical implications of the two frameworks.

CLT is defined as the construction of knowledge by combining new knowledge with existing knowledge, as it is considered as a vital part of the learning process in education (Bada & Olusegun, 2015). This approach of updating knowledge is known as the Constructivist approach. As Grubaugh et al. (2023) discusses, the Constructivist Philosophy is when learners actively enrich their knowledge by adding new and updated information to prior knowledge through first-hand experiences. Integrating AI in HE amplifies constructivist learning by encouraging higher engagement, self-awareness and clarity while ensuring a human touch in the learning process. The authors discuss that combining AI with constructivism allows educators to create dynamic and personalised learning pathways relevant to each student with regards to their prior knowledge and experience. Furthermore, combining AI with education helps mitigate the misconceptions by providing profound insights with factual reasoning. This research tested the correlation between the personalised learning experience of using AI tools and the impact they have on the academic performance of each individual international student using the personalised learning experience as the independent variable and the academic performance as the dependent variable as shown in Figure 3 below.

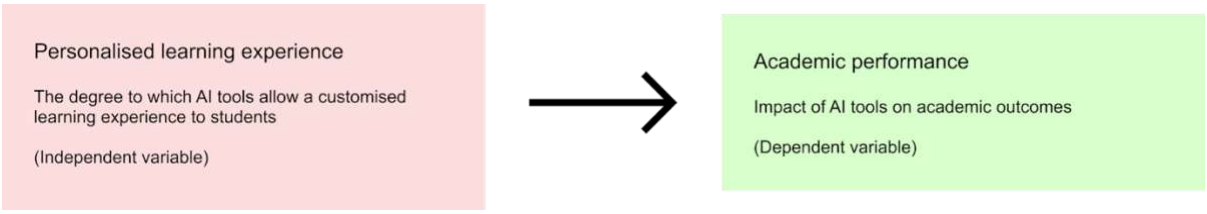


Figure 3: Relationship between independent and dependent variables for CLT (Source: Author)

Marangunić and Granić (2014) defines TAM as the decision made by individuals on accepting or rejecting the adoption of technology. In other words, with technology offering many features to help and support daily activities of individuals, the question remains whether such technology will be accepted by these individuals or rejected. TAM helps identify an individual's behaviour toward a certain technology and assess their likeliness to accept and adopt the technology, or reject it. According to Li (2023), many organisations in various industries have widely explored AI technologies for many decades. Furthermore, the author discusses several studies that were carried out, which proved that AI impacted the academic performance of students in a very positive manner. Li (2023) also discusses other studies that were carried out to investigate if AI

impacted the self-efficacy, learning attitude and motivation positively, or negatively. The research carried out by Li (2023) to gain insight on the level of acceptability of AI by students based on past research indicated that the majority of students not only accepted the technology, but were motivated to use AI in their learning, resulting in higher academic performance. TAM was used to analyse and understand the relationship between the perceived ease-of-use and usefulness of AI tools in learning, and the influence of these two factors in terms of international students accepting and adopting the use of AI tools in their academics, where the perceived usefulness and the ease-of-use are the independent variables and the adoption of AI tools is considered as the dependent variables as per *Figure 4* below.

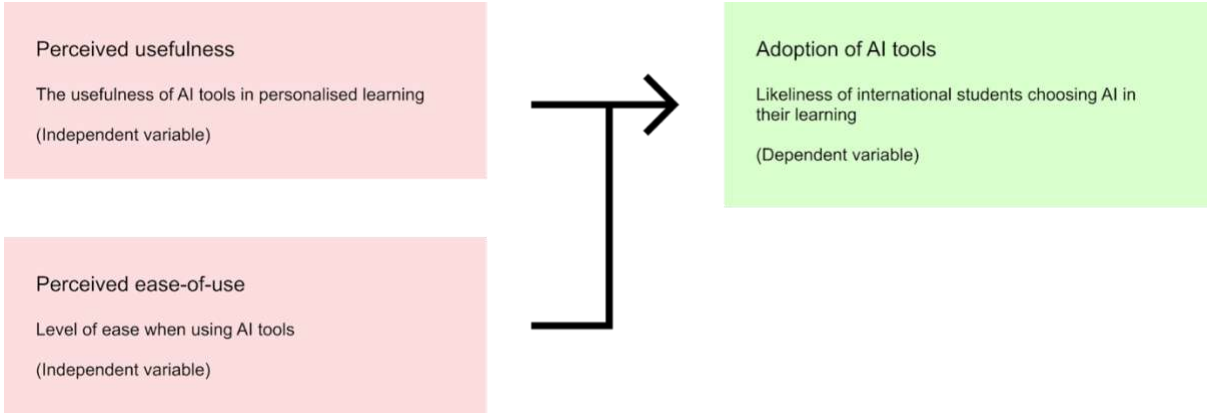


Figure 4: Relationship between independent and dependent variables for TAM (Source: Author)

2.6 Hypotheses

This study tests the relationship and correlation of two hypotheses against research objectives 2 and 3 mentioned in *1.2. Research question and objectives*. The hypotheses are as follows:

Table 1: Hypotheses tested with the data collected (Source: Author)

	Hypothesis
1	$H1_0$: International students tend to not adopt AI tools despite their ease-of-use and usefulness. H_{1a}: International students tend to adopt AI tools due to their ease-of-use and usefulness.
2	$H2_0$: An international student's academic performance is poor due to the frequent use of AI tools in personalised learning. H_{1a}: An international student's academic performance is improved when they frequently use AI tools in personalised learning.

3. RESEARCH METHODOLOGY

This study used a quantitative research methodology, as the research tested the hypotheses mentioned in *2.6. Hypotheses* against the variables mentioned in *2.5. Conceptual framework*. Since the variables required numerical value the quantitative research method was better suited for this study. Furthermore, a quantitative research method was used due to it being more time efficient. The design method used in this research was the correlation design method which is a design method which is a part of the quantitative research method selected for this study. This design method was used because the research aimed to investigate the correlation between the use of AI tools in personalised learning with its impact on the academic performance of international students pursuing a HE in New Zealand, as well as, investigate the relationship between the adoption of AI tools by international students, based on their perceived ease-of-use and usefulness of AI tools. The research strategy used in this study was a survey-based questionnaire, as this strategy is compliant with the selected research method and the design method. A key reason to use this strategy was also due to the ease of gaining the necessary permissions and approvals from the lecturers at the university, prior to attending their classrooms and distributing the survey among the students.

As Mazhar et al. (2021) describes, data is a fundamental piece of information, without which research cannot be carried out, leading to failure. Primary data collection was used for this research due to the lack of secondary data as AI has been more popular among society in recent years. Furthermore, this data collection method was used as there is a sufficient population of international students in New Zealand to gather insights regarding the use of AI tools in academics. The data collection was conducted in classrooms after prior approvals, by attending those classrooms and distributing the survey by sharing a QR code and link to the survey. The questionnaire was created in Google Forms which recorded the responses in a Google Sheet document which was then downloaded and saved as Microsoft Excel Spreadsheet document for coding and analysis purposes. The questionnaire featured close-ended questions to ensure more accurate data. A sample size of 385 was needed and calculated as follows:

- Margin of error € = 5% (0.05)
- Confidence level = 95% (Z-score = 1.96)
- Population proportion (p) = 0.5

$$n = \frac{Z^2 \cdot p \cdot (1-p)}{e^2}$$

$$n = \frac{Z^2 \cdot p \cdot (1-p)}{e^2}$$

$n = 384.16$

The sampling technique used for this study was the convenient non-probability sampling technique, due to its efficiency and given the time constraint to complete this research. This is also due to the total population of international students in New Zealand being unknown.

IBM Statistical Package for Social Sciences (SPSS) was used to analyse and transform the data collected from the survey. Before conducting the various analyses, the research performed a reliability test to ensure that the data collected was reliable.

Table 2: Reliability statistics (Source: Author)

Cronbach's Alpha	N of Items
.766	18

According to Tavakol and Dennick (2011), it is always best to perform a reliability test on data collected by analysing the Cornbach's Alpha, where an acceptable Cronbach's Alpha ranges between 0.7 and 0.95. As presented in *Table 2* above, the Cronbach's Alpha is 0.766, indicating that the data collected is within the acceptable range of the Cronbach's Alpha and is reliable for further analyses. A further analysis of the reliability was carried out for each question in the survey to ensure the reliability, as shown in *Table 3* below.

Table 3: Cronbach's Alpha statistics of each survey question (Source: Author)

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
What is your gender? (Please tick your answer)	51.87	34.276	.005	.774
Which age group do you belong to? (Please tick your answer)	50.03	35.879	-.213	.794
What is the highest level of study you have attained? (Please tick your answer)	49.70	34.596	-.051	.778
How long have you been studying in New Zealand? (Please tick your answer)	50.62	34.419	-.041	.782

How frequently do you use AI tools? (Please tick your answer)	48.85	26.447	.538	.736
How many hours on average do you spend on using AI tools per week? (Please tick your answer)	50.46	31.892	.241	.763
How easy do you find it to use AI tools? (Please tick your answer)	48.16	29.693	.528	.740
How useful do you find AI tools in enhancing your learning? (Please tick your answer)	48.18	28.244	.687	.726
To what extent do AI tools help you achieve better academic performance? (Please tick your answer)	48.38	27.137	.715	.719
How has your academic performance changed since you started using AI tools for learning? (Please tick your answer)	48.29	30.633	.560	.742
How satisfied are you with the [AI tools you use in terms of learning?]	48.15	28.911	.686	.729
How satisfied are you with the [answers provided to you by the AI tool?]	48.30	28.358	.749	.723
How satisfied are you with the [authenticity of the answers provided by AI tools?]	48.56	28.475	.636	.729
How satisfied are you with the [relevancy of the results provided by the AI tools to your questions?]	48.35	28.539	.680	.727
Do you have to rephrase your question multiple times to get an accurate answer from AI tools?	51.75	35.017	-.117	.780

(Please tick your answer)				
How many times do you rephrase your questions to the AI tool on average? (Please tick your answer)	48.99	32.482	.199	.766
Are you required to post your question numerous times to the AI tool in order to receive answers relevant to your question? (Please tick your answer)	51.80	35.233	-.153	.781
On average, how many tries does it take for the AI tool to provide you with an answer relevant to your question? (Please tick your answer)	48.96	32.527	.216	.764

4. FINDINGS AND DISCUSSIONS

4.1 Descriptive statistics of respondent demographics

The primary objective of this study was to explore the impact of AI on personalised learning of international students pursuing a HE in New Zealand. The survey gathered responses from 343 respondents.

4.1.1 Gender distribution

Of the 343 respondents, 192 (56%) were females, 150 (43.7%) were males, with 1 respondent (0.3%) opting not to disclose their gender, as shown in *Table 4* below.

Table 4: Demographic statistics - gender (Source: Author)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	FEMALE	192	56.0	56.0	56.0
	MALE	150	43.7	43.7	99.7
	PREFER NOT TO SAY	1	.3	.3	100.0
	Total	343	100.0	100.0	

4.1.2 Age group

A descriptive statistic was then conducted on the 343 respondents based on their age, distributed across four age groups as shown in Table 5 below.

Table 5: Demographic statistics - age group (Source: Author)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	18 - 24 YEARS	36	10.5	10.5	10.5
	25 - 34 YEARS	188	54.8	54.8	65.3
	35 - 44 YEARS	104	30.3	30.3	95.6
	45 YEARS OR MORE	15	4.4	4.4	100.0
	Total	343	100.0	100.0	

As presented in Table 5 above, the largest group of 188 respondents (54.8%) were aged between 25 and 34 years, followed by 104 respondents (30.3%) aged between 35 and 44 years, 36 respondents (10.5%) between the ages of 18 and 24, while the least number of respondents of 15 (4.4%) were aged 45 years or more.

Figure 5: Bar chart representing respondent percentiles based on age (Source: Author)

Figure 5 above graphically represents the statistics in *Table 5* of the respondents based on their age.

4.1.3 Educational background

In terms of the highest educational qualification attained, a majority of the respondents totaling 206 (60.1%) had completed their Master's Degree, while 124 respondents (36.2%) held a Bachelor's Degree. Of the remaining 13 respondents, 7 (2%) had only completed an Undergraduate programme, while the 6 remaining respondents (1.7%) had obtained other qualifications. *Table 6* below shows these data of the respondents at the time of participating in the survey.

Table 6: Demographic statistics - highest education attained: Normality testing (Source: Author)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Undergraduate	7	2.0	2.0	2.0
	Bachelor's Degree	124	36.2	36.2	38.2
	Master's Degree	206	60.1	60.1	98.3
	Others	6	1.7	1.7	100.0
	Total	343	100.0	100.0	

Prior to instigating further statistical analyses, a normality test was performed to check if the dataset followed a normal distribution or a Gaussian distribution, as Ghasemi & Zahediasl (2012) discuss that a normality test will help determine if the analyses should be conducted using parametric tests or non-parametric tests. Therefore, normality tests were carried out on the dependent variables mentioned in The normality was assessed using both, graphical and statistical tests. Histograms and Q-Q plots were examined to visually inspect the distribution of each variable. A Shapiro-Wilk test was conducted on each dependent variable due to the smaller sample size. A p value greater than 0.05 suggests that the data does not deviate significantly from a normal distribution.

4.1.4 Academic performance

A total of 343 responses were recorded for the question: "How has your academic performance changed since you started using AI tools for learning?", indicating a 100% response rate from the participants of the survey as shown in *Table 7* below.

Table 7: Total responses for academic performance (Source: Author)

	Valid		Cases Missing		Total	
	N	Percent	N	Percent	N	Percent
How has your academic performance changed since you started using AI tools for learning? (Please tick your answer)	343	100.0%	0	0.0%	343	100.0%

Table 8 below shows a mean score of 4.04 (SD = 0.582), which indicates that the academic performance has improved with the use of AI tools in learning.

Table 8: Descriptives for academic performance (Source: Author)

			Statistic	Std. Error
How has your academic performance changed since you started using AI tools for learning? (Please tick your answer)	Mean		4.03	.031
	95% Confidence Interval for Mean	Lower Bound	3.97	
		Upper Bound	4.09	
	5% Trimmed Mean		4.05	
	Median		4.00	
	Variance		.338	
	Std. Deviation		.582	
	Minimum		1	
	Maximum		5	
	Range		4	
	Interquartile Range		0	
	Skewness		-.630	.132
	Kurtosis		2.909	.263

- Total number of valid responses (N): 343
- Frequency of Score 4 (Improved): 244
- Frequency of Score 5 (Significantly Improved): 57

As shown in *Table 8*, the median score is 4, and based on the variables above, a majority of 71.1% of the participants rated that their academic performance had improved (Score 4), which is the highest answer recorded. The histogram in *Figure 6* below clearly depicts that the majority of the respondents had witnessed

an improvement in their academic performance after incorporating AI tools in their learning.

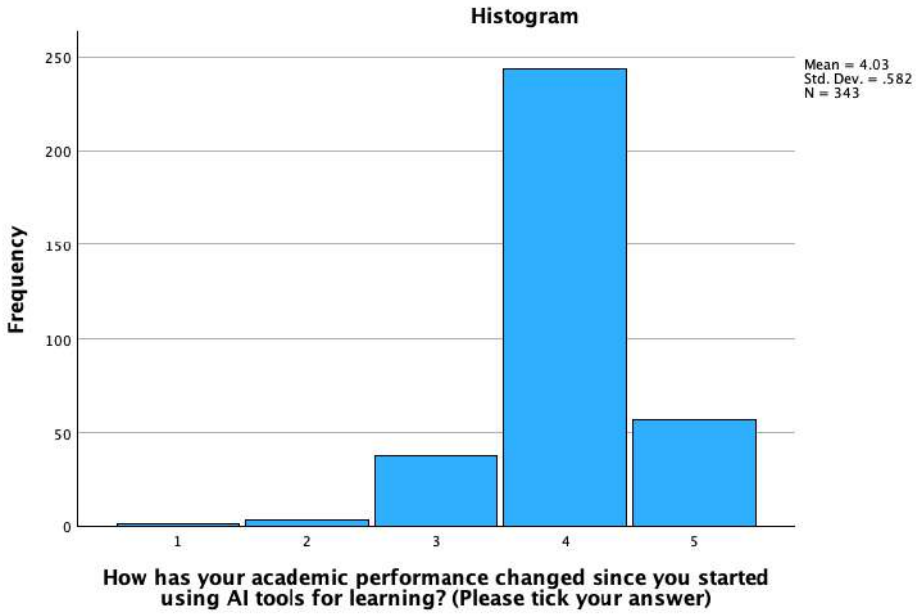


Figure 6: Histogram representing academic performance (Source: Author)

Table 9 below depicts a p value less than 0.001, in both, the Kolmogorov-Smirnov test and the Shapiro-Wilks test, indicating a large deviation from the normal data distribution ($p < 0.05$) suggesting that non-parametric tests are more suitable in subsequent analyses.

Table 9: Kolmogorov-Smirnov and Shapiro-Wilks test for academic performance (Source: Author)

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
How has your academic performance changed since you started using AI tools for learning? (Please tick your answer)	.358	343	<.001	.717	343	<.001

a. Lilliefors Significance Correction

4.1.5 Usage frequency

Table 10 below indicates a 100% participation of the 343 respondents to the survey question: “How frequently do you use AI tools?”.

Table 10: Total responses for usage frequency (Source: Author)

	Valid		Cases Missing		Total	
	N	Percent	N	Percent	N	Percent
How frequently do you use AI tools? (Please tick your answer)	343	100.0%	0	0.0%	343	100.0%

As shown in *Table 11*, the mean value of 3.47 indicates that, on average, the respondents tend to use AI tools more frequently. This is interpreted by the scale used for the responses, ranging from "0 - never", "1 - rarely", "2 - once a month", "3 - once a week", "4 - several times a week" and "5 - daily".

Table 11: Descriptive for AI tools usage frequency (Source: Author)

			Statistic	Std. Error
How frequently do you use AI tools? (Please tick your answer)	Mean		3.47	.065
	95% Confidence Interval for Mean	Lower Bound	3.34	
		Upper Bound	3.60	
	5% Trimmed Mean		3.54	
	Median		4.00	
	Variance		1.455	
	Std. Deviation		1.206	
	Minimum		0	
	Maximum		5	
	Range		5	
	Interquartile Range		1	
	Skewness		-.870	.132
	Kurtosis		.056	.263

The findings in *Table 11* indicate that the average usage is closer to "4 - several times a week". With a 95% confidence level for Mean falling between 3.34 and 3.60, it is clear that on average, the usage frequency of AI tools by participants

are between “Once a week” or “Several times a week”. Although a moderate variability exists among the responses, the data still fairly indicates a majority of respondents use AI tools more frequently.

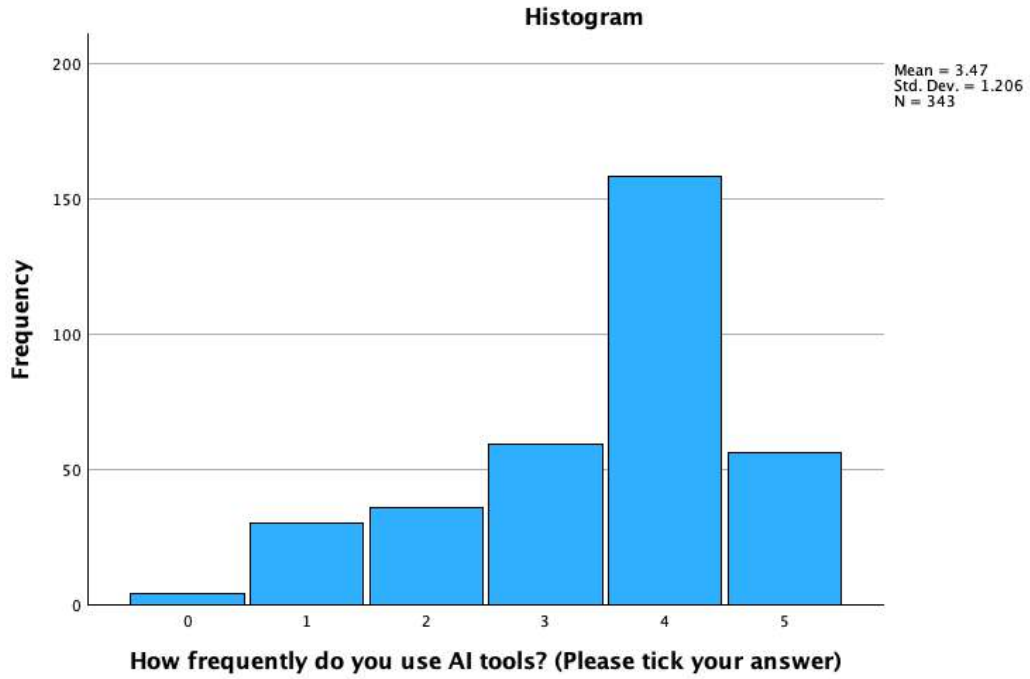


Figure 7: Histogram representing AI tool usage (Source: Author)

The statistics in *Figure 7* validate that many of the respondents used AI tools several times a week. However, it is also evident that Scores 1, 2, 3 and 4 deviate very slightly suggesting a fair distribution of data among them, while Score 0 has the lowest votes recorded.

Table 12: Kolmogorov-Smirnov and Shapiro-Wilks normality test for usage frequency (Source: Author)

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
How frequently do you use AI tools? (Please tick your answer)	.293	343	<.001	.856	343	<.001

a. Lilliefors Significance Correction

The statistics of the Kolmogorov-Smirnov and Shapiro-Wilks tests in *Table 12* indicate the existence of a significant deviation in the data distribution. This is

evident in the p value being less than 0.001 which is below the normal data distribution value ($p < 0.05$), suggesting that subsequent analyses need to use non-parametric tests.

4.2 Hypothesis testing

Since the normality tests showed a significant deviation in the data distributed, the hypothesis testing was conducted using the nonparametric Kruskal-Willis H and Spearman's Rank Correlation tests.

. ***Relationship between the perceived satisfaction gained by the ease-of-use and usefulness of AI tools, and their adoption***

The Kruskal-Willis H test was conducted to test the relationship between the adoption of AI tools in learning by international students, based on their perception of the ease-of-use and the usefulness of AI tools. This test was conducted to analyse the combined relationships of the independent variables (usefulness and ease-of-use) with the dependent variable (adoption of AI tools).

Table 13: Kruskal-Willis test (Source: Author)

	Recoded_IV	N	Mean Rank
How frequently do you use AI tools? (Please tick your answer)	1.00	10	43.05
	2.00	199	152.59
	3.00	134	210.44
	Total	343	

- Group 1 (Recorded IV = 1): Mean Rank 43.05
- Group 2 (Recorded IV = 2): Mean Rank 152.59
- Group 3 (Recorded IV = 3): Mean Rank 210.44

The mean ranks indicate that respondents belonging to Group 3 rated the combination of the ease-of-use and usefulness higher and also reported a greater adoption of AI tools compared to the participants in Groups 1 and 2, according to *Table 13*. Upon close observation of *Table 13*, it is clear that the mean rank of Group 3 (210.44) is higher than the mean rank of Group 2 (152.59) despite the number of participants in Group 2 (199) being higher than that of Group 3 (134). This finding suggests that although more respondents were in Group 2, those in Group 3 demonstrated a higher tendency to adopt AI tools due to their higher ratings for ease-of-use and usefulness of AI tools.

Table 14: Kruskal-Willis H test statistics (Source: Author)

Test Statistics[a,b]

	How frequently do you use AI tools? (Please tick your answer)
Kruskal-Wallis H	50.141
df	2
Asymp. Sig.	<.001

a. Kruskal Wallis Test
b. Grouping Variable: Recoded_IV

The aim of the statistical analysis in *Table 14* is to prove the relationship between the perceived ease-of-use and usefulness of AI tools has a positive or negative impact on the adoption of AI tools by accepting either the null hypothesis (H_0) or the alternate hypothesis (H_1) and rejecting the other.

H_0: International students tend to not adopt AI tools despite their ease-of-use and usefulness.

H_1: International students tend to adopt AI tools due to their ease-of-use and usefulness.

The Kruskal-Willis H test in Table 14 shows a statistic of 50.141 with 2 degrees of freedom (df) and a significance level (Asymp. Sig. (p)) of < 0.001. This finding proves that there is a statistically significant relationship between the adoption of AI tools based on the perceived ease-of-use and usefulness of AI tools, thereby proving H_1. Therefore, we can accept H_1 which states that "International students tend to adopt AI tools due to their ease-of-use and usefulness", while rejecting H_0 which states that "International students tend to not adopt AI tools despite their ease-of-use and usefulness".

B. Correlation between the personalised learning experience of AI tools and the academic performance

To test the correlation between the personalised learning experience of AI tools and the impact on academic performance, the Spearman's Rank Correlation test was conducted.

Table 15: Correlation between the personalised learning experience and the academic performance (Source: Author)

			How useful do you find AI tools in enhancing your learning? (Please tick your answer)	How has your academic performance changed since you started using AI tools for learning? (Please tick your answer)
Spearman's rho	How useful do you find AI tools in enhancing your learning? (Please tick your answer)	Correlation Coefficient	1.000	.476**
		Sig. (2-tailed)	.	<.001
		N	343	343
	How has your academic performance changed since you started using AI tools for learning? (Please tick your answer)	Correlation Coefficient	.476**	1.000
		Sig. (2-tailed)	<.001	.
		N	343	343

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

A strong, positive and significant correlation between the personalised learning experience and the academic performance is evident in *Table 15* with the correlation coefficient of the independent variable being 1 and the correlation coefficient of the dependent variable being 0.476 which leans more towards 1. Therefore, it is clear that a majority of respondents who found their personalised learning experience to be better with AI tools experienced an improvement in their academic performance. The aim of this statistical analysis was to investigate if a correlation existed between the personalised learning experience with AI tools and the impact on academic performance.

H_0: An international student's academic performance is poor due to the frequent use of AI tools in personalised learning.

H_1: An international student's academic performance is improved when they frequently use AI tools in personalised learning.

According to *Table 15*, since the p value is less than 0.001 which is less than the significance threshold of 0.05, H_0 which states that "An international student's academic performance is poor due to the frequent use of AI tools in personalised learning" can be rejected, while accepting H_1 which states that "An international student's academic performance is poor due to the frequent use of AI tools in personalised learning".

4.3 Challenges faced when using AI tools in personalised learning

Apart from proving the positive relationships of using AI tools in personalised learning, this study further aimed to provide insight on the unique challenges that international students face when using AI tools in their learning. To test this, a Frequency Analysis and Chi-Square test was conducted. Furthermore, these tests analyse if the challenges faced vary depending on the age groups to help provide recommendations.

Table 16: Frequency statistics of challenges faced (Source: Author)

		Technical challenges	Lack of training/support	Language barriers	Difficulty understanding AI responses	Other
N	Valid	343	343	343	343	343
	Missing	0	0	0	0	0
Mean		.27	.52	.17	.19	.03
Median		.00	1.00	.00	.00	.00
Std. Deviation		.445	.500	.380	.392	.176
Skewness		1.034	-.076	1.719	1.591	5.335
Std. Error of Skewness		.132	.132	.132	.132	.132

Based on the mean values in *Table 16*, it is evident that more than 50% of the respondents reported the lack of training and support as the challenge they face when using AI tools in personalised learning. Technical challenges were reported as the second largest challenge faced by 17% of the 343 international students. However, it is clear that a significant gap exists between the most commonly faced challenges. 19% of the participants reported they faced difficulties in understanding AI responses, while 17% reported issues due to language barriers and a minority of 3% reported other challenges. The median of 1 for the challenge, "lack of training and support". Is 1, signifying that this is the most commonly faced challenge, whereas, the other challenges all have a median of 0 according to *Table 16*.

Despite the most common challenge reported being the lack of training and support, Crosstab and Chi-Square tests were carried out for technical challenges and the difficulty in understanding AI responses, based on the age groups.

Table 17: Crosstab for technical challenges faced based on age group (Source: Author)

		Age group				Total
		18 - 24 years	25 - 34 years	35 to 44 years	45 years or more	
Technical challenges	NO	30	150	61	9	250
	YES	6	38	43	6	93
Total		36	188	104	15	343

As indicated in *Table 17*, of the total participant count of 343, 43 participants between the age of 35 and 44 years reported facing technical challenges. 38 of the 343 participants who reported they faced technical challenges were aged between 25 and 34 years. However, in comparison, it is clear that nearly half of the respondents aged between 35 and 44 years faced this unique challenge. This finding proves that there is a significant relationship between the age groups and them experiencing technical challenges when using AI tools.

Table 18: Chi-Square test for technical challenges faced based on age groups (Source: Author)

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	18.439[a]	3	<.001
Likelihood Ratio	17.960	3	<.001
Linear-by-Linear Association	14.756	1	<.001
N of Valid Cases	343		

a. 1 cell (12.5%) has an expected count less than 5. The minimum expected count is 4.07.

With a Pearson Chi-Square statistic of 18.439 and a 3 df and a p value of < 0.001 as shown in *Table 18*, it is evident that a statistically significant association exists between the age groups and if the participants belonging to these age groups faced technical challenges when using AI tools. This finding suggests that older age groups were more likely to experience technical challenges.

Table 19: Crosstab for difficulty in understanding AI responses based on age groups (Source: Author)

		Age group				Total
		18 - 24 years	25 - 34 years	35 to 44 years	45 years or more	
Difficulty understanding AI responses	NO	32	159	75	12	278
	YES	4	29	29	3	65
Total		36	188	104	15	343

As shown in *Table 19*, 29 of 188 participants (15.4%) between the ages 25 and 34 years reported a difficulty in understanding Ai responses. Among the 104 participants aged between 35 and 44 years, 29 participants reported a difficulty in understanding Ai responses. When comparing these two age groups, it is clear that the older age group once again faced this challenge more than the participants belonging to other age groups.

Table 20: Chi-Square test for difficulty in understanding AI responses based on age groups (Source: Author)

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	8.377[a]	3	.039
Likelihood Ratio	8.133	3	.043
Linear-by-Linear Association	5.830	1	.016
N of Valid Cases	343		

a. 1 cell (12.5%) has an expected count of less than 5. The minimum expected count is 2.84.

The Pearson Chi-Square statistic is 8.377 with 3 df and a p value of 0.039 which is less than the common p value of 0.05, thus indicating a significant association between age groups and experiencing a difficulty in understanding AI responses, especially among the older age groups.

5. CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary of findings

The results of this study offer comprehensive insights on the factors that influence the adoption of AI tools among international students, as well as proving the personalised learning experience of AI tools has a positive impact on academic performance. The unique challenges faced by the international students is another

key finding of this study. The study also uncovered that older age groups faced more challenges compared to those in younger age groups.

5.2 Implications of findings

The findings of this study contribute to the theoretical understanding of technology adoption among international students. By applying TAM alongside CLT, this research highlights the importance of the perceived ease-of-use and the usefulness of AI tools in determining the adoption of these technologies by international students. According to the TAM framework, these two factors are crucial in moulding the students' attitude towards adopting AI tools.

The findings further prove the theory of the CLT framework by highlighting the experience gained in personalised learning with the use of AI tools vastly influences the academic performance in a positive manner. As per the CLT framework, students are encouraged to individually engage more in seeking new knowledge, reducing the misconception through their personal experience and existing knowledge. The outcome of the findings suggests that international students who gain a better personalised learning experience using AI tools, tend to outperform others in academic performance.

However, the study also suggests that additional variables such as, the lack of proper training and support, language barriers and technical challenges play a crucial role in moderating the perceived ease-of-use, usefulness and academic gains of using AI tools. While TAM provides a solid foundation for understanding technology adoption, future iterations of this model may need to factor in the unique challenges faced by diverse international student groups.

5.3 Limitations

While this research provides valuable insights regarding the relationship between the perceived ease-of-use and usefulness of AI tools influencing their adoption, and the relationship between the improvement in academic performance influenced by the personalised learning experience of international students, this study features several limitations that should be acknowledged.

First, the sample size, while sufficient for statistical analysis, may not fully capture the diversity of international student experiences across different geographic regions and educational systems within New Zealand. This is due to the fact that most respondents were drawn from a single educational institution in Auckland New Zealand, which limits the generalisability of the findings.

Another limitation of this study is its resilience on self-reported data. While the survey was an effective and more efficient way of gathering data on perceptions and experiences, they are subject to bias, as the participants may not always

provide accurate or complete responses, rather provide responses that they think may be relevant to the success of the research.

Additionally, this study focuses on the experiences of students at a single point in time. However, the perceptions of students for AI tools may evolve as AI tools become more tightly integrated with education and as the students become more familiar with AI tools and their benefits.

Lastly, this study primarily investigates the positive aspects of using AI tools. However, similar to the many benefits of using AI tools, these tools also consist of many negative aspects which are quite crucial too. Privacy concerns, trust and the tendencies of plagiarism are some of the main downsides of using AI tools.

5.4 Future research

Firstly, to overcome the limitations related to the sample size, future research should consider expanding the sample size to include international students enrolled in HE from multiple educational institutions across all regions in New Zealand. This would provide a more comprehensive understanding of the challenges faced by international students within all of New Zealand.

Secondly, future studies should consider using a mixed method to gain more accurate information regarding the use of AI tools in learning. A mixed-methods approach will support cross-examination of data gathered.

A longitudinal study is required to help monitor the perception of international students regarding the use of AI tools in their learning over a period of time, allowing future research to identify and understand the variations in the perception of AI tools based on the changes in attitudes and challenges as international students gain more experience with AI tools.

Future research also should shift their focus towards the negative aspects incorporated with AI tools. Studies need to be conducted on the risks of using AI tools in learning such as, the privacy issues, trust and tendencies to commit plagiarism.

5.5 Recommendations

5.5.1 Educational institutions

Educational institutions in New Zealand should consider promoting the use of AI tools, based on the findings which proved that the academic performance was improved. Furthermore, these institutions need to provide adequate training and support to help students learn how to use AI tools.

5.5.2 AI developers

AI tools developers need to focus their efforts on creating more intuitive and user-friendly solutions that are easier to use regardless of age and individuals who are non-technical or non-native English speakers.

5.5.3 Policy makers

The New Zealand Government and educational institutions should collaborate in implementing standards for using AI tools in educational settings. These policies need to ensure all students are provided with equal opportunities.

5.6 Conclusion

In conclusion, this study highlights the potential of AI tools in enhancing the personalised learning experience while positively impacting international students pursuing a HE in New Zealand. The study further uncovers the many unique challenges faced by international students and provides the limitations of this study, suggestions for future research and recommendations for proper implementation and use of AI tools. A key aspect provided by this study for future research is to conduct a longitudinal study, and expand the sample size to accommodate more regions of New Zealand.

6. REFERENCES

Bada, S. O., & Olusegun, S. (2015). Constructivism Learning Theory: A Paradigm for Teaching and Learning. *Journal of Research & Method in Education*, *5*(6), 66–70. https://doi.org/10.9790/7388-05616670

Education New Zealand Manapou ki te Ao. (2024, March 20). *New Zealand International Student Enrolments 2013 to 2023*. Tableau. https://public.tableau.com/app/profile/education.new.zealand/viz/MOEInternationalStudentEnrolments2013to2023/BarCharts-InternationalEnrolments2013-2023

García, C. G., Núñez-Valdez, E., García-Díaz, V., G-Bustelo, C. P., & Cueva-Lovelle, J. M. (2019). A review of artificial intelligence in the Internet of Things. *International Journal of Interactive Multimedia and Artificial Intelligence*, *5*(4), 9. https://doi.org/10.9781/ijimai.2018.03.004

Ghasemi, A., & Zahediasl, S. (2012). Normality Tests for Statistical Analysis: A Guide for Non-Statisticians. *International Journal of Endocrinology and Metabolism*, *10*(2), 486–489. https://doi.org/10.5812/ijem.3505

Grubaugh, S., Levitt, G., & Deever, D. (2023). Harnessing AI to Power Constructivist Learning: An evolution in Educational Methodologies. *EIKI Journal of Effective Teaching Methods*, *1*(3). https://doi.org/10.59652/jetm.v1i3.43

Hashim, S., Omar, M. K., Jalil, H. A., & Sharef, N. M. (2022). Trends on Technologies and Artificial Intelligence in Education for Personalized

Learning: Systematic Literature review. *International Journal of Academic Research in Progressive Education and Development*, *11*(1). https://doi.org/10.6007/ijarped/v11-i1/12230

IIE Open Doors. (2023, November 13). *New International Student Enrollment - IIE open doors*. IIE Open Doors / New International Student Enrollment. https://opendoorsdata.org/data/international-students/new-international-students-enrollment/

Jibeen, T., & Khan, M. A. (2015). Internationalization of higher Education: Potential benefits and costs. *International Journal of Evaluation and Research in Education*, *4*(4), 196. https://doi.org/10.11591/ijere.v4i4.4511

Marangunić, N., & Granić, A. (2014). Technology acceptance model: a literature review from 1986 to 2013. *Universal Access in the Information Society*, *14*(1), 81–95. https://doi.org/10.1007/s10209-014-0348-1

Marengo, A., Pagano, A., Soomro, K., & Pange, J. (2023). The Educational Value of Artificial Intelligence in Higher Education: A Ten-Year Systematic Literature Review. *Preprints*. https://doi.org/10.20944/preprints202311.0055.v1

Mazhar, S. A., Anjum, R., Anwar, A. I., & Khan, A. A. (2021). Methods of data collection: a fundamental tool of research. Journal of Integrated Community Health, *10*(01), 6-10. https://doi.org/10.24321/2319.9113.202101

Pereda, M., Airey, D., & Bennett, M. (2007). Service quality in higher Education: The experience of overseas students. *Journal of Hospitality Leisure Sport & Tourism Education*, *6*(2), 55–67. https://doi.org/10.3794/johlste.62.160

Tapalova, O., & Zhiyenbayeva, N. (2022). Artificial Intelligence in Education: AIED for Personalised Learning Pathways. *Electronic Journal of e-Learning*, *20*(5), 639–653. https://doi.org/10.34190/ejel.20.5.2597

Tavakol, M., & Dennick, R. (2011). Making sense of Cronbach's alpha. *International Journal of Medical Education*, *2*, 53–55. https://doi.org/10.5116/ijme.4dfb.8dfd

Walczak, K., & Cellary, W. (2023). Challenges for higher education in the era of widespread access to generative AI. *Economics and Business Review/the Poznań University of Economics Review*, *9*(2). https://doi.org/10.18559/ebr.2023.2.743

Wang, T., Lund, B. D., Marengo, A., Pagano, A., Mannuru, N. R., Teel, Z. A., & Pange, J. (2023). Exploring the potential impact of artificial intelligence (AI) on international students in higher education: generative AI, chatbots, analytics, and international student success. *Applied Sciences*, *13*(11), 6716. https://doi.org/10.3390/app13116716

The Antecedents of Intention to Use Smart Scenic Guide Systems in the China Market

Jin Yu and Dr Kok Hong Liew

ABSTRACT

This study explores the factors influencing the intention to use Smart Scenic Guide Systems (SSGS) in the Chinese market through the Technology Acceptance Model (TAM). The tourism sector has evolved significantly due to intelligent tourism technologies that improve service quality and visitor satisfaction. This cross-sectional research collected data via online surveys from 438 tourists who utilized SSGS in Lijia Mountain City Smart Park. The study examined constructs such as perceived usefulness, ease of use, fun, and risk, each operationalized and measured. Results show that perceived usefulness (R^2 = 68.7%) and ease of use (R^2 = 63.5%) significantly enhance tourists' willingness to use SSGS, while perceived risk has a negative effect. Additionally, perceived fun is crucial for enhancing user experience and intention to use the system. These findings support the proposed hypotheses and underscore the importance of perceived usefulness and ease of use for SSGS adoption. The study suggests that system developers and scenic spot managers should prioritize optimizing these aspects to boost user adoption and satisfaction. Despite its focus on a single smart park, the research highlights the transformative potential of intelligent tourism technologies and offers strategic insights for future development.

Keywords*: Smart Scenic Guide Systems, Technology Acceptance Model, perceived usefulness, perceived ease of use, perceived fun, perceived risk, smart tourism, China.*

1. INTRODUCTION

With the rapid advancement in informatization, digitization, and intelligentisation, both the supply and demand in the tourism industry have significantly evolved. Smart tourism has become a key driver for high-quality development in the sector, encompassing various fields such as smart cities and smart transportation. Its core objective is to leverage information technology to enable real-time acquisition and interaction of tourism information, thereby enhancing the overall tourist experience (Gretzel et al., 2015; Wang et al., 2013). As the physical carriers of tourism supply, scenic spots play a pivotal role in determining the development level of smart tourism. The construction of smart scenic spots includes various aspects such as Smart Scenic Guide Systems, smart

ticketing systems, and smart service systems (Hitrec, 2018; Tu & Jia, 2024) that enable scenic spots to achieve personalized service provision, significantly improving management efficiency and service quality (Femenia-Serra et al., 2019).

The success of smart tourism largely depends on tourists' acceptance and willingness to use these systems (Davis, 1989; Venkatesh & Bala, 2008). Despite the significant potential benefits of Smart Scenic Guide Systems, their adoption rate in actual applications remains low. For instance, a study showed that only 35% of tourists found the Smart Scenic Guide Systems easy to use (Wu, Wu, Ye, Wu, & Pan, 2022). During system development, the needs of tourists as users were overlooked, and the focus was solely on adding new technologies, resulting in systems that, while technically advanced, do not meet the essential needs of tourists. This asymmetry in smart tourism services directly affects tourists' usage experiences (Choe & Kim, 2018). Therefore, it is of great importance to start from the demand side and focus on the specific determinants of tourists' intentions to use innovative tourism systems while, simultaneously, from both the supply and demand sides, striving to improve service quality for bright scenic spots toward the sustainable development of innovative tourism.

Although Smart Scenic Guide Systems have a huge potential to increase the tourist experience, and provide personalized services, their application in practice is still deficient (Choe & Kim, 2018). Many scenic spots have advanced Smart Scenic Guide Systems that are updated frequently, but due to a neglect of tourists' needs and experiences, these systems have low usage rates and do not achieve high tourist satisfaction (Kim & Law, 2015). Currently, research on Smart Scenic Guide Systems, mainly focuses on technological development and functional design, with less attention given to user needs and usage intentions (Buhalis & Amaranggana, 2015). Tourists, as the primary service recipients of smart scenic spots, have demands and experiences that directly impact the success of Smart Scenic Guide Systems (Parasuraman et al., 2005). Also, most research focuses on smart tourism technologies in developed countries or specific regions, with not much research in developing countries, especially China. Zhang and Gretzel (2021) assert that studies in China could show technology acceptance behaviour in different cultural contexts and provide important references for global smart tourism technologies development. To close this gap, this study takes the perspective of tourist needs to explore the key factors influencing tourists' intentions to use Smart Scenic Guide Systems. The goal is to provide theoretical support and practical guidance for the construction and optimization of smart scenic spots (Davis, 1989).

Drawing on the Technology Acceptance Model (TAM), this study examines the antecedents of tourists' use intentions, taking Smart Scenic Guide Systems as an

example. Particularly, the main objectives of this study are as follows: 1) to explore how the practicality, ease of use, perceived fun, and perceived risk of Smart Scenic Guide Systems influence tourists' willingness to use the Smart Scenic Guide System; and 2) to assess how tourists' perceptions of Smart Scenic Guide Systems affect their behavioural intentions to use smart scenic technologies. Aligning with these objectives, this study addresses the following research questions:

RQ1: How does perceived usefulness affect tourists' willingness to use Smart Scenic Guide Systems?
RQ2: What impact does perceived ease of use have on tourists' behavioural intentions to use smart guide technology in scenic areas?
RQ3: How does perceived fun of using Smart Scenic Guide Systems influence tourists' intentions to use these technologies?
RQ4: In what ways does perceived risk associated with using Smart Scenic Guide Systems deter tourists from intending to use these technologies?

2. LITERATURE REVIEW

This study contributes to existing literature by developing and empirically testing a conceptual framework of tourists' use intention. Our findings provide insights into improvement to intelligent scenic guide systems in terms of effectiveness, travel experience, and satisfaction of tourists. The scientific management strategies and optimization proposals, based on an in-depth analysis of these factors, could be given to managers of scenic spots.

2.1 Technology adoption in tourism industry

Service quality enhancement and improving the tourist experience are significant ways to apply technology in the tourism industry (Kim & Law, 2015). Since information technology dawned with its development, waves of technical innovation have been injected into the tourism business (Choe & Kim, 2018) with a significant number of tourism-related applications have been created (Leung, Law, Van Hoof, & Buhalis, 2013). These applications appear to comprise every possible aspect of tourism: from online booking to guide services and even travel-oriented social networking—all aimed at increasing tourists' convenience and satisfaction (Leung, Law, Van Hoof, & Buhalis, 2013; Van der Heijden, 2004). The lightweight version would gradually replace heavy ones such as problems like data usage and installation of difficulty (Van der Heijden, 2004) as it offers immediate services about information after simple operations and is regarded as the primary way of mobile application development for tourists (Zheng & Li, 2019). These lightweight applications are rich in functions and contents to satisfy diverse tourists' needs (Matemba, Li, Gogan, & Maiseli, 2020). For instance; tourists can cover scenic spot information, ticket purchasing, hotel and restaurant

reservations, and traffic routes anytime, anywhere, hence significantly improving convenience and travel efficiency (Van der Heijden, 2004).

Technology adoption in the tourism industry prevents and encompasses a wide range of services, including all online booking systems, virtual and augmented reality technologies, and intelligent customer service robots (Kim & Law, 2015). This research focuses on Smart Scenic Guide System, which is based on intelligent terminal devices and incorporating modern information technology to provide visitors from all parts of the world with touring guide service functions. Core features include GPS positioning, audio guidance, route planning, and information query functions (Leung, Law, Van Hoof, & Buhalis, 2013). These features not only allow for powering tourists with the ability to guide themselves around scenic spots but also provide real-time navigation and information services to support super travel experiences and satisfaction levels (Oh et al., 2009). As of 2020, there are over 200 smart cities under development in China alone, such as Beijing, Shanghai, and Hangzhou, which are integrating these systems to improve tourist experiences (Wu, Wu, Ye, Wu, & Pan, 2022). For instance, Beijing welcomed approximately 6.5 million tourists in 2020, while Shanghai and Hangzhou received 5.6 million and 4.1 million tourists respectively (Wu, Wu, Ye, Wu, & Pan, 2022). The implementation of Smart Scenic Guide Systems in these cities helps manage the influx of millions of visitors annually, ensuring a smoother and more enjoyable travel experience.

In summary, the Smart Scenic Guide System, as an essential component of smart scenic areas, significantly enhances tourists' travel experience and satisfaction. By offering real-time navigation, voice guidance, route planning, and information query functions, the system helps tourists navigate independently, avoid getting lost, and not miss important attractions, while providing them with rich information and personalized services. The widespread application of the Smart Scenic Guide System not only improves service quality and management level of scenic areas but also lays a solid foundation for the development of smart tourism (Kim & Law, 2015). The key to the tourism industry, therefore, is the effective use of technology. Improved technological advancements and applications continuously provide great impetus and support for innovation in tourism industries (Xiang & Fesenmaier, 2020). To investigate the topic of tourists' intention to use the Smart Scenic Guide System, this study draws upon the TAM model, which will be discussed next.

2.2 Technology Acceptance Model (TAM)

According to Davis (1989; the Technology Acceptance Model (TAM) posits two main constructs: perceived usefulness and perceived ease of use, which affects behavioural intention and actual usage behaviour of users (see Figure 1). The

TAM model has been widely used in information systems and information technology management (Venkatesh & Bala, 2008).

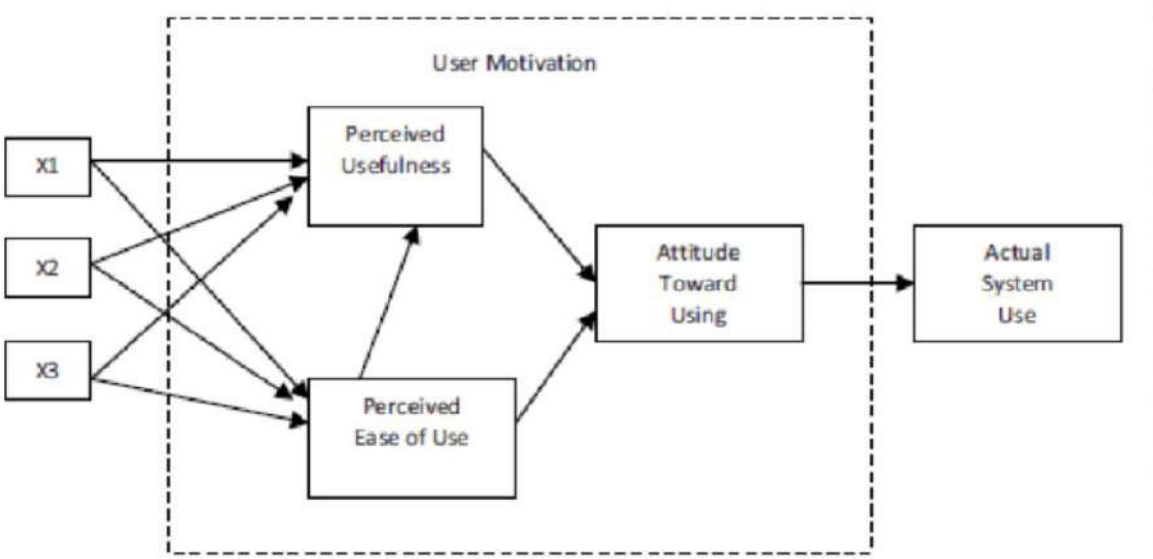


Figure 1: Original Technology Acceptance Model (Davis, 1986)

Perceived Usefulness is the extent to which users believe that a particular technology or system improves efficiency at work or in life (Marakarkandy et al., 2017) while Perceived Ease of Use refers to the degree to which users believe that using a specific technology or system will not require much effort and is free of obstacles (Marakarkandy et al., 2017; Shaw & Sergueeva, 2019). These two constructs have an impact on the attitude of the users, which in turn influences their behavioural intentions and actual usage behaviour (Van der Heijden, 2004). The TAM model is useful to explain and predict—at least to a high degree—the adoption of new technologies or systems by the users, forming a theoretical basis for designing relevant systems and their promotion (Lu et al., 2019).

The TAM model has shown high explanatory and predictive strength in many fields, like e-commerce, healthcare, and education. For example, a meta-analysis by King and He (2006) showed that the TAM model is very strong in different technology settings and contexts. In a study using the TAM model with electronic health record systems, Zhang (2021) confirmed that perceived usefulness and ease of use greatly affected intentions to use and actual usage behaviours.

To date, the TAM model has been tested in various domains. For example, Venkatesh and Davis (2000) expanded the TAM model into what is called TAM2, adding variables like social influence and cognitive processes for a more detailed explanation of technology acceptance behaviour. Venkatesh and Bala

(2008) even suggested TAM3, which included the factors that come before and after perceived usefulness and ease of use for a more complete framework on technology acceptance. More specifically, the TAM model has been used in the tourism industry to predict the acceptance behaviour of tourists toward Smart Scenic Guide Systems (see Table 1).

Table 1: Impact of Perceived Usefulness and Ease of Use on Tourists' Usage Intentions

Study	Focus Area	Key Findings
Kim, Lee, & Law (2008)	Perceived Usefulness	Significantly influences tourists' usage intentions
Chen & Tsai (2017)	Perceived Usefulness	Affects usage intentions and satisfaction; functionality and practicality are key
Venkatesh, Thong, & Xu (2012)	Perceived Ease of Use	Affects attitudes, behavioral intentions, and actual usage behavior
Huh & Kim (2016)	Perceived Ease of Use	Simplicity of operation and user-friendly interface influence usage intentions
Yoon & Uysal (2015)	Perceived Ease of Use	Simplifying operations and optimizing interfaces enhance ease of use

Source: Adapted from Zhang & Chen (2022); Zhang & Lo (2024); Khoshroo & Irani (2024); Yoon & Uysal (2005).

In summary, the TAM Model is an appropriate theoretical framework for explaining and predicting users' acceptance behaviour toward Smart Scenic Guide Systems. By optimally using the expanded TAM model, we can understand and predict users' acceptance behaviour more comprehensively and provide better support for designs, promotion, and application of technologies.

2.3 The development of conceptual model

While the TAM model has been widely used to explain the acceptance of smart tourism technologies, there are still some research gaps in the application of Smart Scenic Guide Systems. First, existing studies mainly focus on perceived usefulness and perceived ease of use, but less on other factors. For example, research on perceived fun and perceived risk in Smart Scenic Guide Systems remains scant. Jung, Tom Dieck, and Han (2018) conclude that perceived fun and perceived risk are important in other technology acceptance studies, but not much research in Smart Scenic Guide Systems. Thus, to understand the behaviour of acceptance of tourists toward the Smart Scenic Guide System more fully, the current study integrates two constructs i.e., perceived fun and perceived risk into the conceptual model (Figure 2). These two variables have been shown to considerably affect acceptance of technology behaviour in different studies. Intended fun, as a kind of positive motivation factor, enhances usage intentions and satisfaction of tourists, while perceived risk, as a kind of negative inhibiting factor, may reduce usage intentions.

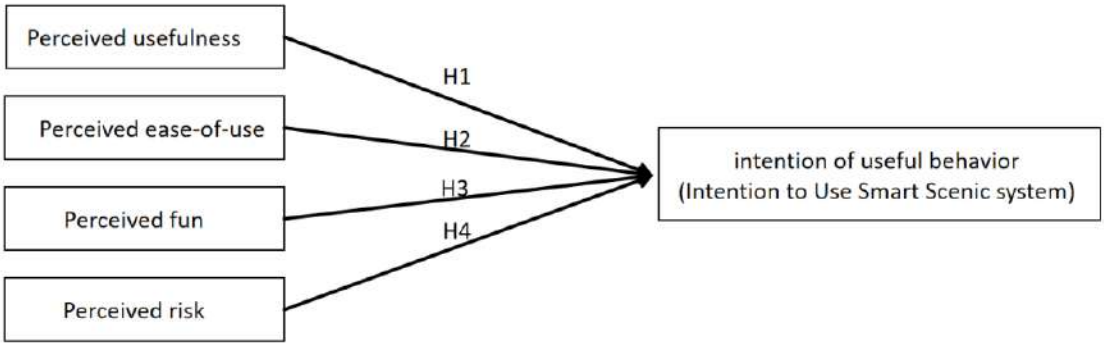


Figure 2: The conceptual model of the study

Perceived Fun implies that pleasure or satisfaction is derived by users when using a specific technology or system. A study on fun has revealed that it has a decisive impact on the behavioural intention of users (Venkatesh, Thong & Xu, 2012). Fun is an essential intrinsic motivator that influences users' behaviour toward technology acceptance. For example, Kim and Forsythe (2017) looked at virtual fitting technology applied in e-commerce and found that perceived fun significantly impacts user intention to use the technology. The fun that the users perceive with the system motivates them to continue using that system. Enhanced perceived fun through the available interactive facilities, gamification mechanisms, and multimedia content within the Smart Scenic Guide Systems will raise their intention to use, as proposed by Kim and Law (2015). For example, integrating VR and AR technologies allows tourists to preview the attraction in a virtual environment for more immersive guide services. This increases not only the enhancement of the tourist experience but also the attractiveness of the system.

Perceived risk is generally portrayed as a negative factor that significantly affects users' technology acceptance behaviour. Empirical studies have shown that perceived risk is highly significant in predicting users' behavioural intentions (Pavlou, 2003). For example, Featherman and Pavlou (2003) found that high perceived risk significantly reduces the intention to use new technologies or systems during online shopping. Perceived risk is also a massive factor in innovative tourism systems. If tourists perceive risks like information privacy violations or even the provision of poor-quality information from this Smart Guide System, then they will not be so willing to use it (Javornik, 2016). A sense of security and privacy protection is essential for Smart Scenic Guide Systems. Scenic spots will only be able to reduce the perceived risk of tourists by implementing advanced encryption technologies and privacy protection measures, which are effective enough to be able to increase the trust and willingness of tourists to use the system. Overall, the extended TAM model with the added variables of the perceived fun and perceived risk into the research

model should exhibit better explanatory power in acceptance behaviour by the tourists for Smart Scenic Guide Systems.

2.4 Hypotheses development

Based on past literature and the central tenets of the TAM model, four hypotheses are proposed to explore the main factors influencing tourists' behavioural intentions to use Smart Scenic Guide Systems. Perceived usefulness is considered a central construct in the TAM model, and it refers to how the users perceive that using a specific technology or system could enhance their work or life efficiency (Davis, 1989). The TAM model theorizes that if technology is perceived valuable, the users would most likely use this technology. In a Smart Scenic Guide System, tourists are more likely to apply the system when they believe it offers valuable information and navigation services. Indeed, quite a large number of studies have determined that perceived usefulness significantly affects technology acceptance behaviour. For instance, Zhang & Lo (2024) found that the perceived usefulness of innovative tourism systems significantly affected tourists' usage intentions and satisfaction.

In the meantime, Zhang and Chen (2022) also proved perceived usefulness as a mediator in innovative tourism systems. Therefore, we propose that the perceived usefulness for tourists using the Smart Scenic Guide system positively influences behavioural intention.

H1*: The perceived usefulness positively impacts the tourist's intention to use Smart Scenic Guide Systems.*

Another key construct in the TAM model is perceived ease of use (PEOU), which refers to the extent to which users believe it is easy to use a certain technology or system without much effort and difficulty. Perceived ease of use influences users' attitudes, which in turn affect their behavioural intentions and actual use behaviour. If tourists find it easy to use the Smart Scenic Guide System, they will be more willing to use it. For example, the study on perceived ease of use conducted by Venkatesh, Thong, and Xu (2012) identifies that such a study is one of the main determinants which highly influence the consumer's intention to use information technology. Perceived ease of use was also determined to significantly impact tourists' acceptance of smart guide systems in the Khoshroo and Irani’s (2024) study. Therefore, it is hypothesized that the perceived ease of use by tourists in the Smart Scenic Guide System positively influences the behavioural intentions of tourists.

H2: *Perceived ease of use positively influences tourist intention to use Smart Scenic Guide Systems.*

The fun perceived to be intrinsic to technology plays a vital role in technology acceptance behaviour. Perceived fun is the extent of enjoyment and pleasure that a user finds when dealing with a specific technology or system. If the tourist sees the Smart Scenic Guide System fun and exciting, there are more chances for his further use of it. Research has considered perceived fun as significantly influencing the acceptance of behaviour towards technology. For instance, Huang and Benyoucef (2015) find that perceived fun and interactivity of the user experience toward the system's usefulness can highly increase satisfaction with the application and usage intention. Jung and Han (2014) also illustrate that perceived fun has significant implications on tourists' behavioural intentions in using virtual reality technology. Consequently, we suggest that the perceived fun by the Smart Scenic Guide System positively affects the behavioural intentions of the tourists.

***H3**: Perceived fun positively influences tourists' intention to use the Smart Scenic Guide System.*

Perceived risk in using specific technology or a system refers to the uncertainty and possible loss that users may go through. Perceived risk is one of the negative factors that significantly affect the users' acceptance behaviour towards technology. High perceived risk reduces users' intention to use technology (Featherman & Pavlou, 2003). In Smart Scenic Guide Systems, the Tourists may not be willing to use the system due to the extreme concern of privacy breaches and incorrect information that takes place. The other study also indicated that the tourist's perceived risk significantly influences the technology acceptance behaviour. For instance, Pavlou (2003) specified that perceived risk substantially reduces the usage intentions of the users. Perceived risk in applying AR technology, has also proved to be a significant factor in user behavioural intention in the findings from Javornik 2016's research. Hence, we hypothesize that perceived risk about the Smart Scenic Guide System is negatively associated with behavioural intentions for tourism.

***H4:** Perceived risk negatively affects the willingness of tourists to use Smart Scenic Guide Systems.*

In summary, the extended TAM model integrates perceived fun and perceived risk and provides a more comprehensive theoretical model for understanding and predicting tourists' acceptance behaviour toward Smart Scenic Guide Systems.

3. RESEARCH METHODS

This study employed a cross-sectional survey design. The following sections discuss the research design which include sampling, data collection and research instrument.

3.1 Sampling Plan

The population is all tourists who have used the Smart Scenic Guide System in Chongqing Lijia Mountain City Smart Park. Because it is impossible to access the whole population in the research, the study must, therefore, adopt sampling methods in choosing a portion of the individuals. The underlying principle followed in the selection of samples is to have a representative sample so that by the data of the sample taken, the characteristics and behaviours of the population under research can be inferred (Bryman, 2016). This study initially targeted 400 participants. The final usable sample was 385, and the sample recovery rate was 96.25%. This study utilized the convenience sampling technique, in which non-probability sampling procedures are employed to select respondents who are easily reachable and willing to participate. We collected data through online surveys.

Attention was also paid to the proportion of the respondents of each gender, age group, education level, and occupational background, hence ensuring diversity and representativeness in the sample.

3.2 Data collection

This study employed an online survey to collect data. The survey link was shared through email, WeChat groups, Weibo, and other Xiaohongshu social media platforms through the first author's personal and professional network to invite participation in the broadest possible way to ensure sample diversity and representativeness (Wright, 2005). An online survey is practical, convenient, and has overcome most geographical limitations. To prevent potential low response rates, various measures were undertaken. This was achieved via the process of sending reminder emails and follow-up messages, which would incite the respondents to answer the questionnaire as well (Dillman, Smyth, & Christian, 2014). Moreover, an attempt was made to limit the extent of the survey so that the time of the respondents could be saved and they could be more interested in participating in the research as well (Porter, 2004). Ultimately, posting survey links on social media encouraged a more comprehensive range and higher response rate (Couper, 2000).

The survey was designed to be easy to use on smartphones, tablets, and computers. Participants were invited through personalized emails and social media posts, highlighting the importance and confidentiality of their responses.

To increase participation, the survey was promoted through several ways:

- QR Codes: QR codes linked to the survey were displayed in scenic spots like entrances, information desks, and popular places. Visitors could scan the QR codes with their smartphones to complete the survey.
- WeChat Groups: The survey link was shared in WeChat groups related to tourism and local communities. Group leaders were asked to share the link to reach more people.
- Official Websites: The survey link was posted on the official websites of the scenic spots. Visitors looking for information were invited to join the survey.
- Social Media Platforms: The survey was advertised on Weibo and Xiaohongshu, targeting people interested in travel. Posts had attractive visuals and clear instructions to encourage participation.
- On-site Announcements: Announcements about the survey were made through digital displays and speakers in the scenic spots. Staff members also told visitors about the survey and encouraged them to join.
- Flyers and Posters: Flyers and posters with the survey QR code and link were put in busy areas of the scenic spots. These had simple instructions on how to join the survey.

The research team endeavoured to work in full accordance with ethical standards in terms of informed consent and the protection of the privacy of the data concerning the participants (Trochim, 2006). All respondents were briefed regarding the purpose of the research and its content before the start of the survey (Presser et al., 2004; it was explicitly mentioned that participation was purely voluntary and could be terminated at will.

3.3 Research instrument

We adopted the existing scale measurements for each construct: Perceived Usefulness (PU), Perceived Ease of Use (PEOU), Perceived Fun (PF), and Perceived Risk (PR) on a 5-point scale anchored by 'strongly disagree,' to 'strongly agree'. Perceived Usefulness contains four items that measure the usefulness of the Smart Scenic Guide System (e.g., "The Smart Scenic Guide System provides me with a lot of needed information" and "Using the Smart Scenic Guide System increases my travel efficiency") adopted from Davis (1989). There are five items in Perceived Ease of Use, which are concerned with appraising the system's ease of operation. Sample items include "The Smart Scenic Guide System is relatively easy to use" and "It is easy to get the information I need from the Smart Scenic Guide System" (Venkatesh & Bala, 2008). Perceived Fun consists of four items that comprehend the enjoyment that the respondents have had during the use of the system. Sample items of this factor include "The Smart Scenic Guide System has many interesting features" and "Using the Smart Scenic Guide System is novel and fun" (Kim & Forsythe, 2017). Perceived Risk is a construct comprising five items with which the respondents were tested for potential risks in using the system. Sample items include "I am

concerned that using the Smart Scenic Guide System will expose my privacy" and "I worry that the Smart Scenic Guide System may not accurately provide the information I need" (Featherman & Pavlou, 2003).

4. DATA ANALYSIS

Quantitative tools and statistical methods are used in conducting data analysis for this research. Data analysis is the process of rationalizing raw data that are collected for a study to produce meaningful insights and to test some hypotheses. In this study, SPSS software version 26.0 was used for analysis.

5. FINDINGS

The final sample size is 385 (see Table 2 for the respondent profiling). The gender distribution is relatively balanced, with 48.31% of the respondents being male and 51.69% being female. For age, the majority of respondents were within the 20-29 age, making up 56.62% of the sample. This is followed by the 30-39 age group, and the least represented age group is those below 20 years, implying that younger tourists are more inclined to use smart guide systems, possibly due to greater familiarity with digital technologies. In terms of education and occupation, the largest segment of respondents has a junior college degree (36.36%), closely followed by those with a bachelor's degree (35.32%), and full-time students make up the largest group (42.34%) of the sample. This indicates that the use of smart guide systems is most popular among individuals with higher education levels, likely due to their greater exposure to and comfort with advanced technologies.

In terms of place of residence, the majority of respondents live in county seats (41.30%) or downtown areas (32.47%), and residents of provincial capitals and above make up the smallest group at 7.79%. Smart guide systems are particularly popular in mid-sized urban areas, possibly due to better accessibility and infrastructure compared to smaller towns or rural areas. Monthly income distribution shows that 33.51% of respondents earn between RMB2000-3500, and 27.27% earn between RMB3500-5000. Those earning under RMB2000 constitute 21.30%, while 17.92% earn more than RMB5000. The relatively even distribution across income brackets suggests that intelligent guidance systems appeal to a wide range of income levels. Finally, in terms of family status, the largest group is unmarried individuals, comprising 60.78%, which might be linked to their greater likelihood of traveling independently and using technology to enhance their travel experiences.

Table 2: Respondent Profiling (Source: Author)

Name	Options	Frequency	Percentage
Gender	Male	186	48.31
	Female	199	51.69
Age	*Below 20*	16	4.16
	20 – 29	218	56.62
	30 – 39	98	25.45
	40 – 49	32	8.31
	50 and above	21	5.45
Education	*High school and below*	61	15.84
	Junior college	140	36.36
	Bachelor's degree	136	35.32
	Master's degree or above	48	12.47
Occupation	*Government or public institution workers*	53	13.77
	Enterprise employees	67	17.40
	Professional technicians (teachers, doctors, engineers, etc.)	59	15.32
	Full-time students	163	42.34
	Other	43	11.17
Place	*Provincial capitals and above*	30	7.79
	Downtown	125	32.47
	The county seat	159	41.30
	Below the county seat	71	18.44
Income	*Under 2000*	82	21.30
	2000-3500	129	33.51
	3500-5000	105	27.27
	More than 5000	69	17.92
Family	*Unmarried*	234	60.78
	Married, no children	103	26.75
	Married with grown children	37	9.61
	Married, children with families	11	2.86
Total		385	100.0

5.1 Reliability and validity analysis

Our analysis revealed that Cronbach's alpha coefficient scores for the key constructs ranged from 0.876 to 0.942. Therefore, it can be concluded that the measurement scales have high reliability as it’s above 0.70 benchmark. Table 3 present the reliability results of the key constructs.

Table 3: Reliability Analysis (Source: Author)

Factor	Standardized Loading Coefficient	Cronbach α
All	0.899	0.898
PU1	0.877	0.876
PU2		
PU3		
PU4		
PEOU1	0.890	0.883
PEOU2		
PEOU3		
PEOU4		
PEOU5		
PF1	0.879	0.876
PF2		
PF3		
PF4		
PR1	0.909	0.909
PR2		
PR3		
PR4		
PR5		
BI1	0.942	0.942
BI2		
BI3		
BI4		

For validity analysis, we first conducted the exploratory factor analysis to first explore the dimensionality of the measurement and to assess both content validity and construct validity. The KMO value and the significance of Bartlett's sphericity test are generally used to determine whether factor analysis is appropriate. The KMO value is 0.815, which is greater than 0.8, and the p-value for Bartlett's sphericity test is less than 0.01. The significant level is at 1%, indicating that factor analysis is appropriate.

Principal component analysis was conducted on the four key constructs, and the dimensions were classified through dimensionality reduction. Table 4 presents the factor rotation coefficients for each dimension. It was found that the initial eigenvalues of the five dimensions are greater than 1, with a cumulative variance explained of 76.931%. There is no significant CMB as the percentage the first factor explains is 17.623%, which is less than 40%. The number of eigenvalues greater than 1 corresponds to the number of dimensions. If the factor loading

coefficient is larger, the degree of association with the item is higher, and indicates a stronger power for the corresponding item. Therefore, a threshold of 0.5 was set and items with loading coefficients greater than 0.5 were considered as the final measurement basis. Our analysis shows that the factor loadings for each item correspond to the respective dimensions, which is a preliminary indication of the rationality of the construct validity of the questionnaire.

Table 4: Factor Loading Matrix (Source: Author)

Factor	Factor Loadings				
	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
PU1				0.756	
PU2				0.893	
PU3				0.850	
PU4				0.784	
PEOU1		0.726			
PEOU2		0.752			
PEOU3		0.880			
PEOU4		0.838			
PEOU5		0.753			
PF1					0.899
PF2					0.911
PF3					0.944
PF4					0.546
PR1	0.775				
PR2	0.875				
PR3	0.821				
PR4	0.622				
PR5	0.858				
BI1			0.659		
BI2			0.809		
BI3			0.726		
BI4			0.819		
Eigenvalues (after rotation)	3.877	3.635	3.286	3.147	2.979
Variance explained % (after rotation)	17.623%	16.525%	14.937%	14.304%	13.541%
Cumulative variance explained % (after rotation)	17.623%	34.148%	49.086%	63.390%	76.931%

Based on the scale data, SPSSAU is used to calculate the convergent validity and discriminant validity for each dimension. As shown in Table 5, the average variance extracted (AVE) and composite reliability (CR) for each factor were above the acceptable threshold of 0.5 and0.7, respectively, indicating that each dimension demonstrates good convergent validity.

Table 5: Convergent Validity (Source: Author)

Factor	AVE	CR
Perceived Usefulness	0.650	0.881
Perceived Ease of Use	0.637	0.897
Perceived Fun	0.681	0.892
Perceived Risk	0.672	0.911
Behavioral Intention	0.813	0.945

Table 6 presents the discriminant validity. Diagonals represent square roots of AVE scores, which should be greater than non-diagonals in corresponding rows and columns to show good discriminant validity. The results revealed that the correlations between the factors were all below the AVE square roots, confirming that each variable is distinct from the others, thus indicating satisfactory discriminant validity.

Table 6: Discriminant Analysis (Source: Author)

	PU	PEOU	PF	PR	BI
Perceived Usefulness	0.807				
Perceived Ease of Use	0.333	0.798			
Perceived Fun	0.158	0.267	0.825		
Perceived Risk	0.331	0.395	0.223	0.820	
Behavioral Intention	0.453	0.536	0.369	0.673	0.902

5.2 Differential Analysis

Demographic variables have a certain impact on the variables under study (see Table 7). Independent t-tests and ANOVA were adopted to explore the demographic differences in tourists' behavioural intentions. For gender, the t-test is -3.778 t-value and 0.000 p-value, indicating a difference in behavioural intentions between males (2.86±1.10) and females (3.31±1.22). This suggests that females' behavioural intention is higher compared to males. Regarding age, the significant difference (p= 0.020) indicates that age groups may have varying levels of interest or perceived utility of the Smart Scenic Guide Systems. The higher behavioural intention among younger tourists (below 20 years old) might be due to greater familiarity compared to older age groups.

Similarly, educational level showed a significant impact (p=0.035), with Bachelor's degree holders exhibiting the highest behavioural intention. This result suggests that individuals with higher educational attainment may perceive greater value or benefits from using Smart Scenic Guide Systems, possibly due to their better understanding of technology or enhanced information processing capabilities. On the other hand, variables such as occupation, place of residence, income and marital status did not show any significant differences in terms of

behavioural intentions. This suggests that these factors may have a limited impact on tourists' decisions to use an intelligent tourist guide system.

This section presents the results for hypotheses H1-4 (see Table 8). The efficacy of the model is demonstrated by R^2 =0.636 and adjusted R^2 values =0.624. The Durbin-Watson statistic shows that the validity of the model is strengthened by the absence of significant correlation in the residuals. Among the demographic variables, gender emerges as a significant determinant, with women showing significantly higher behavioural intentions than men. Age also has a significant impact, with all age groups except those under 20 showing significantly lower intentions, suggesting a generational bias towards system adoption. This may be due to their greater inclination towards personalised experiences and new technologies. However, education level has a minimal impact on behavioural intentions, suggesting a relatively minor role in users' engagement with the system.

Table 7: Differential Analysis (Source: Author)

Item	Sample Size	Purchase Intention (Score, x±s)	t/F	P Value
Gender			-3.778	0.000**
Male	186	2.86±1.10		
Female	199	3.31±1.22		
Age			2.969	0.020*
Below 20	16	4.03±0.75		
20 – 29	218	3.03±1.13		
30 – 39	96	3.06±1.17		
40 – 49	32	3.23±1.45		
50 and above	21	2.92±1.41		
Education			2.905	0.035*
High school and below	61	3.06±1.38		
Junior college	140	2.88±1.09		
Bachelor's degree	136	3.29±1.16		
Master's degree or above	48	3.17±1.21		
Profession			1.738	0.141
Government or public institution workers	57	3.41±1.03		
Enterprise employees	63	2.97±1.26		
Professional technicians (teachers, doctors, engineers, etc.)	59	3.10±1.32		
Full-time students	163	3.10±1.12		
Other	43	2.81±1.25		
Place			0.406	0.749
Provincial capitals and above	30	2.97±1.37		
Downtown	125	3.06±1.16		
The county seat	159	3.08±1.13		
Below the county seat	71	3.21±1.29		
Income			0.405	0.750
Under 2000	82	3.19±1.17		
2000-3500	129	3.09±1.21		
3500-5000	105	3.00±1.29		
More than 5000	69	3.11±1.00		
Family			1.729	0.161
Unmarried	234	2.99±1.22		
Married, no children	103	3.19±1.07		
Married with grown children	37	3.42±1.24		
Married, children with families	11	3.11±1.24		

Table 8: OLS Regression Analysis (Source: Author)

	Coef	Std.Err	t	p	95% CI
Constant	-0.320	0.240	-1.333	0.182	-0.790 ~ 0.150
Reference=Male					
Female	0.343	0.074	4.657	0.000**	0.199 ~ 0.488
Reference=Below 20					
20 – 29	-0.392	0.149	-2.635	0.008**	-0.684 ~ -0.100
30 – 39	-0.393	0.157	-2.499	0.012*	-0.700 ~ -0.085
40 – 49	-0.290	0.214	-1.358	0.175	-0.709 ~ 0.129
50 and above	-0.328	0.210	-1.561	0.118	-0.739 ~ 0.084
Reference=High school and below					
Junior college	-0.092	0.125	-0.736	0.462	-0.338 ~ 0.154
Bachelor's degree	0.206	0.120	1.706	0.088	-0.031 ~ 0.442
Master's degree or above	0.032	0.146	0.219	0.826	-0.255 ~ 0.319
Perceived Usefulness	0.225	0.046	4.855	0.000**	0.134 ~ 0.317
Perceived Ease of Use	0.259	0.049	5.242	0.000**	0.162 ~ 0.356
Perceived Fun	0.216	0.053	4.110	0.000**	0.113 ~ 0.319
Perceived Risk	0.499	0.045	11.095	0.000**	0.411 ~ 0.588
R^2	0.636				
Adjust R^2	0.624				
F	F (12,372)=76.645,p=0.000				
D-W	1.956				

Dependent Variable: Behavioral Intention

* p<0.05 ** p<0.01

The structural equation model (SEM) was used to test the research hypothesis, and the results were as follows (see Table 9):

H1: Perceived usefulness positively affects tourists' intention of using intelligent scenic navigation systems (path coefficient = 0.225, $p < 0.01$). The hypothesis is supported.

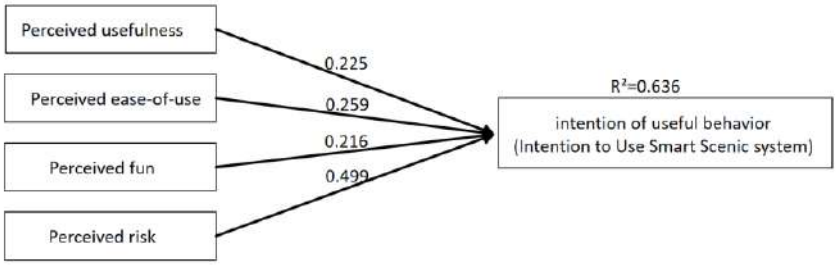
H2: Perceived ease-of-use positively affects tourists' intention of using intelligent scenic navigation systems (path coefficient = 0.259, $p < 0.01$). The hypothesis is supported.

H3: Perceived pleasure positively affects tourists' intention of using intelligent scenic navigation systems (path coefficient = 0.216, $p < 0.01$). The hypothesis is supported.

H4: Perceived risk positively affects tourists' intention of using intelligent scenic navigation systems (path coefficient = 0.499, $p < 0.01$). The hypothesis is supported.

Table 9: Hypothesis Testing (Source: Author)

Hypothesis	Path Coefficient	p-value	Result
H1: PU -> Intention to Use	0.225	<0.01	Supported
H2: PEOU -> Intention to Use	0.259	<0.01	Supported
H3: PF -> Intention to Use	0.216	<0.01	Supported
H4: PR -> Intention to Use	0.499	<0.01	Supported



5.3 Summary of Key Findings

The findings revealed that the perceived usefulness, the perceived ease of use, and the perceived fun positively influenced tourists' intention to use Smart Scenic Guide Systems. In contrast, the perceived risk negatively impacted the willingness.

The research showed that perceived usefulness and ease of use are the two important influences. It showed that a tourist was more willing to use systems they had in mind to improve their travel experience and were easy to use. Therefore, scenic managers should put more effort into developing and promoting the intelligent navigation system in enhancing the practicality and ease of use of the system. For example, more information value-added services and optimization of user interface and interaction design towards attaining more gratification by users will be developed for their use intention.

The higher the perceived pleasure, the more it would seem that interactivity and entertainment characteristics will be prevalent in drawing visitors. Besides, both gamification elements and multimedia content add to the whole touring process, making it much more exciting and attractive to enhance the user experience of the intelligent scenic navigation system. For example, the implementation of virtual reality (VR) and augmented reality (AR) technologies into the system as part of a guided visit experience means that not only will satisfaction increase, but also the attraction and utilization of the system itself.

Although the effect of perceived risk on use intention is small, its negative effect is still significant. Visitors' concerns about privacy and data security may deter them from using smart navigation systems. Therefore, scenic spot managers and system developers should attach importance to data protection and privacy security, adopt advanced encryption technology and strict privacy protection measures to reduce tourists' risk perception and enhance their trust and use intention.

This study proved the influences of perceived usefulness, perceived ease of use, perceived pleasure and perceived risk on tourists' purpose of using intelligent scenic navigation systems through empirical analysis. The research results provide a scientific basis for scenic area managers and system developers to help them optimize the design and promotion strategy of intelligent navigation systems, improve the utilization rate of the system and the satisfaction of tourists. This is not only of great significance to the growth of smart scenic spots, but also provides a reference for the sustainable development of smart tourism.

Future studies can further explore other factors that may affect tourists' use of intelligent tour guide systems, such as social influence and individual innovation, and verify the conclusions of this study through larger samples and diversified research methods.

5.4 Managerial Implications

Based on our findings, several implications are deduced for developing and promoting Smart Scenic Guide Systems in China. For the Smart Scenic Guide System to be seen as more valuable by users, application developers should provide information that is accurate, timely, and relevant. This would give real-time updates on weather, the traffic situation, and the status of attractions, provide in-depth route planning with other options, and offer individual recommendations for special interests based on a user's previous behaviour. For example, tourists in a scenic park would get alerts about less crowded routes or even real-time alerts about special events nearby. Increasing the system's usefulness will increase the trust that tourists have in these systems for planning and executing their trips.

To have more usability, the Smart Scenic Guide System should be user-friendly. The system developers should make the interfaces more straightforward to understand with clear and straightforward instructions. This is facilitated through user testing, where the design is enhanced incrementally to identify and correct any problems. For instance, attraction search, ticket booking, and navigation of routes can be made accessible, which significantly improves the user experience. Additionally, customer support in terms of in-app help centres or chatbots will

assist users in overcoming problems that they face, thereby making the system more user-friendly to a more significant number of people.

Interactive features, gamification, and multimedia content make an app fun and engaging for users. Features like virtual tours and interactive maps with augmented reality experiences can make it fun to explore scenic areas. For example, AR may show them reconstructions of the past for some location or have them play scavenger hunts with prizes of points and discounts, and so on. Game-related elements, such as collecting badges for visiting some attractions or completing some challenges, can also bring in user engagement to make it fun. These features can turn a simple guide into an entertaining companion, making users more satisfied and likely to use it again.

The prevalent concerns about privacy and data security, therefore always mean that users have to be protected. Developers should adopt strong security measures in terms of data encryption, secure storage, and regular checks for information relating to the user. Communication about security practices at the same time builds trust. For example, clear, readily available information on how their data will be collected, used, and protected can substantially reduce worries and risks of use. Providing options that allow users to manage their privacy settings, possibly opt out of sharing data, also has a way of building trust.

Engaging with the target customers may help alleviate their fears about data privacy and ease of use in these campaigns. Moreover, portraying user testimonials and successful implementation may indicate the system's benefits, thereby increasing the number of users. Additionally, working with local tourism authorities and agencies can significantly increase the use of Smart Scenic Guide Systems. For example, offer specific discounts or gain access to some of the activities exclusively accessible to savvy systems users as an incentive. In this partnership, systems are easily marketed by official channels, hence gaining recognition and more credibility.

Smart Scenic Guide System should be improved often based on user feedback and new technologies to keep in line with the current relevance and value. These can range from designing new features to improving existing ones to repairing any detected issues. For example, adopting a new technology, say 5G, into the system would make the system possibly faster and more capable. A feedback loop with users—to quickly let users suggest and report problems—can help developers focus on the most beneficial updates for users. A system that undergoes continuous improvement evolves with changing user needs and preferences, making the usefulness and attractiveness of such systems retained in the long term.

6. LIMITATIONS AND FUTURE RESEARCH

Despite some valuable insights, there are several limitations associated with this study. First, the sample size is small and limited to only tourists who used the Smart Scenic Guide Systems in the Chongqing Lijia Mountain City Smart Park. Such a limitation, in terms of geographical area and demography, may not represent the larger population of tourists in China, which consequently limits generalization. The use of convenience sampling might have biased the results since the sample would not represent all potential users of such systems. It could over-represent certain groups, such as younger tourists or those already more familiar with digital technologies. Furthermore, the research depended on self-reported data where the data was open to social desirability bias. Respondents might have answered in a societally approved way but did not reflect their real feelings or behaviours; this would directly influence the validity of the data. Moreover, the cross-sectional design of the study pares the capacity to build causal relationships between the variables. While associations between variables can be identified, causality cannot be confirmed, which is a significant limitation for understanding the dynamics of technology adoption over time. Finally, the technological infrastructure and cultural context of Chongqing Lijia Mountain City Smart Park may differ from other regions, impacting the generalizability of the results. Different regions might have varying levels of technological adoption and cultural attitudes towards smart technologies.

Several endorsements for further research can be made with consideration of the results and limitations of this research. Future research efforts can be undertaken to elicit the responses of tourists from across regions to various other categories of scenic spots in China. This, in turn, would increase the external effectiveness of the findings and the all-encompassing understanding of the factors that drive the acceptance of Smart Scenic Guide Systems. Future research should look into other things that might affect how people accept Smart Scenic Guide Systems. These factors include cultural differences, trust in technology, and social influence. Moreover, cross-cultural comparisons can be very enlightening to see how different cultural backgrounds affect the acceptance and use of Smart Scenic Guide Systems. This can help create tailored strategies for different cultural groups and increase the effectiveness of these systems. Furthermore, Research on how Smart Scenic Guide Systems integrate with other new technologies, like AR and VR, aims to enhance the user experience. Future research will look at how these integrations affect tourists' perceptions and usage intentions.

Methodologically, a longitudinal study will prove to be the best type in the monitoring of changes in tourists' perceptions and behaviours over time. This may further enhance gaining a greater understanding of factors that may be used to support the implementation and continued use of Smart Scenic Guide Systems.

Through the use of qualitative techniques of research, such as face-to-face interviews, more in-depth reasons underlying perception and behaviour of the tourists can be explored. This information is usually complementary to the quantitative findings and may lead to a more nuanced view of tourists' experiences and attitudes. Besides, to verify research results, we need to study actual usage patterns and behaviours in real-world settings. Observational studies and usage data analysis will be used to give practical advice on how to improve the design and implementation of Smart Scenic Guide Systems.

7. CONCLUSIONS

This study produced valuable insights into the determining factors of tourists' intention in using Smart Scenic Guide Systems in China. The application of the TAM framework identifies the determinants of acceptance as perceived usefulness, perceived ease of use, perceived fun, and perceived risk. These results are practically meaningful in developing and designing marketing plans for Smart Scenic Guide Systems. This helps improve and expand the area of intelligent tourism within China. The success of the application in Smart Scenic Guide Systems should be helpful for the entire conversion of the tourist trade and elevate the satisfaction of tourists and the service level of scenic spots. Through increasing the content of people's needs, the tourism industry can use intelligent technologies to secure growth and development sustainably.

8. REFERENCES

Bryman, A. (2016). Social research methods. Oxford university press.

Buhalis, D., & Amaranggana, A. (2015). Smart tourism destinations enhance tourism experience through personalisation of services. In Information and Communication Technologies in Tourism 2015: Proceedings of the International Conference in Lugano, Switzerland, February 3-6, 2015 (pp. 377-389). Springer International Publishing.

Choe, J. Y. J., & Kim, S. S. (2018). Effects of tourists' local food consumption value on attitude, food destination image, and behavioral intention. *International Journal of Hospitality Management*, 71, 1-10.

Chung, C. J., Huang, Y. H., Yang, J. C., Yang, Y. Y., Huang, S. S., Lin, S. M., ... & Lin, Y. Y. (2023). The dissemination of holistic health care and evidence-based medicine courses from institution-based to department-based via a course management system. *Interactive Learning Environments*, 1-16.

Chung, N., & Koo, C. (2015). The use of social media in travel information search. *Telematics and Informatics*, 32(2), 215-229.

Creswell, J. W., & Creswell, J. D. (2017). Research design: Qualitative, quantitative, and mixed methods approaches. Sage publications.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS quarterly*, 319-340.

Dillman, D. A., Smyth, J. D., & Christian, L. M. (2014). Internet, phone, mail, and mixed-mode surveys: The tailored design method. John Wiley & Sons.

Featherman, M. S., & Pavlou, P. A. (2003). Predicting e-services adoption: a perceived risk facets perspective. *International Journal of Human-computer Studi*es, 59(4), 451-474.

Femenia-Serra, F., Neuhofer, B., & Ivars-Baidal, J. A. (2019). Towards a conceptualisation of smart tourists and their role within the smart destination scenario. *The Service Industries Journal*, 39(2), 109-133.

Gretzel, U. (2015). Intelligent systems in tourism: A social science perspective. *Annals of Tourism Research*, 38(3), 757-779.

Hitrec, T. (2018). Journal of China Tourism Research. *Tourism: An International Interdisciplinary Journal*, 66(3), 354-355.

Huang, Z., & Benyoucef, M. (2015). User preferences of social features on social commerce websites: An empirical study. *Technological Forecasting and Social Change*, 95, 57-72.

Javornik, A. (2016). Augmented reality: Research agenda for studying the impact of its media characteristics on consumer behaviour. *Journal of Retailing and Consumer Services*, 30, 252-261.

Jung, T. H., & Han, D. (2014). Augmented Reality (AR) in Urban Heritage Tourism. *e-Review of Tourism Research*, 5.

Jung, T., & Tom Dieck, M. C. (2018). Augmented reality and virtual reality. Ujedinjeno Kraljevstvo: Springer International Publishing AG.

Khoshroo, M., & Irani, H. R. (2024, April). Analyzing Augmented Reality Technology Acceptance Models by Consumers: A Systematic Literature Review. In 2024 10th International Conference on Web Research (ICWR) (pp. 269-274). IEEE.

Kim, H. H., & Law, R. (2015). Smartphones in tourism and hospitality marketing: A literature review. *Journal of Travel & Tourism Marketing*, 32(6), 692-711.

Kim, J., & Forsythe, S. (2008). Adoption of virtual try-on technology for online apparel shopping. *Journal of Interactive Marketing*, 22(2), 45-59.

King, W. R., & He, J. (2006). A meta-analysis of the technology acceptance model. *Information & Management*, 43(6), 740-755.

Leung, D., Law, R., Van Hoof, H., & Buhalis, D. (2013). Social media in tourism and hospitality: A literature review. *Journal of Travel & Tourism Marketing*, 30(1-2), 3-22.

Lu, Y., Papagiannidis, S., & Alamanos, E. (2019). Exploring the emotional antecedents and outcomes of technology acceptance. *Computers in Human Behavior*, 90, 153-169.

Marakarkandy, B., Yajnik, N., & Dasgupta, C. (2017). Enabling internet banking adoption: An empirical examination with an augmented technology

acceptance model (TAM). *Journal of Enterprise Information Management*, 30(2), 263-294.
Matemba, E. D., Li, G., Gogan, I. C. W., & Maiseli, B. J. (2020). Technology acceptance model: recent developments, future directions, and proposals for hypothetical extensions. *International Journal of Technology Intelligence and Planning*, 12(4), 315-348.
Oh, S., Lehto, X. Y., & Park, J. (2009). Travelers' intent to use mobile technologies as a function of effort and performance expectancy. *Journal of Hospitality Marketing & Management*, 18(8), 765-781.
Parasuraman, A., Zeithaml, V. A., & Malhotra, A. (2005). ES-QUAL: A multiple-item scale for assessing electronic service quality. *Journal of Service Research*, 7(3), 213-233.
Pavlou, P. A. (2003). Consumer acceptance of electronic commerce: Integrating trust and risk with the technology acceptance model. *International Journal of Electronic Commerce*, 7(3), 101-134.
Porter, S. R. (2004). Raising response rates: What works? *New Directions for Institutional Research*, (121), 5-21.
Presser, S., Couper, M. P., Lessler, J. T., Martin, E., Martin, J., Rothgeb, J. M., & Singer, E. (2004). Methods for testing and evaluating survey questions. Methods for testing and evaluating survey questionnaires, 1-22.
Shaw, N., & Sergueeva, K. (2019). The non-monetary benefits of mobile commerce: Extending UTAUT2 with perceived value. *International Journal of Information Management*, 45, 44-55.
Trochim, W. M. (2006). Ethics in research. *Research Methods Knowledge Base*, 361(1), 2-16.
Tu, J. C., & Jia, X. H. (2024). A Study on Immersion and Intention to Pay in AR Broadcasting: Validating and Expanding the Hedonic Motivation System Adoption Mode. *Sustainability*, 16(5), 2040.
Van der Heijden, H. (2004). User acceptance of hedonic information systems. *MIS quarterly,* 695-704.
Venkatesh, V., & Bala, H. (2008). Technology acceptance model 3 and a research agenda on interventions. *Decision Sciences*, 39(2), 273-315.
Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management Science*, 46(2), 186-204.
Venkatesh, V., Thong, J. Y., & Xu, X. (2012). Consumer acceptance and use of information technology: extending the unified theory of acceptance and use of technology. *MIS quarterly*, 157-178.
Wang, D., Li, X. R., & Li, Y. (2013). China's “smart tourism destination” initiative: A taste of the service-dominant logic. *Journal of Destination Marketing & Management*, 2(2), 59-61.
Wright, K. B. (2005). Researching Internet-based populations: Advantages and disadvantages of online survey research, online questionnaire authoring

software packages, and web survey services. *Journal of Computer-mediated Communication*, 10(3), JCMC1034.

Wu, T. P., Wu, H. C., Ye, G., Wu, X., & Pan, B. (2022). The contribution of international tourism development to economic growth in Chinese economy. *Journal of Policy Research in Tourism, Leisure and Events*, 1-15.

Xiang, Z., & Fesenmaier, D. R. (2017). Analytics in smart tourism design: concepts and methods. Springer International Publishing Switzerland.

Yoon, Y., & Uysal, M. (2005). An examination of the effects of motivation and satisfaction on destination loyalty: a structural model. *Tourism Management*, 26(1), 45-56.

Zhang, K., & Chen, X. (2022). Research on the influencing mechanism via which security perception of personal information affects tourist happiness: A moderated mediation model. *Sustainability*, 14(22), 15407.

Zhang, H. (2021). Online travel agencies in China: The impact of online reviews, trust, perceived risk, perceived ease of use, perceived usefulness and perceived enjoyment on purchase intention (Doctoral dissertation, Bangkok University).

Zhang, S., & Lo, Y. H. (2024). Tourists' perceived destination image and heritage conservation intention: a comparative study of heritage and film-induced images. *International Journal of Tourism Cities*, 10(2), 469-490.

Zeng, B., & Gerritsen, R. (2014). What do we know about social media in tourism? A review. *Tourism Management Perspectives*, 10, 27-36.

A Comparative Analysis of Tesla's Marketing Strategies and Their Impact on Consumer Purchasing Decisions

Heqing Lou and Dr Sid Sirisukha

ABSTRACT

This paper gives some insight into Tesla's innovative marketing strategies and their adopted effects on consumer perception, brand loyalty, and purchase decisions, respectively, within the automotive industry. All the above would be with deeper interviews with Tesla owners along with a social media sentiment analysis aimed at exploring the user's impact of focus on digital marketing, social media engagement, and direct consumer interaction through the technology-focused marketing areas. Other noted discussion points included: the company-aside-in-chief committing to technological innovation; environmentalism dedication behind this; and charisma displayed by Mr. Musk's leadership. The results show that the emphasis placed on innovation by Tesla-which includes such things as its Autopilot, over-the-air updates, and battery technology-has a positive effect on consumer perception and long-term brand loyalty-building. The sustainability messages also add credence to the company, with Tesla, for the most part, being pointed to as one of the industry's pioneers at the environmental forefront. To what extent Mr. Musk became visible on social media helped give the brand "added value," while exposing potential issues to the brand image charge; therefore, it prompted on extending such recommendations to Tesla: building its customer service volume and diversifying its marketing representation beyond Mr. Musk. For other practical implications, capitalization for their sustainability and innovation might add to the marketing mix takeaways for establishing their competitive edge out there on the planet.

Keywords: *Digital Marketing, Brand Loyalty, Sustainability, Consumer Behaviour*

1. INTRODUCTION

The past couple of decades have seen digital marketing transformed by rapid changes in technology and consumer behaviour. Digital marketing employs new, targeted methods in engaging consumers through the interactive channels of social media and content-based interaction, channels which are dissimilar to traditional means of mass-media such as print and television. Tesla Inc. is one of the biggest consumers of digital marketing processes in actively establishing

its own identity while maybe also eclipsing and delivering more than it thought possible with those options. Tesla Incorporated is revolutionizing automotive marketing thanks to digital marketing by focusing upon innovations, sustainability, and higher engagement with customers altogether, thereby doing away with traditional marketing methods, and using social media and direct interaction with the consumer (Chaffey & Ellis-Chadwick, 2020; Sheth, 2021). Tesla's marketing strategy is completely unique as it is combined with the brand identity of technological advancement and quality of environment sustainability. On Tesla, the traditional concepts of advertising are abandoned-for the most part-implemented through a more inexpensive brand of customer communication that is direct such as through digital media platforms. Elon Musk, the CEO of Tesla, is hugely involved in this strategy. His free and liberal use of social media—especially Twitter—amplifies what Tesla has to say, extends direct outreach to consumers, and builds a sense of community around the company. Musk's public persona acts as an extension of Tesla's brand, reinforcing the company as a forward-thinking, technology-disrupting entity. Of course, while Musk's pull strengthens the brand vision of Tesla, it comes with some perception risk of the company as it is due to, at times, controversial behaviour (Kaplan & Haenlein, 2021). The paper investigates Tesla's innovative marketing strategies and how they impact consumer purchasing decisions, brand loyalty, and overall perception in a highly competitive market. The study examines the effectiveness of Tesla's digital marketing focus on sustainability and the influence of Musk's personal brand on consumer attitudes. In addition to applying the theories of consumer behaviour and digital marketing, this research also aims to contextualize Tesla's strategies in infusing changes in consumer expectation over more engaged, personalized, and sustainable brand experience.

1.1 Research Questions

This study addresses the following research questions:

RQ1: How do Tesla's marketing strategies influence consumer purchase decisions in the electric vehicle market?

RQ2: What impact does Elon Musk's personal brand have on Tesla’s overall brand perception?

RQ3: In what ways does Tesla's emphasis on sustainability enhance consumer loyalty and brand positioning?

1.2 Research Objectives

To comprehensively analyse Tesla’s marketing strategies and their implications, the research pursues the following objectives:

RO1: To evaluate the key drivers influencing consumer behaviour in relation to Tesla’s digital marketing approach.

RO2: To assess the role of Elon Musk's public image and its impact on Tesla's brand perception and consumer engagement.
RO3: To analyse how Tesla's sustainability initiatives contribute to brand loyalty and differentiate the company from traditional automakers.
RO4: To identify lessons for other automotive companies aiming to incorporate digital marketing and sustainability into their brand strategies.

1.3 Background

With the advent of digital technologies, the means of marketing are undergoing a redefinition in various industries, with several companies adopting novel strategies to engage consumers. Tesla has arrived as the leading brand in the automotive world that has adopted digital transformation for competitive advantage. This digital approach allows Tesla to sell directly to consumers through social media, press releases, and its official website without involving any dealerships, creating an unusual model for a direct-to-consumer strategy in the entire auto industry (Ryan, 2020).

The company's mission, to accelerate the transition to sustainable energy, is reflected in its electric vehicle-only product line. It continues to resonate with the environmental theme to attract consumers with environmental concerns. This ongoing concern has linked global environmental concerns with solutions to enable Tesla to maintain itself as a leader in providing eco-friendly solutions for the automotive sector. By creating a brand story around environmental responsibility and technological innovation, Tesla has managed to develop a loyal consumer base that shares its values and vision (Ottman, 2017; Sheth, 2021).

2. LITERATURE REVIEW

A wide-ranging literature review points out the fact that innovation is the key to success for Tesla, with marketing strategies built on a base of concepts well rooted in consumer behaviour and digital marketing theories. Ajzen's Theory of Planned Behaviour (1991) states that consumer behaviour is a function of attitudes, subjective norms, and perceived behavioural control. For the case of Tesla, customer attitudes towards electric vehicles are shaped by the strong emphasis of the brand on sustainability and innovation. This attitude is reinforced by social norms that increasingly favour eco-friendly products, making Tesla's offering attractive to the consumers who wish to reduce their carbon footprint.

Self-Concept Theory provides further explanation as to why Tesla's marketing works so well for its consumers. This theory proposes that consumers will approach brands that embody their self-image or idealized identity (Sirgy,

1982). Tesla's brand advanced technology, ecological and socially responsibly aligned values, and futuristic attitude have attracted the attention of the target consumers who self-identify as being progressive and environmentally aware. If Tesla can align with the ideals of its target audience, it creates a powerful sense of brand loyalty among its customers (Solomon et al., 2019).

Another perspective on Tesla's marketing is through Rogers' Diffusion of Innovation Theory (2003), that posits a classification of consumers in terms of his/her readiness to adopt a new technology. In being the pioneer in electric vehicle technology, Tesla appeals to early adopters and innovators. Such a niche appeal to the technological-savvy consumers has allowed Tesla to build up a faithful following of customers who are willing to pay a premium price for their vehicles. In its years ahead, the challenge of Tesla would be to promote the early majority and late majority state by shifting focus onto affordability and mainstream acceptance as the EV market matures.

2.1 Tesla's Marketing Strategies

The marketing mix or 7P is useful in organizing observations about how Tesla formulates its marketing strategies. It consists of product, price, place, promotion, people, process, and physical evidence. Tesla has developed itself as a premium brand in the electrical car market, characterized by features like Autopilot and over-the-air software updates. Such a product strategy is considered fitting with the company as a technology flagship and appeals to consumers who appreciate technological innovation (Kotler & Keller, 2016). It is priced at a good price point-not the highest in the industry-to reflect the perception and exclusivity of the product. In line with this, Tesla is not averse to competing with other manufacturers to bring viable alternatives like Model 3 into the market while keeping a firm grip on its premium branding (Luttrell, 2018).

Tesla's Place strategy revolves around a direct-to-consumer sales system that eliminates traditional dealer involvement. This allows Tesla to control the customer experience from the configuration of the vehicle to the delivery process by melding them into a seamless transaction. In terms of Promotion, Tesla focuses mainly on digital engagement and social media, where Elon Musk is actively engaging customers. Not only is this a considerable saving in advertising costs, but it also builds a close relationship between Tesla and its consumers (Kaplan & Haenlein, 2021). The approach to People, Processes, and Physical Evidence adds to Tesla's innovative and customer-centric brand image, with its employees trained to deliver outstanding customer service and its website designed for easy navigation.

2.2 Implications for Other Automotive Companies

Values and principles that lead to Tesla's great success in marketing, more especially for other companies in the automotive industry and their counterparts, are piecing to catch the keen sense of good alignment of marketing strategies with the consumer values. Climate change and other environmental concerns shape consumers' preferences, and by planting sustainability in tale-telling, automotive companies may get a head up. Further, the company leveraged digital marketing for driving brand loyalty with targeted, interactive engagement influencing customers' decision to purchase.

A significant lesson for any company wishing to replicate the success of Telsa has to be the creation of profound associations between their brands and values important to people's perceptions of personal identity. With a clear brand perception trajectory aligned with social trends, consumer loyalty can be ramped up, increasing the tone for long-term growth. In addition, as Bolt shows, Elon Musk has used social media to leverage the power of his position to promulgate the messages of the Tesla brand and engage people at a personal level. However, other companies need to be aware of the dangers of positioning themselves too much in connection with a certain figurehead, as this puts them under brand reputation vulnerability (Chaffey & Smith, 2020).

This marketing strategy of Tesla represents a signal change in the automobile industry, revealing what could be achieved through digital marketing, sustainability, and personalized interactions as they mould consumer behaviour. Building a brand in conjunction with values of innovation and environmental responsibility has enabled Tesla to develop a loyal customer base and establish itself as a frontrunner in the electric vehicle market. Results from this research illustrate the necessity for consumers to align themselves with brand values and provide marketers with ideas such as options available to companies willing to step up their game in the sector of digital marketing. Continued research can be done on Tesla's changing position in the market, comparisons with competitive electric vehicle brands, or the long-term implications that Mr. Musk's leadership has on changing the voice of Tesla.

3. MATERIALS AND METHODS

This research scrutinizes Tesla's marketing strategy and its implication towards consumer behaviour. For this, a qualitative research approach is adopted that allows in-depth exploration into various complex situations prevailing in consumer perception, brand loyalty, and purchasing decisions. Qualitative methods provide fresh, detailed understandings on a variety of consumer attitudes, behaviours and motivations, which in the case of analysing the

peculiarity and novel strategies of Tesla are life-sustaining. This section details the methodology by which this study was conducted, including research design methodologies, data collection techniques, sampling methods, and how data were analysed.

3.1 The Design of the Research

The qualitative research study concentrated on in-depth interviews of Tesla owners as well as social media sentiment analysis on Tesla and Elon Musk. Qualitative research is considered more appropriate than others to explore complex, multi-dimensional issues that require subjective perceptions, or lived experiences and attitudes for understanding what sustains such success as a company. This study used qualitative research methodology to find out how digital marketing activities and sustainable principles influence the behaviour of consumers and were, in turn, shaped by Elon Musk. Thus, qualitative methods were used to obtain detailed accounts of consumers' experiences and attitudes toward Tesla, which quantitative data may not capture.

In keeping with the design choice in phase one, the methodology for this study encompassed two basic sources of data: interview transcripts of in-depth interviews with Tesla owners and a social media-sentiment analysis. While in-depth interviews allow first-hand glimpse into the effects of Tesla's marketing strategies on individual customers, social media analysis enables the research to capture overall public perceptions of Tesla in terms of what happens online. By using a combination of the two sources of data, this study tried to paint a complete picture of Tesla's overall brand image and the drivers of consumer loyalty.

3.2 Data Collection

Data collection for this research involved two prime methods: in-depth semi-structured interview with Tesla owners and the analysis of social media. These methods were specifically chosen to answer the identified research questions and objectives, consolidating Tesla owners' personal opinions and broader public reactions to Tesla's marketing approach.

3.3 In-Depth Interviews

In-depth interviews were conducted with a purposive sample of some Tesla car owners with the intention of acquiring an in-depth understanding of their perceptions and experiences regarding the brand. The interview method was semi-structured, allowing the interviewer room and flexibility to explore the topics most relevant to the research questions. Semi-structured interviews provide a balance between structured and open-ended questions to ensure key

themes are covered but also provide enough room for participants to share their views freely and to bring up new topics.

Each interview lasted for from about 45 to 60 minutes, depending on whether the participants preferred to be interviewed in person, via video conferencing (such as Zoom), or over the phone. Interview themes were focused on the participants' reasons for choosing Tesla, perceptions of Tesla's brand image, influences of digital marketing and social media, sustainability as part of their decision process, and their views regarding Elon Musk's influence on the brand. Open-ended questions encouraged participants to illuminate their memorable experiences, thoughts, and attitudes towards Tesla marketing strategies.

Interviews were audio-recorded with the participants' consent and subsequently transcribed for analysis then verifying accuracy against the original audiotape. The transcripts were thoroughly reviewed for accuracy, and pseudonyms were given to ensure the protection of participant identities and confidentiality in accordance with ethical guidelines.

3.4 Social Media Analysis

In order to complement the interview data, a social media analysis was performed to capture larger public perceptions of Tesla and Elon Musk. Twitter, Instagram, and YouTube were selected for analysis because of their user engagement and for the active presence of Tesla’s CEO, who frequently interacts with consumers on Twitter and Instagram. Social media analysis can provide valuable insights into the sentiments and sentiments of a larger audience, reflecting the real-time consumer response to Tesla’s marketing activities and Musk’s social media presence.

A keyword search was executed for relevant social media postings in connection with those related to Tesla, Elon Musk, sustainability, innovation, and keywords such as "Tesla," "Elon Musk," "sustainability," "innovation," "Autopilot," and "electric vehicles." Considerable postings from the past year have been collected so as to grasp the recent public perception. Many of the thematic analyses were focused on admiration, concerns about the consumers, and the overall influence of Mr. Elon Musk on brand perception.

Thematic analysis of the social media posts allowed this study to develop an ongoing theme of sentiment toward Tesla's brand image, sustainability efforts, and the positioning of Elon Musk. The analysis examined how Tesla's social media presence helped shape the brand identity and engagement with the community.

3.5 Sampling Techniques

Participants in the interview for this research were selected using purposive sampling that considered people that would offer salient served insight into Tesla's marketing strategies as well as brand perception. Purposive sampling is one such technique that suits qualitative research, as it allows the researcher to select participants depending on certain traits necessary for the answer of the research questions.

This study's interview participants were active Tesla owners, as their experiences with the brand would elucidate how effective Tesla's marketing strategies were. A variety of other characteristics was also important in considering candidates to assure diversity among the participants-a variety of such as age, gender, and location-to ensure a strong argument from any side. A total of ten participants were included, with various levels of loyalty to the brand and participation in Tesla's online content.

3.6 Sampling from Social Media

A criterion-based sampling approach was used in the social media analysis, focusing on posts that were recent in nature concerning Tesla, Elon Musk, and related topics. The posts were selected based on their relevance to the objectives of the research, as outlined above. Engagement metrics, such as likes, shares, and comments, also served to gauge how well certain posts resonated with audiences. By examining posts with heavier engagement, the study deemed it worthy to capture sentiments that could be commonly perceived by the public about Musk and Tesla.

4. DATA ANALYSIS

This investigation targeted the consumer influences on behaviour that were further delineated following thematic analysis of the interview and social media posts. Thematic analysis is a qualitative approach towards analysing data that identifies, analyses, and reliably reports patterns (themes) within a data set. This approach was chosen due to its flexibility and utility in exploring the complex and subjective nature of experiences and perceptions.

4.1 Thematic Analysis of Interview Data

The interview transcripts were analysed using thematic analysis to identify recurring themes related to Tesla’s marketing strategies, brand perception, and consumer loyalty. The analysis followed the six-step process outlined by Braun and Clarke (2006):

- Familiarization with the Data: The researcher began by reading and re-reading the interview transcripts to become thoroughly familiar with the data. This process helped identify initial ideas and patterns.
- Generating Initial Codes: The transcripts were coded line by line, with each segment of text labelled according to its meaning or relevance to the research questions. Codes were created for specific themes such as "innovation," "sustainability," "customer loyalty," "Elon Musk's influence," and "social media engagement."
- Searching for Themes: After coding the entire dataset, the researcher grouped related codes into broader themes that captured key aspects of the data. For example, codes related to environmental responsibility, technological advancement, and social media presence were grouped under the theme of "Brand Identity."
- Reviewing Themes: The themes were reviewed and refined to ensure they accurately represented the data. This process involved comparing themes across different interviews to ensure consistency and depth in the analysis.
- Defining and Naming Themes: Each theme was defined and named to reflect its core meaning. Key themes identified in the interview data included "Perceived Innovation," "Sustainability and Environmental Responsibility," "Impact of Elon Musk's Personal Brand," and "Digital Engagement and Community Building."
- Writing the Report: The final step involved organizing the themes into a coherent narrative that addressed the research questions and highlighted the key findings. Each theme was supported by direct quotes from participants, providing evidence for the interpretations and insights derived from the data.

4.2 Thematic Analysis of Social Media Data

The social media posts were similarly analysed using thematic analysis to identify patterns in public sentiment toward Tesla and Elon Musk. The steps for thematic analysis were applied as follows:

- Data Familiarization: The researcher reviewed a sample of social media posts to gain an initial understanding of public sentiment and identify commonly discussed topics.
- Coding: Social media posts were coded based on keywords, phrases, and expressions that reflected consumer attitudes and perceptions. Codes included "admiration for innovation," "scepticism about Musk's influence," "concerns about sustainability," and "brand loyalty."
- Theme Development: Codes were grouped into themes that reflected recurring patterns in public sentiment. Key themes included "Public Perception of Innovation," "Sustainability and Environmental Concerns," and "Elon Musk's Role in Brand Identity."

- Theme Review: The themes were reviewed to ensure consistency and accuracy, with adjustments made as necessary to reflect the nuances of public sentiment.
- Finalizing Themes: Each theme was defined and named to capture its significance. The final themes provided insights into how Tesla's social media presence and Elon Musk's engagement affect public perception.
- Integration with Interview Findings: To provide a holistic view, the themes from the social media analysis were integrated with those from the interview data, allowing for a comparison of personal experiences and public sentiment.

4.3 Ethical considerations

Ethical considerations were, without question, paramount in this study, especially due to the sensitive nature of participants' personal experiences and opinions. To protect participant privacy, participants were asked to provide informed consent before interviews were conducted; thus, every participant was fully informed about the study's objectives, usage of data, and means for assuring confidentiality. All participants were provided with pseudonyms to maintain their anonymity and that all forms of identification were removed from the transcript.

For social media data, only publicly available posts were analysed to match the ethical standards regarding privacy and data protection established in this study. No private or restricted posts were accessed and the data were used solely for academic analyses.

4.4 Limitations of Methodology

While the methodology employed offered flexibility in exploring Tesla's marketing strategies in detail, it blended in certain disadvantages. The interview sample consisted of just ten participants, which may not be representative of the entire consumers' view on Tesla. Besides, there are factors which may hinder public sentiment: recent news events or public controversies have the potential to sway public emotions for a short period of time.

5. RESULTS

The findings of this study provide insight into understanding how Tesla's innovative marketing strategy and sustainability initiatives, together with the character of CEO Elon Musk, shape consumer perception, establish brand loyalty, and, ultimately, drive purchasing behaviour. Data collected through in-depth interviews with Tesla owners and a thematic analysis of social media sentiment unearthed several key themes and patterns in consumer attitudes.

These include the powerful influence of technological innovation on brand perception, a strong contribution of sustainability-oriented purchasing behaviour towards brand loyalty, and a two-way process of Elon Musk's public persona affecting Tesla's reputation. This section is a condensed summary of these core results, offering insights into how Tesla's approach corresponds with what modern consumers expect.

5.1 Innovation and Technological Superiority.

Innovation formed the bedrock of Tesla's brand identity, a critical driver of perception by consumers establishing the company as a market leader in the electric vehicle (EV) space. Through the interviews, the participants understood Tesla not just as a car manufacturer but as a technology-based company fostering advanced stages of transportation. Several focal innovations that distinguish Tesla from traditional automakers were often cited by respondents, with emphasis on Tesla's Autopilot system, over-the-air software updates, and battery technology. These innovations were noted by consumers as evidence of Tesla's endeavour to keep being a pioneer of technologies, thereby instilling a considerable measure of its brand loyalty. Several interviewees mentioned the value that exists in ownership that Tesla offers by continuously upgrading its vehicles via software, providing an impression to owners that they are taking part in an evolutionary technological experience. One participant stated, "Tesla's updates make my car feel new every time. It's like I'm part of a bigger mission to advance the future of cars." Such observations were further evidenced in the social media analyses, being hinted at in numerous posts emphasizing Tesla's ability to stand at the forefront of technological advancement. Many consumers chimed in on Twitter and YouTube, admiring how efficient Tesla was in bringing innovation to the market, while constantly being compared favourably by them with other automakers that lean on more traditional automotive features. It has also been portrayed by consumers as a "smart" and "forward-thinking" manufacturer, which neatly captures tech-savvy, eco-conscious consumers' attention.

5.2 Sustainability and Environmental Responsibility

Tesla has done enough, with sustainability being an important input for the attitude and loyalty of consumers. The study indicated that the mission of Tesla resonated closely with the participants' value systems when it comes to being environmentally responsible. The interviewees said pretty much that the conviction behind the mission of accelerating the world's transition to sustainable energy was another reason for choosing Tesla over all other automotive brands.

Some of the interviewees reported that, as opposed to traditional automobile manufacturers, Tesla developed all-electric vehicles with zero-emission messaging and associated them with developmental renewables such as solar panels and home battery storage. “Tesla is selling not just cars, but they are selling a lifestyle that is more attractive to the planet. I’m proud to own a Tesla.”

The social media analysis suggested similar sentiments among users who often cited the impact of Tesla on the environment as a reason for their support. Highly engagement posts regularly rolled out to pinpoint various sustainability-driven initiatives where the Giga factories were committed to renewable energy and partnerships to provide green energy solutions. Consumers consider Tesla to be an innovator in eco-friendly automotive technology. Such associations accentuate brand loyalty, as consumers' feelings that by driving a Tesla they are contributing positively to the health of the environment.

5.3 The Influence of Elon Musk's Personal Brand

Elon Musk is the CEO of Tesla, a combination that is somewhat of an asset as well as a complicated influence with respect to the brand. The study found that his personal brand and his involvement on social media had a significant and brazenly dangerous influence on consumer perceptions. Many interviewees appreciated the accessibility and transparency of Musk on Twitter, where he was regularly found sharing updates on Tesla's innovations and directly replying to consumer inquiries; such direct engagement was a plus for the consumers, who reported to feel a stronger connection with the brand because of Musk's visibility and transparency.

Musk's influence on Tesla's brand, however, presents drawbacks. Some interviewees expressed apprehension about Musk's occasional controversial statements and unpredictable behaviour, which they believed could mildly undermine Tesla's reputation. One participant commented, "I love Tesla, but sometimes I'm afraid Elon tweets that could almost hurt the company a bit." It was a recurrent theme that consumer perception was marked by nostalgia for Musk as a mastermind combined with fear about Musk's public persona.

Musk's influence on social media became the topic of frequent discussions, where allegations and eulogies toward him were met with strong opinions from both supporting and criticizing sides. Some appreciated Musk for being visionary and pushing boundaries, while others grew frustrated with his split comments. But it all reflects a nuance in an attitude stating that while Musk's personal brand has had a critical role in the constitution of the identity of Tesla,

it also invokes careful brand management to take precautions against the dangers posed away.

5.4 Consumer Loyalty and Brand Community

Tesla's marketing strategy leverages product characteristics to generate communal awareness among consumers. Interview evidence shows that, for many owners of the brand, there exists strong affiliation between not only one other but among Tesla owners in distinct groups. These community-oriented efforts were sustained through Tesla's direct engagement with consumers on social media, developing user-generated content.

For many interviewed, Tesla's efforts to engage its customers by inviting them into Tesla events or encouraging them to share their Tesla ownership experiences on social media were appreciated. This sense of belonging builds loyalty to the brand: the consumers feel they belong to an exclusive community of shared values and experiences. As one participant articulated: "Being a Tesla owner feels like being part of a movement. We are all supporters of a company that is attempting to make a positive difference".

Social media analysis corroborated the presence of a sizable and enthusiastic Tesla community, where users would provide posts celebrating the brand and share their personal Tesla experiences. Hashtags like #TeslaFamily and #DriveTesla were usually used to connect to others in the Tesla community, forming an online forum to strengthen brand loyalty. This aspect of community-building in Tesla's marketing affords it a favourable image, supporting and nurturing consumer loyalty and recommendation of the brand within their social networks.

5.5 Patterns of Consumer Behaviour

The study ascertained those distinctive patterns emerged in consumer behaviour that assented to the marketing strategies for Tesla. Many consumers spoke of Tesla as an inimitable 'lifestyle brand' that symbolized commitment to innovation and environmental sustainability. Interviewees often claimed that Tesla's products fit neatly into their values and aspirations, a statement echoed by those individuals' voicing opinions or observations on social media.

Another consistent pattern seen among interviewees was the association of Tesla ownership with social class or status and personal identity. In particular, the participants mentioned that driving a Tesla is considered a statement in favor of sustainable practice and new technology and that this association contributes to their self-perception positively. Due to the alignment with personal values, Tesla was cited as a brand with which brand loyalty was easily

forged, as consumers feel a deeper connection to the company compared to other automotive brands.

Moreover, Tesla's digital-first marketing strategy has also influenced consumer expectations for transparency, real-time interaction, and ongoing product enhancements. Many interviewees mentioned that they appreciated regular updates from Tesla and pointed to how Elon Musk's engagement on social media created an atmosphere of openness and trust. Increasingly, consumers expect brands to be open with them and engage with them in real-time-a benchmark that Tesla has established through its digital engagement programs.

5.6 Implications for Tesla and the Automotive Industry

The findings suggest implications for Tesla's future marketing strategies and other auto manufacturers within the industry. In the case of Tesla, the results emphasize the importance of maintaining the reputation of the firm as a technology and sustainability expert. Technological advancement and environmental responsibility are core attributes of the Tesla brand that strongly resonate with consumers, and that continuous stressing of such themes will have a haunted effect on consumer affinity for the brand.

The duality of influence that Elon Musk has cast towards the brand may suggest that a diversified brand representation at Tesla would actually work better. Even as his visionary sort of leadership is a major reason behind Tesla's accomplishing great success, Musk's public persona as a controversial figure may thus not be viewed so favourably towards the brand. Tesla may even want to consider taking other faces to continue to represent the mission and values of the company, thus averting the situation whereby the company becomes too dependent on Musk's private brand.

For the others in the automotive field, Tesla's success offers valuable lessons toward integrating sustainability and innovation into marketing strategies. As consumers place increasing priority on eco-friendly alternatives, automotive brands emphasizing sustainability could leverage opportunities to distinguish themselves from others in the market. In addition, Tesla's digital engagement models confirm an essential role for transparency and real-time engagement in today's consumer environment.

5.7 Summary of Key Findings

The study's findings indicate that Tesla's marketing tactics are successful in rendering consumer behaviour and brand loyalty a reality. The critical findings have been:

Innovation and Brand Perception: Due to Tesla's technological advancements, such as Autopilot and over-the-air updates, consumer perception of Tesla is significantly impacted, and the brand is associated with progression and innovation.

Sustainability and Brand Loyalty: Tesla's sustainability focus resonates with eco-conscious consumers, fostering brand loyalty and establishing Tesla as a leader in environmental responsibility.

Influence of Elon Musk's Persona: Musk's activity online allows consumers to interact with him more regularly, but this comes with a risk for damaging the brand's reputation. Consumers appreciate his availability but are wary of his controversial utterances.

Meshing Community with Brand Loyalty: When consumers embrace the sense of community Tesla engineers in its social media engagements, events that solicit consumer reliance and participation contribute to brand loyalty.

Consumer Behaviours: Tesla is discipled as a lifestyle brand, with its ownership thus signalling a commitment to volition and sustainability. Among consumers, finding a link between Tesla products and their values and social status improves consumer loyalty.

Overall, our findings show that Tesla's winning combination of innovation, sustainability, and responsive engagement with consumers has produced a loyal and passionate customer base. These insights can thus provide them with an anchor in marketing initiative development in the future and hold lessons for other automotive brands that wish to win over tech-savvy, ecologically conscious consumers.

6. CONCLUSIONS

This study reveals how Tesla used innovative practices, sustainability, and digital engagement to create consumer perception, establish brand loyalty, and encourage purchases. Tesla represents the industry leader in marketing from the perspectives of cutting-edge technology and environmentalism and appeals to consumers who value both sustainable practices and new technology. The sustainability factor of the Tesla brand considerably enhances its brand equity as a driver of innovation for the automobile industry by the continuing developments in technology such as Autopilot and over-the-air updates. The brand's sustainability messaging is found appealing among eco-conscious customers, who consider it the car manufacturer that embodies their value of environmental responsibility.

Being the Chief Executive Officer, Musk thus embodies a dual effect. His presence allows Tesla to ride high on the popularity charts owing to its active social media and visionary leadership while his conduct invites considerable reputational risk, owing to its controversial nature. The duality implies that while Musk's personal brand is able to significantly augment Tesla's image, decentralization of his representation will not only serve as insurance against any possible risk but would also prevent total company dependency upon Musk.

To build upon its existing strengths, Tesla should also implement a suite of pragmatic initiatives to help it diversify its branding. It could attempt some diversification by advocating other leadership figures that represent, embody, and symbolize Tesla's mission and value system to ensure some assurance regarding the stability of market brand image should Musk's influence wane. Improving customer service and engaging with them especially in social platforms would affirm more of Tesla's dedication to customer satisfaction and loyalty. Quickly reaching out to reply to customer inquiries and feedback will match Tesla's digital-first marketing approach while also augmenting consumer trust.

Furthermore, the continued emphasis on environmental programs and technological innovations is crucial in protecting brand loyalty. By its persistent commitment to sustainability and a flair for innovation, Tesla could stretch its competitive edge further in the face of a large influx of EVs. There are a number of vital lessons that traditional auto-makers can learn from the achievements of Tesla. If other brands were to target sustainability in product design and marketing, this could resonate strongly among environmentally-conscious consumers and allow companies to better position themselves for relevance in the emerging EV market. A direct-to-consumer engagement model, familiar to the traditional automakers, such as Tesla's utilization of digital platforms such as social media to invoke consumer trust and loyalty through relationship-building transparency, is also important. For companies wishing to break into digital marketing successfully, interacting with the consumer in real-time and personalizing engagements-like Tesla-could enhance interaction with consumers and establish a match between brand values and consumers' expectations.

Accordingly, innovation, sustainability, and direct engagement with consumers by Tesla have rendered it the game changer of the industry. These findings suggest that those organizations best aligned with environmental stewardship, technological progress, and legitimate consumer outreach have a greater chance of surviving and thriving in the increasingly competitive and volatile landscape as consumer priorities evolve.

7. REFERENCES

Aaker, D. A. (2012). Building strong brands. Free Press.

Ajzen, I. (1991). The theory of planned behaviour. *Organizational Behaviour and Human Decision Processes*, 50(2), 179–211. https://doi.org/10.1016/0749-5978(91)90020-T

Armstrong, G., Kotler, P., & Opresnik, M. O. (2020). Marketing: An introduction (14th ed.). Pearson.

Bhaskar, R. (1978). A realist theory of science. Harvester Press.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101. https://doi.org/10.1191/1478088706qp063oa

Chaffey, D., & Ellis-Chadwick, F. (2020). Digital marketing: Strategy, implementation, and practice (7th ed.). Pearson.

Chaffey, D., & Smith, P. R. (2020). Digital marketing excellence: Planning, optimizing and integrating online marketing (5th ed.). Routledge.

Creswell, J. W. (2014). Research design: Qualitative, quantitative, and mixed methods approaches (4th ed.). SAGE Publications.

Denzin, N. K., & Lincoln, Y. S. (Eds.). (2011). The SAGE handbook of qualitative research (4th ed.). Sage Publications.

Feloni, R., & Morgan, R. (2019). The Elon Musk method: How the billionaire CEO of SpaceX and Tesla leads by bringing his brand to social media. *Journal of Management and Leadership*, 25(1), 56–64.

Kaplan, A. M., & Haenlein, M. (2021). The influence of CEO personal brands on corporate social media marketing: A case study of Tesla and Elon Musk. *International Journal of Business Communication*, 58(3), 305-319. https://doi.org/10.1177/2329488418776044

Kotler, P., & Keller, K. L. (2016). Marketing management (15th ed.). Pearson.

Kvale, S., & Brinkmann, S. (2009). InterViews: Learning the craft of qualitative research interviewing (2nd ed.). Sage Publications.

Laursen, K., & Svejvig, P. (2016). Digital transformation and the role of leadership in achieving brand innovation. *Journal of Business Research*, 12(1), 54–67.

Lincoln, Y. S., & Guba, E. G. (1985). Naturalistic inquiry. Sage Publications.

Luttrell, R. (2018). Social media: How to engage, share, and connect. Rowman & Littlefield.

Mangram, M. E. (2012). Tesla Motors: A case study in disruptive innovation. *Technology Innovation Management Review*, 2(4), 26–32. https://doi.org/10.22215/timreview/548

Maslow, A. H. (1943). A theory of human motivation. Psychological Review, 50(4), 370–396. https://doi.org/10.1037/h0054346

Ottman, J. A. (2017). The new rules of green marketing: Strategies, tools, and inspiration for sustainable branding. Berrett-Koehler Publishers.

Porter, M. E., & Kramer, M. R. (2019). Creating shared value. In On competition (pp. 37–66). Harvard Business Review Press.

Rust, R. T., & Huang, M. H. (2014). The service revolution and the transformation of marketing science. *Marketing Science*, 33(2), 206–221. https://doi.org/10.1287/mksc.2013.0836

Ryan, D. (2020). Understanding digital marketing: Marketing strategies for engaging the digital generation (5th ed.). Kogan Page.

Sheth, J. N. (2021). The future of consumption in a post-COVID world. *Journal of Marketing*, 85(S1), 20–26. https://doi.org/10.1177/0022242920967938

Sirgy, M. J. (1982). Self-concept in consumer behaviour: A critical review. *Journal of Consumer Research*, 9(3), 287–300. https://doi.org/10.1086/208924

Solomon, M. R., Bamossy, G., Askegaard, S., & Hogg, M. K. (2019). Consumer behaviour: A European perspective (7th ed.). Pearson.

Vynakov, O., et al. (2019). Influence of personal brand of a CEO on organizational performance. *Journal of Corporate Leadership*, 15(1), 12–20.

Perspective of New Zealand Consumers on the Use of payWave Transactions for Daily Financial Activities

Krishneel Alvin Prasad and Premalatha Sampath

ABSTRACT

Consumers' traditional payment methods are becoming outdated, and a shift towards the use of the new payWave payment method gained popularity globally during the recent COVID-19 pandemic. A similar effect was observed on purchase payment methods among the New Zealand population in 2023. However, New Zealand is slow in adopting new technologies and lags in digitalization, according to the New Zealand Institute of Economic Research's report published in 2023. Significantly, this lag in adopting the use of new payWave payment methods provides leverage to faster-adopting countries.

This study examines the demographics of payWave users in 2023 and outlines the awareness of its risks among its users in New Zealand. The research was conducted using a deductive approach based on a cross-sectional research design. Data was collected over 16 weeks by way of an online survey (SQ). A total of 391 participants took part in the survey, which was distributed through emails, a WhatsApp group, and was also advertised on research posters.

The primary results highlighted that the New Zealand population is using payWave payment methods in 2023 and is aware of the risks associated with the use of these methods. Millennials, aged 27-37, are the majority users of payWave payment methods. Detailed information is provided on the research's limitations and on directions for future studies incorporating the identified limitations.

It is recommended that the Ministry of Business, Innovation and Employment (MBIE) promotes awareness among the older New Zealand population of the significance of payWave payment methods. This is because, based on the survey data, it is possible that they may revert to using traditional payment methods.

Keywords: *payWave, Contactless Payments, Cashless economy, Digital transformation, Technology adoptions*

1. INTRODUCTION

1.1 Background of New Zealand and technology adoption

It is believed that New Zealand was first discovered by Polynesian sailors between 1200 and 1300 AD (New Zealand Immigration, 2022). New Zealand is a diverse country with an estimated population of 5,199,100 as of March 31st, 2023 (New Zealand Government, 2023).

However, despite its potential, New Zealand has been relatively slow in adopting new technologies compared to other developed countries (Asia Pacific Infrastructure, 2017). According to the State of the New Zealand Digital Economy report (2012), only 35% of businesses have a website, and only 18% identify as early technology adopters. The New Zealand Productivity Commission's 2020 report further emphasizes this lag in technology adoption.

The COVID-19 pandemic accelerated the need for digital transformation in New Zealand, which was already facing challenges such as an aging workforce and declining productivity growth. Digital transformation offered an opportunity to boost the economy by $46.6 billion by 2023.

The pandemic also accelerated the adoption of disruptive technologies across various sectors (Mat Aripin & Brougham, 2023). As outlined by Harvard Business Review (2015), disruptive technologies emerge when customers adopt new products or services to address social problems. In the case of New Zealand, government restrictions and changing consumer behaviours during the pandemic fuelled the adoption of contactless payment methods.

While the adoption of contactless payments offers numerous benefits, it also presents challenges for both consumers and regulators. A Datacom group survey (Wright, 2023) found that 49% of New Zealand businesses have yet to embark on digital transformation, indicating a significant gap in adoption rates.

To better understand the adoption of contactless payment methods in post-pandemic New Zealand, this research applies Rogers' diffusion of innovation theory. By examining the factors influencing the adoption of contactless payments, this study aims to contribute to the understanding of technology adoption in a specific context.

1.2 Five types of technology consumer adoption

A consumer is a person who purchases goods and services to satisfy personal wants, needs, or desires. Consumers can be categorized into five adopter groups based on demographics and psychosocial characteristics: innovators, early adopters, early majority, late majority, and laggards. Therefore, marketers must

understand the differences between these groups to tailor their strategies effectively.

Similarly, technology consumers can be categorized into generations: Baby Boomers (born between 1946 and 1964), Generation X (1965-1980), Millennials or Generation Y (1980-1996), and Generation Z, iGen, or Centennials (1996 and above). Data suggests that Gen Z and Millennials are early tech adopters and innovators (Anaza et al., 2022).

1.3 Development of consumer transaction infrastructures in the New Zealand market

During the early colonial era, arrangements were made between the Directors of the New Zealand Land Company and the Union Bank of Australia (UBA) to establish New Zealand's first bank in Wellington in 1840. The second bank, the Auckland Savings Bank, opened in Queen Street in 1847. In 1861, the Bank of New Zealand (BNZ) began operations, followed by the Bank of Otago in 1867. These developments revolutionized New Zealand's monetary economy, facilitating formal trade and investment.

By the 19th century, six banks—four international and two local—were providing financial services to New Zealanders. The world's first ATM was installed in London in 1967, and ATMs were introduced to New Zealand in 1981 by the Northern Building Society.

EFTPOS cards became widely available to New Zealand bank customers in 1984, free of charge. Merchants were provided with POS terminals and infrastructure by financial service providers, who charged fees for installation and usage.

New Zealand has been a leader in the adoption of POS terminals. In 2014, with a population of 4.5 million, the country had 151,700 POS terminals, equating to 29.7 people per terminal. This high density of terminals, along with the widespread availability of contactless payment cards, has contributed to the popularity of cashless transactions in New Zealand (Polasik et al. (2022b).

Polasik et al. (2022a) highlight the competitive advantage of contactless payment cards, particularly in terms of speed and convenience.

1.4 Problem statement

A recently published report by the New Zealand Institute of Economic Research has highlighted that New Zealand lags in digitalization compared to other

countries and is positioned at 27th place among 63 countries globally, and this is of great concern.

Additionally, lagging in technology provides leverage to countries that are fast adapting to changes and new technology. Thus, it negatively impacts on New Zealand's population and economic development. This research aims to identify and understand the New Zealand population's demographic representation towards technology adoption with the use of payWave transactions, and categorize them using the Diffusion of theory.

A quantitative approach is used to achieve the set objectives with the help of Diffusion of Innovation theory to develop hypotheses. Surveys are created and the survey link is distributed online to collect 391 voluntary participants. The data gathered from the survey is analysed to understand the overall research objective and the research questions raised.

1.5 Research questions

This research aims to determine the acceptance of the use of payWave transactions and the greater adoption of technology, mainly contactless method transactions, among consumers in New Zealand during COVID-19. The following research questions are identified to evaluate the objectives of this study.

> RQ1: What is the preferred choice of contactless transaction payment instrument in 2023, and how to categorize technology adoptions using the innovation diffusion model among the New Zealand population?
> RQ2: Are the users of contactless transaction payment methods aware of the risks?
> RQ3: Will the New Zealand population continue to use contactless transaction payment methods in future?

This research tends to identify different demographic categories of technology adoption in New Zealand with the use of payWave payment transactions among the New Zealand population.

1.6 Significance of the study

This study aims to identify the demographic characteristics of New Zealanders who use contactless transactions in 2023 and to understand how the COVID-19 pandemic has influenced the adoption of payWave transactions. By analysing consumer behaviour, the study will provide insights that can be used by marketing agencies to target potential consumers of new technology products.

Additionally, the study will identify age groups that are slower to adopt contactless transactions. This information can be valuable for contactless transaction service providers to develop targeted awareness campaigns. Future

researchers can use this study as a foundation to explore the adoption of other technological products and to predict consumer buying patterns and payment trends.

By applying Rogers' diffusion of innovation theory, the study will categorize New Zealanders based on their technology adoption behaviour. It will also assess consumer awareness of the risks associated with contactless transactions and provide recommendations to financial service providers to mitigate these risks and improve consumer education. Finally, the study will identify the most popular contactless payment option in New Zealand in 2023.

2. LITERATURE REVIEW

In 2019 European Central Bank highlights the resilience of cash, emphasizing its long-standing use and its importance beyond technological advancements (Central Bank, 2020). Bagnall et al. (2016) identify factors influencing cash usage, including transaction value, demographics, POS terminal availability, transaction fees, and venue. In 2018, The Reserve Bank of New Zealand reports a decline in cash transactions due to reduced access and acceptance, which can be attributed to the growth of digital payment methods (The Reserve Bank of New Zealand, 2023).

The increasing popularity of contactless payments, credit/debit cards, e-wallets, online transfers, cryptocurrencies, and NFC technology has contributed to the decline in cash usage (Lippi & Secchi, 2009; Trütsch, 2020). Research suggests that perceived usefulness and ease of use significantly impact consumer adoption of electronic payment methods (Lin et al., 2023). However, consumer acceptance is influenced by multiple factors and cannot be solely attributed to a single dimension.

The COVID-19 pandemic accelerated the shift towards digital payments, driven by convenience and health concerns (Nguyen & Watson, 2022). A survey conducted in Poland during the pandemic revealed that consumers' decisions regarding digital payment methods were influenced by factors such as availability and infrastructure (Szumski, 2022). The speed and convenience of contactless transactions have been key drivers of their adoption, as highlighted by various studies (Szumski, 2022; Polasik et al., 2022a).

Financial institutions have responded to these trends by adapting their operating models and offering innovative payment solutions (Ul et al., 2017). Contactless transactions have been promoted through initiatives such as fee reductions, increased transaction limits, and expanded POS terminal availability (Bukvic, 2021; Khando, 2022). Additionally, contactless payment providers often offer incentives like waivers, discounts, and cashback to encourage adoption (Thirupathi et al., 2019).

The convenience of contactless payments, as evidenced by the ability to tap or wave cards or phones at POS terminals, has contributed to their popularity (Nguyen & Watson, 2022). Studies have shown that contactless payments can be competitive and even outperform traditional payment methods under certain conditions (Polasik et al., 2022b). The benefits of cashless transactions, such as reduced costs, increased security, and simplified processes, have been highlighted in research (Mui et al., 2021).

While the shift towards cashless societies has gained momentum, concerns remain regarding security, fraud, and the potential for increased consumer debt (Anaza et al., 2022; Jamil et al., 2022; Gawior et al., 2022). The reduced need for physical cash and PIN entry in contactless transactions can create vulnerabilities. Additionally, socio-economic inequalities in developing and emerging economies can hinder the adoption of cashless systems (Bagnall, 2016; Srouji, 2020).

To better understand the factors influencing the adoption of contactless payments, it is essential to consider geographic, demographic, cultural, and economic factors. While numerous studies have examined this topic, there is a need for more research specifically focused on the post-pandemic landscape in New Zealand. This research aims to fill this gap by collecting data from 391 participants aged 16 and older to explore the factors influencing the usage of contactless payment methods in New Zealand.

2.1 Theoretical framework

The literature review identifies Rogers' diffusion of innovations theory as a suitable framework to understand the adoption of contactless payment methods. Kijek (2015) discusses the three stages of technological change: invention, innovation, and diffusion. Rogers' (1962) theory categorizes adopters into five groups: innovators, early adopters, early majority, late majority, and laggards (Sahin, 2006).

While Rogers' theory focuses on individual adoption within a social system, it's important to note that diffusion can be influenced by various factors, including product benefits, perceived costs, market openness, social environment, product information, and uncertainty (Landauer & Swanson, 1953). Additionally, the pace of diffusion can be affected by external factors like crises or emergencies (Mansour, 2022).

Several theories, such as the Unified Theory of Acceptance and Use of Technology (UTAUT), Theory of Reasoned Action (TRA), Theory of Planned Behaviour (TPB), and Technology Acceptance Model (TAM), have been used to explain technology adoption, including contactless payments. These theories

emphasize factors like perceived usefulness, ease of use, social influence, and facilitating conditions.

This research aims to apply Rogers' diffusion of innovations theory (referred in Figure 1) to understand the adoption of contactless payments in New Zealand. By examining the demographic characteristics of adopters and the factors influencing their decisions, this study seeks to contribute to the understanding of the diffusion process in a specific context.

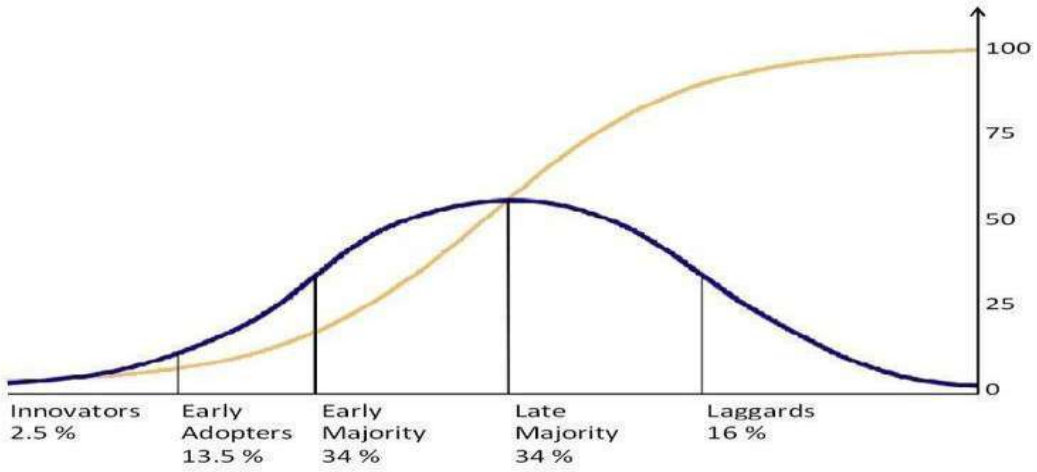


Figure 1 *Diffusion of innovation theory S – diffusion curve (Source: Briscoe et al., 2015)*

The 'S' shaped curve represents the cumulative rate of adoption (or diffusion curve). The bell curve depicts the number of new adopters along the same timeline (Briscoe et al., 2015).

2.1.1 Hypothesis Development

The previous sections lay the foundation to assist in identifying variables based on the diffusion of innovation theory model based on the social system factor that contributes to the diffusion of adoption of contactless payment methods among New Zealand consumers in the year 2023.

2.1.1.1 Innovators

According to Rogers (2003), innovators are willing to experience new ideas, and most are individuals or organizations willing to adopt innovations. They are the most eager and the earliest compared to others in adopting innovations, and their

close relationship outside of the social system is not liked or respected by other members of the social system.

H1 – Innovators prefer to use PayWave transactions over traditional payment options.

2.1.1.2 Early Adopters

Unlike innovators, early adopters are constrained within the boundaries of the social system. These individuals represent, and are regarded as, opinion leaders that enjoy a leadership role and embrace opportunity. Early adopters' leadership abilities in adopting innovations decrease the uncertainty of the diffusion process (Sahin, 2006). Additionally, millennials are considered to be born and raised in an era of new technology development and this has influenced their behaviour in adopting new technology at a faster rate than the early majority but at a slower pace than innovators, with a higher degree of risk awareness.

H2 - Early adopters in New Zealand populations are likely to be millennials that use contactless payment methods.

2.1.1.3 Early Majority

The early majority makes up a larger portion of technology adoption at 34%, after innovators and early adopters. Even though the early majority maintains good communication and interaction with all the members of social system, it fails to have the leadership role of early adopters. This group of people takes a longer time in technology adoption than innovators and early adopters, but less time compared to other categories.

H3 – The ease of using PayWave transactions has led to the adoption among the early majority.

2.1.1.4 Late Majority

The late majority represents a similar percentage of technology adoptions as the early majority at 34%, however, this group only adopts technology after the majority population of 50 % adopts it. This population is risk-averse and once all the benefits and assurances are provided about the technology, they tend to adopt it.

H4 – The Late Majority only adopt use of payWave payment methods after the risks are identified

2.1.1.5 Laggards

Laggards are last in the technology adoption lifecycle of Rogers' diffusion of innovation theory model. They are termed traditionalist and sceptical, and represent 16% of the population. They are mostly interacting with the same group members in the social system and don't play a leadership role in innovation diffusion (Sahin, 2006).

H5 – Laggards prefer to use cash transaction payment methods rather than payWave transactions.

2.2 Research gaps

This study identifies gaps in understanding the use of contactless payment methods through identified and reviewed literature. Many different approaches, theories, and models are used to explain technology adoptions, the evolution of NFC, and the cashless economy, not many studies speak on the consumer perspective of using contactless (payWave) payment methods for daily purchases using Rogers' diffusion model and on aspects of social systems (Venkatesh et al., 2016). Finally, this paper provides fresh insights on the benefits and risks of the usage of contactless payment methods in 2023.

3. FINDINGS AND DISCUSSIONS

3.1 Demographic questions

Survey question 1 (SQ 1) describes the use of contactless payment methods based on the gender of survey participants. The survey responses are recorded in Table 1 and displayed in Figure 2.

Table 1 Gender of Survey Participants (Source: Author)

Gender	Total Participants	% of Total	Cumulative %
Male	226	57.8 %	57.8 %
Female	157	40.2 %	98.0 %
Others	8	2.0 %	100.0 %
	Total participants	391	

Survey question 1 (SQ 1) describes the use of contactless payment methods based on the gender of survey participants. The survey responses are recorded in Table 1 and displayed in Figure 2.

Table 1 outlines the total number of participants and the distribution of genders among respondents. Figure 2 visually represents the percentage of survey responses by gender. The data shows that 226 participants (57.8%) identified as male, 157 (40.2%) as female, and 8 (2.0%) selected other gender options.

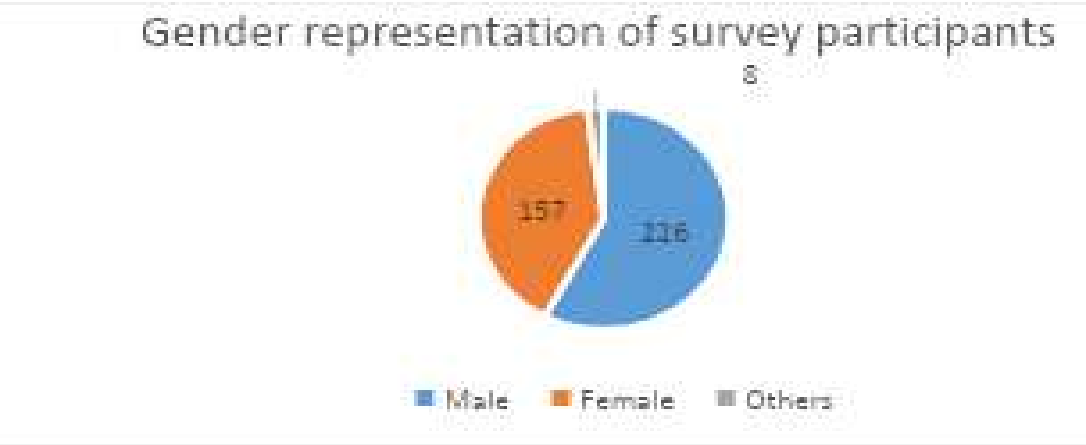


Figure 2: Gender representation of survey participants (Source: Author)

Survey question 2 (SQ 2) addresses the issue of identifying the age range of survey participants. Participants were asked to select their age range from five options, starting from 17 years and above. The responses are recorded in Table 2 and displayed in Figure 3.

Table *2: Survey participants age range (Source: Author)*

Age Range	Total Participants (391)	% of Total Age	Cumulative %
28 – 38	128	32.7 %	32.7 %
50 – 60	70	17.9 %	50.6 %
39 – 49	88	22.5 %	73.1 %
17 – 27	91	23.3 %	96.4 %
60 & above	14	3.6 %	100.0 %

The survey collected responses from a diverse age range of participants. The majority of participants (128) were between the ages of 28 and 38, while a smaller group (14) were aged 60 and above. This diverse age range is appropriate for understanding the adoption of contactless payments, as described by Rogers' diffusion of innovation theory. Figure 3 visually represents the distribution of survey participants by age range in a pie chart.

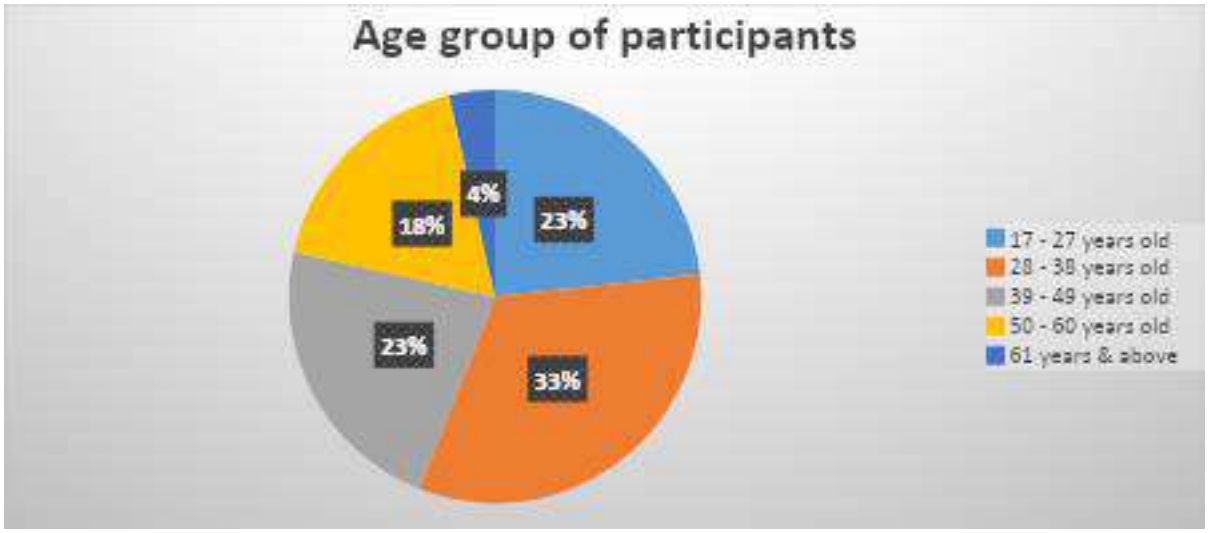


Figure 3: Age range of survey respondents (Source: Author)

Additionally, survey question 5 (SQ 5) helped the researcher understand the financial situation of survey participants. Participants were asked to select a statement that best described their financial condition. This information is important for understanding the adoption of contactless payment methods, as financial factors can influence consumer behavior, as outlined by Rogers' diffusion of innovation theory. It's worth noting that contactless payments may incur higher transaction fees compared to traditional payment methods, which could impact usage. The responses of survey participants are recorded in Table 3 and displayed in Figure 4.

Table 3: Financial background of survey participants (Source: Author)

Financial Background	**Participants**	**% of Total**	**Cumulative %**
I am under a bit of financial pressure but generally can find a way of coping with an unexpected bill	124	31.7 %	31.7 %
I am reasonably comfortable financially	180	46.0 %	77.7 %
I am well off	46	11.8 %	89.5 %
I am always under financial pressure and always find it difficult to pay my bills	18	4.6 %	94.1 %

I have real trouble making ends meet and an unexpected bill puts me under a lot of pressure	17	4.3 %	98.5 %
Unsure	6	1.5 %	100.0 %
Total Participants	**391**		

Figure 4: *Survey participants financial conditions (Source: Author)*

Table 3 and Figure 4 display the financial information of survey participants. A total of 180 participants described themselves as reasonably comfortable financially, 124 as under some financial pressure, 46 as well-off, 18 as always under financial pressure, 17 as having difficulty paying unexpected bills, and 6 as unsure about their financial condition.

3.2 Contactless payment options survey questions

Survey question 9 (SQ 9) is linked to SQ 8 and asks participants who have used contactless payment methods to indicate which specific payment options they used. The responses are displayed in Figure 5 as a bar graph.

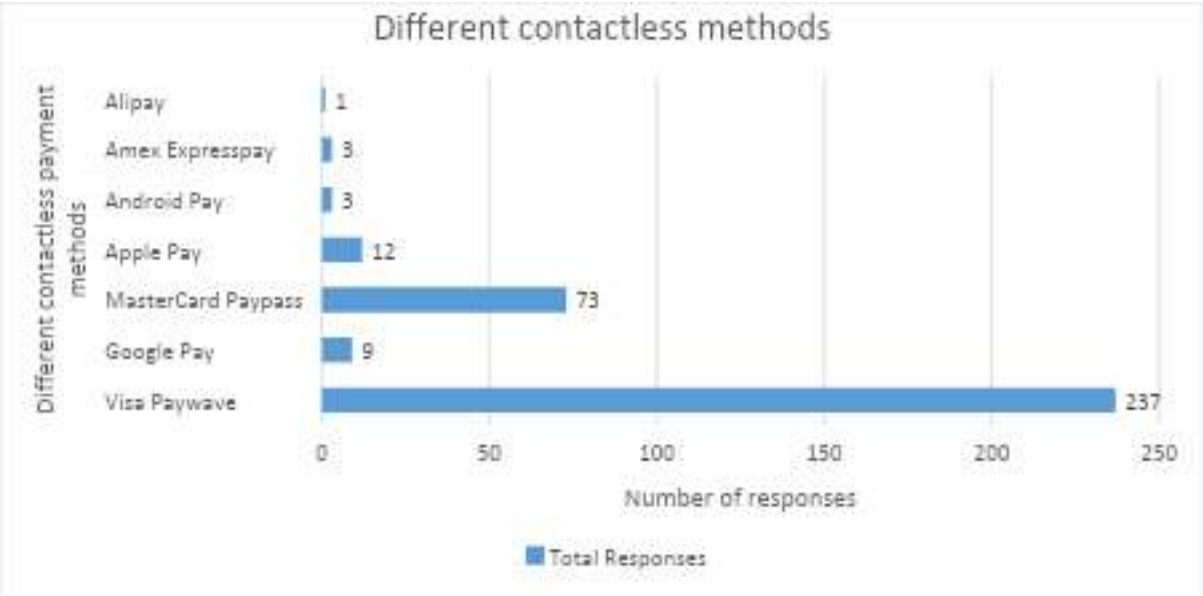


Figure 5: Different contactless method used for instore purchases (Source: Author)

Additionally, Figure 5 highlights Visa payWave (70.1%) as the most popular contactless payment option among New Zealand consumers in 2023. The second most popular option is MasterCard PayPass, at 21.6%. The least popular contactless payment methods are Android Pay – Amex Express Pay (0.9%) and Alipay (0.3%).

SQ 10 provides consumer insights into the ease of using contactless payment options. This question is grounded in Rogers' diffusion theory, which suggests that the convenience of a product significantly contributes to its diffusion. The survey participants' responses are visually represented in Figure 6 as a bar graph.

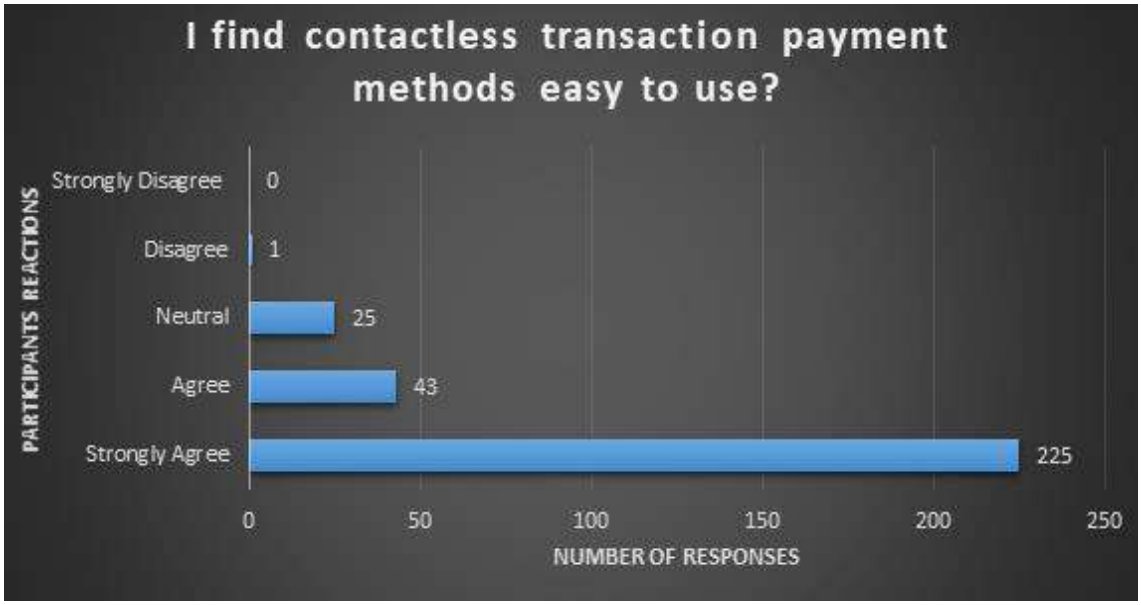


Figure 6: Survey participants' responses to SQ 10 (Source: Author)

As per the Figure 6, 53.8% of respondents strongly agreed, and 34.6% agreed that contactless transactions are easy to use. Conversely, 11.2% were neutral in their responses, and 0.3% disagreed with the statement.

SQ 11 asked participants to specify the year they began using contactless payment options for their purchases. This question was designed with consideration of the components of Rogers' diffusion theory that contribute to product adoption. The survey participants' responses are visually represented in Figure 7 as a pie chart.

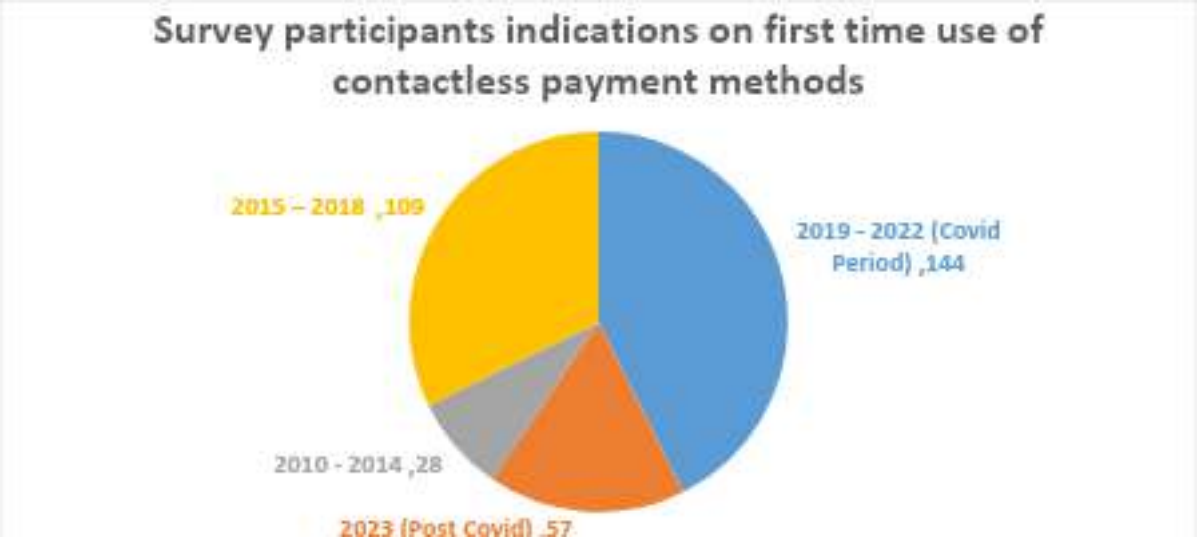


Figure 7: Participants responses on a pie chart for SQ 11 (Source: Author)

As per Figure 7 highlights that the majority of participants (144) started using contactless transactions during the COVID pandemic, between the years 2019 and 2022. Secondly, during the early diffusion and introduction of contactless payment options for purchases in the years 2010 – 2014 (28) the least number of survey participants had made use of them. Additionally, the third highest number of survey participants (109) responded that they first started using contactless payment options in the years 2015 – 2018, whereas 57 participants indicated they have recently started using, post-COVID, in the year 2023.

3.3 Contactless payment different purchase modes

Section three of the survey uses Rogers' diffusion theory to explain contactless payment adoption among New Zealand consumers. These questions will assist the researcher in answering RQ 1 and RQ 2.

The SQ 13 identifies research participants' satisfaction with the processing speed of purchases made using contactless payment modes. The responses of the survey participants are recorded on **Table 4** and displayed in **Figure 8** on a bar graph.

Table 4: Research 'Participants' reactions to processing speed' (Source: Author)

Participants' reactions to processing speed'	Total Responses	% of Total responses	Cumulative %
Strongly Agree	196	50.1%	50.1%
Agree to some extend	132	33.8%	83.9%
Neither agree nor disagree	54	13.8%	97.7%
Don't know	3	0.8%	98.5%
Disagree to some extend	5	1.3%	99.7%
Strongly disagree	1	0.3%	100.0%
TOTAL RESPONSES	**391**		

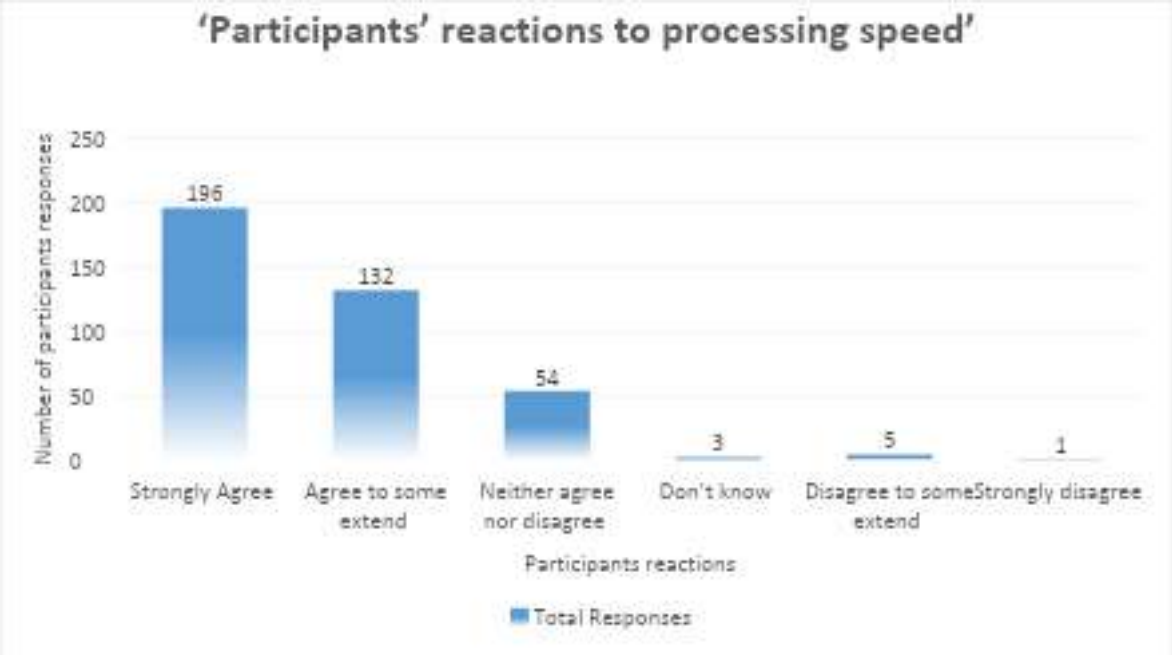


Figure 8: Participants reactions to processing speed (Source: Author)

Table 4 presents the data, and Figure 8 provides a visual representation of survey participants' reactions to the statement that purchases are processed faster using contactless payment methods. Specifically, 50.1% strongly agree, and 33.8% agree to some extent that contactless payment methods speed up transaction processing. Meanwhile, 13.8% neither agree nor disagree, 1.3% disagree to some extent, 0.3% strongly disagree, and 0.8% are unsure or unaware of what the statement refers to.

SQ 14 asks survey participants to describe their use of contactless payment options by selecting one statement from five provided options. The participants' responses are recorded in Table 5 and visually represented in Figure 9 as a bar graph.

Table 5: Survey participants' perspective on the use of contactless payment options (Source: Author)

Participants Perspective on contactless payment options	Total Responses	% of Total Responses	Cumulative %
Prefer to use new payment option with known risks	82	21.0%	21.0%
Keeping up and using new contactless payment options	186	47.6%	68.5%
Depends on my mood	25	6.4%	74.9%
Lagging behind & prefer to cash method	94	24.0%	99.0%
Not Sure	4	1.0%	100.0%
TOTAL RESPONSES	**391**		

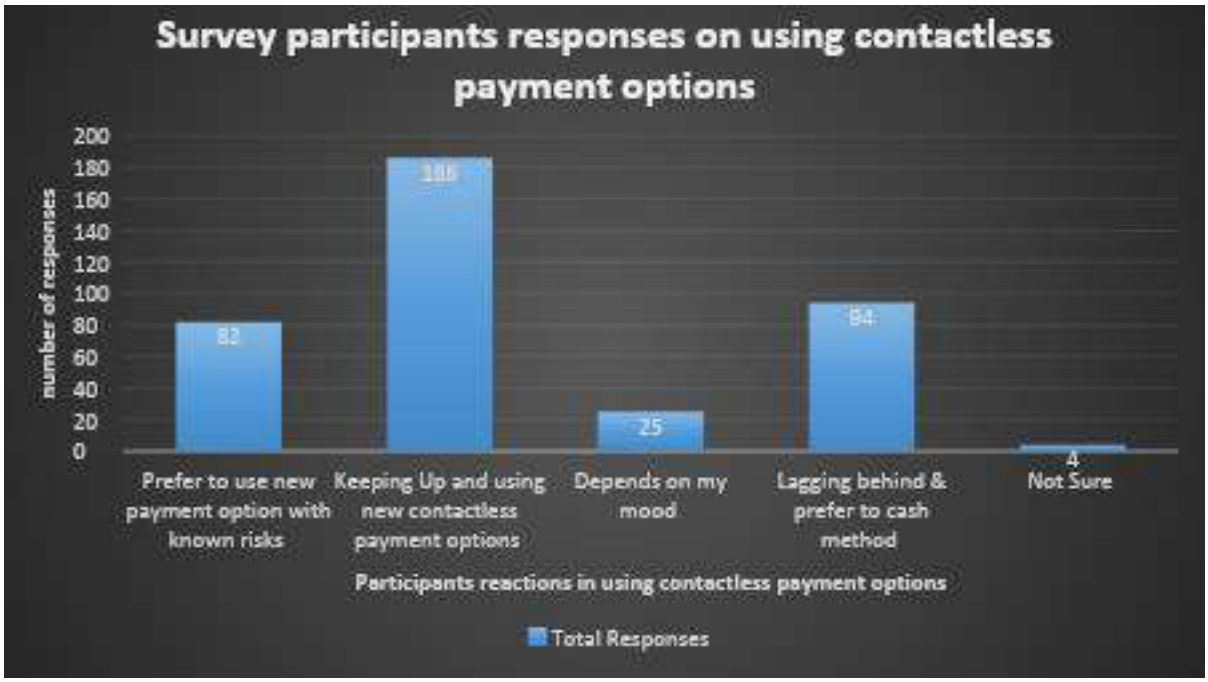


Figure 9: Survey participants' perspectives of using contactless payment options (Source: Author)

The data displayed in Table 5 are visually represented in Figure 9, illustrating consumers' perspectives on using contactless payment options. The majority (47.6%) reported staying up to date and actively using new contactless payment options. Meanwhile, 24.0% indicated that they lag behind in adopting contactless payment methods and prefer using cash, and 21.0% expressed a willingness to

use new contactless payment options despite being aware of the associated risks. Additionally, 6.4% of participants mentioned that their decision to use contactless payment options depends on their mood, and 1.0% were uncertain about using contactless payment methods for their purchases.

SQ 15 asked survey participants to describe their usage of contactless payment methods by selecting one statement from five provided options. The participants' responses are recorded in Table 6 and visually represented in Figure 10 as a bar graph.

Table 6: Participants perspective on using different modes of contactless payments (Source: Author)

Survey participantys perspective on contactless payment modes	Total Responses	% of Total	Cumulative %
I usually use when most the risks are known	54	13.8 %	13.8 %
I love new payment options and am among the first to experiment with and use them	88	22.5 %	36.3 %
I am sceptical and use them only when I have to	94	24.0 %	60.4 %
I am using this if i have no other options	88	22.5 %	82.9 %
I am not sure	13	3.3 %	86.2 %
I like to use them before most people I know	54	13.8 %	100.0 %
TOTAL RESPONSES	**391**		

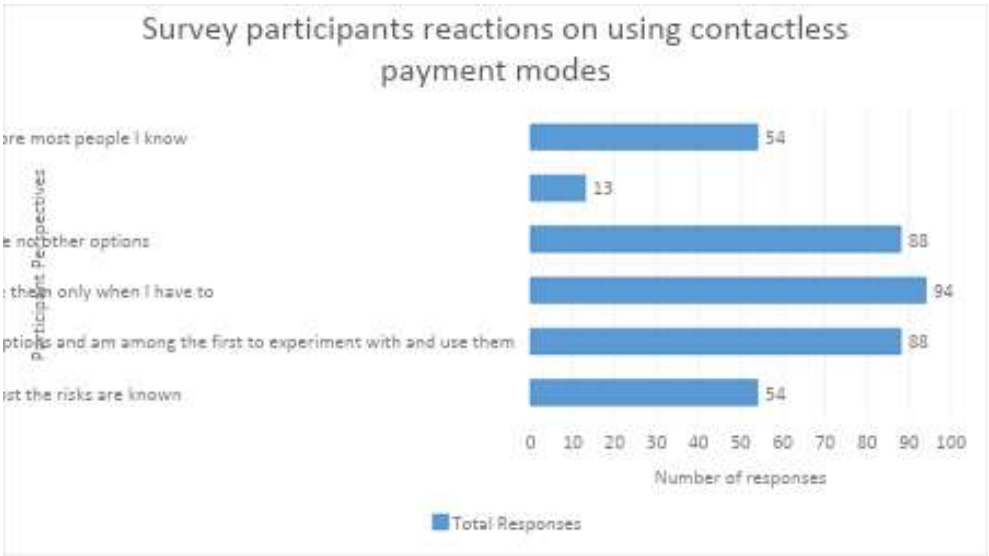


Figure 10: Survey responses of participants' perspectives on the use of different contactless payment modes (Source: Author)

The displayed information in **Table 6** and graphical representation in **Figure 10** demonstrate survey participants' perspectives on using contactless payment modes. The sample yielded a mixed reaction of responses from survey participants. Firstly, 24.0% were sceptical and will only use contactless payment modes if they have to. Secondly, two statements had a similar percentage of reactions from survey participants. The statements had different consumer options. In the first statement, 22.5% of respondents describe themselves as first among all to experiment and use contactless payment modes. While the second statement had 22.5% participants saying they will use contactless payment modes if they have no other options. Additionally, 13.8% said they would use contactless payment modes after the risks were identified. Furthermore, the next statement also had 13.8% of participants saying they used contactless payment modes before most people, and 3.3% of survey participants were not sure.

3.4 Correlation analysis

Aggarwal and Ranganathan (2016) discuss the importance of using correlation analysis to identify and understand the relationship between two variables. They highlight that correlation is a statistical tool used to analyse quantitative data. Similarly, this research employs correlation analysis to examine the relationship between variables. The Pearson correlation coefficient was calculated to test the significance of the relationship (Kaliyadan & Kulkarni, 2019).

3.4.1 Pearson correlation coefficient determination

The correlation coefficient measures the strength and direction of a linear relationship or correlation between two factors. Its value, denoted as *r*, ranges from -1.0 to +1.0, where +1 indicates a perfect positive linear relationship, -1 indicates a perfect negative linear relationship, and 0 indicates no linear relationship (Aggarwal & Ranganathan, 2016).

Additionally, Pearson correlation matrix analysis was conducted based on the variables associated with the research hypotheses to test for correlation significance. The survey questions (SQs) were designed to collect data reflecting the descriptions of the hypothesis variables. The following SQs and participants' feedback provide insights into the variables of this research hypothesis, as shown in Table 7.

Table 7: Displays information of SQ's that address variables in research hypothesis (Source: Author)

Number of Hypothesis	Research Hypothesis	Survey Questions			
H I	Innovators prefer to use PayWave transactions over traditional payment options.	SQ 3	SQ 5	SQ 7	
H 2	Early adopters in New Zealand populations are likely to be millennials that use contactless payment methods.	SQ 2	SQ 14	SQ 15	
H 3	The ease of using PayWave transactions has led to the adoption among the early majority.	SQ 7	SQ 14	SQ 15	
H 4	The Late Majority only adopt use of payWave payment methods after the risks are identified.	SQ 7	SQ 14	SQ 15	
H 5	Laggards prefer to use cash transaction payment methods rather than payWave transactions.	SQ 3	SQ 5	SQ 7	SQ 14

3.4.2 Results

Kwak (2023), mentions statistical hypotheses are applied to test and compare significance probability values and levels to decide whether to accept or reject null hypotheses, and he further elaborates that in most studies the significance level for p – value is 0.05. If p – value is less than 0.05 it is judged as statistically significant and if p – value is more than 0.05 it is judged as statistically not significant. However, the p- value changes depending on the type of the research and researcher's choice based on study parameters. In this research project, the p- value is 0.05 to test the significance level and test the null hypothesis.

3.5 Correlations matrix

H1 – Innovators prefer to use payWave transactions over traditional payment options.

Correlation Matrix

		Educational Level	Financial Situation	Payment Methods
Educational Level	Pearson's r	—		
	df	—		
	p-value	—		
	95% CI Upper	—		
	95% CI Lower	—		
	N	—		
Financial Situation	Pearson's r	0.061	—	
	df	389	—	
	p-value	0.229	—	
	95% CI Upper	0.159	—	
	95% CI Lower	-0.038	—	
	N	391	—	
Payment Methods	Pearson's r	0.146 **	-0.005	—
	df	386	386	—
	p-value	0.004	0.922	—
	95% CI Upper	0.242	0.095	—
	95% CI Lower	0.047	-0.104	—
	N	388	388	—

Note. * p < .05, ** p < .01, *** p < .001

Figure 11 Display of correlation matrix analysis in determining the relationship between SQ's and variable in H1 (Source: Author)

Data gathered through the correlation matrix in **Figure 11** is displayed in ***Table 8***.

Table 8: Displays data from correlation matrix analysis on H1 (Source: Author)

Research hypothesis	Survey questions	Pearson Coefficient - r	Lower Confidence Interval	Upper Confidence Interval	P- Value	Significant level 0.05
	SQ 3 - SQ 5	0.061	0.038	0.159	0.229	Not Significant
H 1	SQ 3 - SQ 7	0.146	0.047	0.242	0.004	Significant
	SQ 5 - SQ 7	-0.005	0.104	0.095	0.922	Not Significant

Firstly, the SQ's corresponding to the H 1 variable have been analysed using a correlation matrix in **Figure 11** and the data is displayed in **Table 8**. The SQ's on educational level and financial situation of survey participants yields a Pearson r value of 0.061, significance (F) or the *P* – value is > 0.229, and alpha value = 0.05. Thus, the correlation between these two variables is statistically not significant. Therefore, there is no significant relationship between the educational

level of survey participants and their financial situation and this fails to reject the null hypothesis. Secondly, the SQ's on participants' educational level and participants' recent purchase payment methods yields a Pearsons r value of 0.146, significance (F) or the *P* – value is < 0.004, and alpha value = 0.05. Thus, the correlations between these two variables are in fact statistically significant. Therefore, there is a significant positive relationship between the survey participants' education level that determines their payment methods, and the null hypothesis is rejected in favour of the alternative (p < 0.004). Thirdly, the SQ's on participants' financial situation and recent payment methods yields a Pearson r value of -0.005 and the *P* – value is > 0.922. The correlations are not statistically significant and fail to reject the null hypothesis. Therefore, there is no significant relationship between the two variables, and negative correlation r means that as the financial situation of survey participants improves there is a change in payment methods.

H2 – Early adopters in New Zealand populations are likely to be millennials that use contactless payment methods.

Correlation Matrix

		Age	Purchase payment options	payment mode
Age	Pearson's r	—		
	df	—		
	p-value	—		
	95% CI Upper	—		
	95% CI Lower	—		
	N	—		
Purchase payment options	Pearson's r	0.574 ***	—	
	df	389	—	
	p-value	< .001	—	
	95% CI Upper	0.637	—	
	95% CI Lower	0.503	—	
	N	391	—	
payment mode	Pearson's r	-0.403 ***	-0.284 ***	—
	df	389	389	—
	p-value	< .001	< .001	—
	95% CI Upper	-0.316	-0.191	—
	95% CI Lower	-0.483	-0.373	—
	N	391	391	—

Note. * p < .05, ** p < .01, *** p < .001

Figure 12: Display of correlation matrix analysis in determining the relationship between SQ's and variables in H2 (Source: Author)

Data gathered through the correlation matrix in **Figure 12** is displayed on Table 9.

Table 9: Displays data from correlation matrix analysis on H2 (Source: Author)

Research hypothesis	Survey questions	Pearson Coefficient - r	Lower Confidence Interval	Upper Confidence Interval	P- Value	Significant level 0.05
	SQ 2 - SQ 14	0.575	0.503	0.637	0.001	Significant
H 2	SQ 2 - SQ 15	-0.403	-0.483	-0.316	0.001	Significant
	SQ 14 - SQ 15	-0.284	-0.373	-0.191	0.01	Significant

Furthermore, the SQ's corresponding to the H 2 variable have been analysed using a correlation matrix in **Figure 12** and the data is displayed in **Table 9**. The SQ's on the age range of participants and purchase payment options yields a Pearson r value of 0.574, and significance (F), or the P – value is < 0.001. Thus, the correlation between these two variables is statistically significant. Therefore, there is a significant positive relationship between the age range of survey participants and their use of new contactless payment method options. In this case the null hypothesis is rejected in favour of the alternative. Secondly, the SQ's on participants' age range and contactless purchase payment modes yields a Pearson r value of -0.403, and significance (F), or the P – value is < 0.001. Thus, the correlation between these two variables is statistically significant. Therefore, there is a significant negative relationship between the survey participants' age range and their response to using new contactless payment modes, and the null hypothesis is rejected in favour of the alternative. The negative correlation signifies that as the age range increases, the survey participants prefer less usage of new contactless payment options (and vice versa). Thirdly, the SQ's on participants' purchase payment options and payment modes yields a Pearson r value of -0.0284 and P – value of < 0. 001. The correlations are statistically significant and the null hypothesis is rejected in favour of the alternative. Therefore, there is a significant negative relationship between the two variables, and a negative correlation value means the in-survey participants prefer to use new contactless payment options, the usage of new payment modes is observed to be decreasing (and vice versa).

H3 – The ease of using PayWave transactions has led to the adoption among the early majority.

H4 – The late majority only adopt use of payWave payment methods after the risks are identified.

Correlation Matrix

		Purchase payment options	payment mode	Payment Methods
Purchase payment options	Pearson's r	—		
	df	—		
	p-value	—		
	95% CI Upper	—		
	95% CI Lower	—		
	N	—		
payment mode	Pearson's r	-0.284 ***	—	
	df	389	—	
	p-value	< .001	—	
	95% CI Upper	-0.191	—	
	95% CI Lower	-0.373	—	
	N	391	—	
Payment Methods	Pearson's r	-0.342 ***	0.515 ***	—
	df	386	386	—
	p-value	< .001	< .001	—
	95% CI Upper	-0.251	0.585	—
	95% CI Lower	-0.427	0.438	—
	N	388	388	—

Note. * p < .05, ** p < .01, *** p < .001

Figure 13: Displays of correlation matrix analysis in determining the relationship between SQ's and variables in H 3 and H 4 (Source: Author)

Data gathered through the correlation matrix in **Figure *13*** is displayed on **Table *10***.

Table 10: Displays data from correlation matrix analysis on H 3 and H 4 (Source: Author)

Research hypothesis	Survey questions	Pearson Coefficient - r	Lower Confidence Interval	Upper Confidence Interval	P- Value	Significant level 0.05
	SQ 7 - SQ 14	-0.282	-0.373	-0.191	0.001	Significant
H 3 & H 4	SQ 7 - SQ 15	-0.342	-0.427	-0.251	0.001	Significant
	SQ 14 - SQ 15	0.515	0.438	0.585	0.001	Significant

Moreover, similar corresponding SQ's provide clarity for the H 3 and H 4 variables that have been analysed using a correlation matrix in **Figure 13**, and the data is displayed in **Table 10**. Moreover, the SQ's on contactless payment options and recent in-store purchase methods yield a Pearson r value of -0.342, and significance (F), or the *P* – value is < 0.001. Thus, the correlations between these two variables are in fact statistically significant. Therefore, there is a significant negative relationship between the survey participants' use of new contactless payments options and recently used payment methods for purchases. The null hypothesis is rejected in favour of the alternative. The negative correlation signifies the increase in survey participants' use of contactless payment methods for purchases, and the decrease in new contactless payment options (and vice versa). In addition, the SQ's on contactless payment modes and recent in-store purchase methods yields a Pearson *r* value of 0.515, and significance (F), or the *P* – value is < 0.001. Thus, the correlation between these two variables is in fact statistically significant. Therefore, there is a significant positive relationship between survey participants' use of contactless payment modes and recent purchase methods for in-store purchases. In this case the null hypothesis is rejected in favour of the alternative ($p < 0.001$).

H5 – Laggards prefer to use cash transaction payment methods rather than payWave transactions.

Correlation Matrix

		Educational Level	Purchase payment options
Educational Level	Pearson's r	—	
	df	—	
	p-value	—	
	95% CI Upper	—	
	95% CI Lower	—	
	N	—	
Purchase payment options	Pearson's r	-0.293 ***	—
	df	389	—
	p-value	< .001	—
	95% CI Upper	-0.200	—
	95% CI Lower	-0.381	—
	N	391	—

Note. * p < .05, ** p < .01, *** p < .001

Figure 14 Displays of correlation matrix analysis in determining the relationship between SQ's and variables in H5 (Source: Author)

Table 11: Displays data from correlation matrix analysis on H5

(Source: Author)

Research hypothesis	Survey questions	Pearson Coefficient - r	Lower Confidence Interval	Upper Confidence Interval	P- Value	Significant level 0.05
	SQ 3 - SQ 5	0.061	0.038	0.159	0.229	Not Significant
	SQ 3 - SQ 7	0.146	0.047	0.242	0.004	Significant
H 5	SQ 3 - SQ 14	-0.293	-0.381	-0.2	0.001	Significant
	SQ 5 - SQ 7	-0.005	0.104	0.095	0.922	Significant
	SQ 5 - SQ14	0.129	0.031	0.226	0.01	Significant
	SQ 7 - SQ 14	-0.342	-0.427	-0.251	0.001	Significant

Furthermore, the SQ's corresponding to the H 5 variable have been analysed using a correlation matrix **Figure *14***. The data is further displayed in **Table 11**. Similarly, SQ's on contactless payment options – contactless payment mode used to explain the relationship with H5 variables has already been explained in H 2's explanations. Additionally, the SQ's on participants' educational level and contactless payment options yields a Pearson r value of -0.293, and significance (F), or the *P* – value is < 0.001. Thus, the correlations between these two variables are statistically significant. Therefore, there is a significant negative relationship between the survey participants' educational level and the usage of new contactless payment options for purchases. The null hypothesis is rejected in favour of the alternative. The negative correlation signifies the increase in survey participants' educational level, decrease in new contactless payment options (and vice versa). Furthermore, **Figure 15** displays a correlation matrix analysis between SQ's financial situation and contactless payment options in relation to the H 5 variable.

Correlation Matrix

		Financial Situation	Purchase payment options
Financial Situation	Pearson's r	—	
	df	—	
	p-value	—	
	95% CI Upper	—	
	95% CI Lower	—	
	N	—	
Purchase payment options	Pearson's r	0.129 *	—
	df	389	—
	p-value	0.010	—
	95% CI Upper	0.226	—
	95% CI Lower	0.031	—
	N	391	—

Note. * p < .05, ** p < .01, *** p < .001

Figure 15: Display of correlation matrix analysis in determining the relationship between SQ and variable in H5 (Source: Author)

Additionally, SQ's on participants' financial situation and contactless payment options yields a Pearson r value of 0.129, and significance (F), or the *P* – value is < 0.010. Thus, the correlation between these two variables is statistically significant. Therefore, there is a significant positive relationship between survey participants' financial situation that determines the use of new purchase payment options. In this case the null hypothesis is rejected in favour of the alternative.

Lastly, the **Table 12** displays correlation matrix details of SQ 3 – SQ 5, SQ 3 – SQ 7, SQ 5 – SQ 7, and SQ 7 – SQ 14 about the findings that have already been discussed in H1, H2, and H3 written explanations.

Table 12: Display of Correlation matrix details of H5 variable (Source: Author)

Research hypothesis	Survey questions	Pearson Coefficient - r	Variables Directions	Lower Confidence Interval	Upper Confidence Interval	P- Value	Significant level 0.05	Accept & Reject Hypothesis
H1	SQ 3 - SQ 5	0.061	Posistive	0.038	0.159	0.229	Not Significant	Accept the null hypothesis
H1	SQ 3 - SQ 7	0.146	Posistive	0.047	0.242	0.004	Significant	Reject the null hypothesis
H2	SQ 5 - SQ 7	-0.005	Negative	0.104	0.095	0.922	Significant	Accept the null hypothesis
H3 & H4	SQ 7 - SQ 14	-0.342	Negative	-0.427	-0.251	0.001	Significant	Reject the null hypothesis

4. DISCUSSIONS AND RECOMMENDATIONS

4.1 Discussion on research questions and research objectives

Using Rogers' diffusion of innovation theory, the study found that 86.7% of survey participants preferred contactless payment methods for in-store purchases, with Visa payWave being the most popular (70.1%). A significant proportion (42.6%) began using contactless payments during the COVID-19 pandemic (Lin et al., 2023).

Survey participants demonstrated a strong awareness of the benefits of contactless payments, with 50.1% strongly agreeing and 33.8% agreeing that they are faster. This aligns with Szumski's (2022) findings. Additionally, 53.8% strongly agreed and 34.6% agreed that contactless payments are easy to use, supporting Lin et al.'s (2023) assertion that perceived usefulness and ease of use influence consumer behaviour.

The majority of participants (44.1%) indicated that they will continue to use contactless payments in the future, confirming the answer to RQ3. Regarding RQ2, 74.4% were aware of the risks associated with contactless payments, while 16.1% and 9.5% were not aware or unsure. This highlights the need for continued education and awareness campaigns to mitigate risks (Bukvic, 2021).

RQ1 was addressed through the analysis of participants' age groups and their usage of contactless payments. The results indicate that younger generations (Gen Z and Millennials) were more likely to adopt contactless payments compared to older generations (Gen X, Boomers I, and Boomers II). This aligns with the S-shaped diffusion curve, where early adopters and early majority groups tend to embrace new technologies more quickly.

Overall, the findings of this study provide valuable insights into the adoption and usage of contactless payment methods in New Zealand. By understanding the factors influencing consumer behaviour and identifying areas for improvement, policymakers, financial institutions, and retailers can work together to promote the widespread adoption of secure and convenient digital payment solutions.

4.2 Discussion of acceptance and rejection of the research hypotheses

The five research hypotheses were created using the assumptions of Rogers' diffusion theory to understand the usage and adoptions of payWave payment methods among the New Zealand population in 2023. The research hypotheses were clearly and precisely outlined in the research to understand the relationship between the independent and dependent variables. However, there was not any single SQ that independently described the relations and impact on any single hypothesis variable. Furthermore, a corresponding SQ **Table 7** was created to

analyse the relationship between variables in order to accept or reject the research hypotheses.

In this survey the Pearson correlation coefficient was determined and null hypothesis significance was tested with alpha of 0.05. Table **13** outlines the overall acceptance and rejection survey.

Table 13: Overall acceptance or rejection of survey hypothesis (Source: Author)

Research hypothesis	Survey questions	Pearson Coefficient	P- Value	Significant level 0.05	Accept / Reject hypothesis	Overall acceptance and rejections of survey hypothesis
	SQ 3 - SQ 5	0.061	0.159	Not Significant	Accept the null hypothesis	
H 1	SQ 3 - SQ 7	0.146	0.004	Significant	Reject the null hypothesis	Overall hypothesis 1 is rejected
	SQ 5 - SQ 7	-0.005	0.095	Not Significant	Accept the null hypothesis	
	SQ 2 - SQ 14	0.575	0.001	Significant	Reject the null hypothesis	
H 2	SQ 2 - SQ 14	-0.403	0.001	Significant	Reject the null hypothesis	Overall hypothesis 2 is accepted
	SQ 14 - SQ 15	-0.284	0.01	Significant	Reject the null hypothesis	
	SQ 7 - SQ 14	-0.282	0.001	Significant	Reject the null hypothesis	
H 3	SQ 7 - SQ 15	-0.342	0.001	Significant	Reject the null hypothesis	Overall hypothesis 3 is accepted
	SQ 14 - SQ 15	0.515	0.001	Significant	Reject the null hypothesis	
	SQ 7 - SQ 14	-0.282	0.001	Significant	Reject the null hypothesis	
H 4	SQ 7 - SQ 15	-0.342	0.001	Significant	Reject the null hypothesis	Overall hypothesis 4 is accepted
	SQ 14 - SQ 15	0.515	0.001	Significant	Reject the null hypothesis	
	SQ 5 - SQ 7	0.061	0.229	Not Significant	Accept the null hypothesis	
H 5	SQ 5 - SQ 14	0.146	0.004	Significant	Reject the null hypothesis	
	SQ 5 - SQ 15	0.005	0.922	Not Significant	Accept the null hypothesis	Overall hypothesis 5 is accepted
	SQ 7 - SQ 14	-0.284	0.001	Significant	Reject the null hypothesis	
	SQ 7 - SQ 15	-0.293	0.001	Significant	Reject the null hypothesis	
	SQ 14 - SQ 15	0.129	0.01	Significant	Reject the null hypothesis	

Furthermore, H 1 was rejected because the corresponding SQ's showed no significant evidence for the relationship between the variables during the testing of H 1. Secondly, H2 was accepted, as the majority of contactless transaction users identified in Appendix section are millennials 31.70%, and there is significant evidence between the corresponding SQ's in accepting H2. Additionally, hypotheses H3, H4, and H5 were all accepted based on the significance level. Ample evidence supporting these hypotheses was found through the analysis of corresponding survey questions and data presented in Section 4.

4.3 Research limitations

Ross and Zaidi (2019) discuss in their journal article that study limitations highlight weaknesses within a research design that could potentially influence the

research outcomes and conclusions. The limitations presented by the authors provide insight into challenges encountered during the research process that require attention (Drotar, 2008). In alignment with this perspective, the researcher of this applied project acknowledged and discussed the limitations encountered to ensure that future studies on this topic are aware of the shortcomings in the selected methods and theories.

The key limitation was the time constraint of completing the research within 16 weeks. This restricted time frame limited the depth of understanding regarding the diffusion and adoption of payWave payment methods. A longitudinal study design, with data collected repeatedly over time from the survey sample, would have been more effective in providing a comprehensive understanding of these phenomena among New Zealand populations. Nevertheless, the chosen research design for this applied project is justified, as it successfully addressed the objectives and research questions discussed in Section 5.2.

4.4 Shortcomings of Rogers' Diffusion of Innovation Theory

Additionally, the application of Rogers' diffusion theory presented certain limitations when the researcher sought to understand the diffusion of the payWave method among the New Zealand population in 2023. For example, to analyse the timeline of contactless payment usage in SQ 11, the years considered ranged from 2010 to 2023. This posed a challenge because the period between 2019 and 2022 coincided with the COVID-19 pandemic, a crisis that contradicts Rogers' diffusion model, which asserts that the diffusion or adoption of products and services occurs under stable conditions and in the absence of emergencies or crises. Consequently, it is difficult to accurately identify the factors that influenced, inspired, or motivated the adoption and diffusion of payWave payment methods among New Zealanders in 2023.

4.5 Future studies

Future studies could investigate the shortfalls and limitations of the current research topic, as highlighted in Section 5.4. For instance, Rogers' diffusion theory explains technological or product diffusion and adoption provided the diffusion occurs under stable conditions, free from emergencies or crises. Researchers need to account for these parameters to fully justify the findings in future studies on similar topics or any other subject related to technology and product diffusion.

Additionally, concerning the first limitation identified in the current research, future studies should integrate Rogers' diffusion theory with the Technology Acceptance Model (TAM) to provide a comprehensive justification for the

adoption of payWave payment methods and other technologies along an S-curve of adoption. Such research could contribute to identifying specific demographics, strategies, and usage patterns related to launching, managing, and defining the success rate of consumption, diffusion, and adoption among wider populations for various products and innovations.

The second limitation of the current study pertained to the use of a cross-sectional research design. Future research on similar topics or other studies related to technology and product diffusion should consider using a longitudinal research design. A longitudinal approach would eliminate the time constraints associated with data collection and allow researchers to gain a deeper understanding of the dynamics of the phenomena under investigation. Moreover, it would enable a detailed explanation of the events and conditions that influence product diffusion and adoption among larger populations.

Finally, the third limitation identified was the survey participants' reluctance to respond with extreme answers on the Likert scale. Future studies on similar topics or other technology and product diffusion research should incorporate open-ended questions. Open-ended questions are not limited by predefined answer options, allowing participants to express their thoughts freely and in their own terms. Such an approach could help identify participants' motivations and the factors influencing their adoption decisions.

4.6 Recommendations

The survey data reveals that the greater adoption of payWave payment methods occurred between 2018 and 2022, during the global COVID-19 pandemic, including in New Zealand. This is concerning, as the diffusion of these methods, based on Rogers' theory, did not occur under stable conditions. Consequently, there is a significant risk of New Zealand consumers reverting to traditional payment methods for their purchases.

For instance, SQ 2, which assessed participants' age ranges, analysed alongside SQ 8's results on preferences for using contactless payments, showed that only 3.4% of the older generation (61 years and above) preferred contactless payment methods. This is alarming, as it indicates a higher likelihood of the older New Zealand population reverting to traditional payment methods. Therefore, the researcher recommends that the Ministry of Business, Innovation, and Employment (MBIE) consider these findings and design awareness and educational programs to emphasize the importance and benefits of using contactless payment methods. This would support the New Zealand government's commitment to its digitalization and transformation plans.

Furthermore, the study highlights weaknesses in the current literature regarding the global perspective on consumer adoption of contactless payment methods compared to traditional methods. Using this research's findings and approach as a guide, the researcher recommends that contactless payment service providers address the identified issues and benefits. This would enable them to successfully launch their products in new locations and encourage broader consumer adoption.

5. CONCLUSIONS

In summary, the greater adoption and diffusion of payWave payment methods for purchases was observed between 2018 and 2022, during the COVID-19 pandemic. The research findings and data analysis process successfully achieved the applied project's objectives, including describing the demographic profile of users of contactless payment methods and identifying the use of payWave payment methods among the New Zealand population in 2023. Additionally, the findings highlighted those who have not reverted to traditional payment methods.

VISA payWave was identified as the most popular contactless payment method among the New Zealand population in 2023. Furthermore, 74.4% of survey participants were aware of the risks associated with using contactless payment methods. Contactless payment methods emerged as the most preferred payment option in New Zealand, with 44.1% of survey participants indicating they always use this method, and 33.7% stating they often use contactless payment methods for their transactions. These findings effectively addressed the research questions, with three research questions and four hypotheses being accepted, while one hypothesis was rejected.

The study also identified limitations in the survey methods during the presentation of the research design. However, the selected cross-sectional research design was deemed the most suitable for the research topic based on its requirements. Ethical considerations were thoroughly addressed in the research design and during the collection of survey data. The researcher ensured that the questionnaires did not collect personal information or offend cultural sentiments of New Zealand's indigenous people or any religious beliefs.

The researcher faced challenges in selecting appropriate theories to address the objectives, research questions, and hypotheses. After a careful review of relevant literature, Rogers' diffusion theory was chosen for the study. If the diffusion of payWave payment methods in New Zealand had occurred under stable conditions, the survey findings might have provided stronger empirical justifications for a larger population.

6. REFERENCES

Aggarwal, R., & Ranganathan, P. (2016). Common pitfalls in statistical analysis: The use of correlation techniques. *Perspectives in Clinical Research*, *7*(4), 187. https://doi.org/10.4103/2229-3485.192046

Anaza, N. A., Bennett, D. H. S., Andonova, Y., & Anaza, E. (2022). DPS 2.0: on the road to a cashless society. *Marketing Letters*, *33*(4), 693–704. https://doi.org/10.1007/s11002-022-09641-8

Asia Pacific Infrastructure. (2017, June 16). *New Zealand is too slow to embrace technology*. 2020 Media Solutions Ltd. https://www.infrastructurenews.co.nz/new-zealand-too-slow-to-embrace-technology/

Bagnall, J., Bounie, D., Huynh, K. P., Kosse, A., Schmidt, T., Schuh, S., & Stix, H. (2016). *Consumer Cash Usage: A Cross-Country Comparison with Payment Diary Survey Data *.* https://www.ijcb.org/journal/ijcb16q4a1.htm

Briscoe, E., Trewhitt, E., & Hutto, C. J. (2015). *Closing the Micro-Macro Divide in Modelling Technology Adoption*. https://www.researchgate.net/publication/264892963

Bukvic, I. B. (2021). Adoption of online payments during the covid-19 pandemic. In *74 th International Scientific Conference on Economic and Social Development-Lisbon*. 65(1). 10.1016/j.jretconser.2022.102838

Central Bank, E. (2020). *Study on the payment attitudes of consumers in the euro area (SPACE)*. https://doi.org/10.2866/849151

Drotar, D. (2008). Editorial: Thoughts on Establishing Research Significance and Preserving Scientific Integrity. *Journal of Paediatric Psychology*, *33*(1), 1–5. https://doi.org/10.1093/jpepsy/jsm092

Gawior, B., Polasik, M., & Lluís Del Olmo, J. (2022). Credit Card Use, Hedonic Motivations, and Impulse Buying Behaviour in Fast Fashion Physical Stores during COVID-19: The Sustainability Paradox. *Sustainability (Switzerland)*, *14*(7). https://doi.org/10.3390/su14074133

Jamil, A. H., Mohd Sanusi, Z., Yaacob, N. M., Mat Isa, Y., & Tarjo, T. (2022). The Covid-19 impact on financial crime and regulatory compliance in Malaysia. *Journal of Financial Crime*, *29*(2), 491–505. https://doi.org/10.1108/JFC-05-2021-0107

Kaliyadan, F., & Kulkarni, V. (2019). Types of variables, descriptive statistics, and sample size. *Indian Dermatology Online Journal*, *10*(1), 82–86. https://doi.org/10.4103/idoj.IDOJ_468_18

Khando, K., ISLAM, S., & Gao, S. (2022). *Factors shaping the cashless payment ecosystem: Understanding the role of participating actors.* 35th E-Conference Digital Restructuring and Human (Re)Action Maribor. https://doi.org/10.18690/um.fov.4.2022

Kijek, T. (2015). Modelling of eco-innovation diffusion: The EU eco-label. *Comparative Economic Research*, *18*(1), 65–79. https://doi.org/10.1515/cer-2015-0004

Kwak, S. (2023). Are Only p-Values Less Than 0.05 Significant? A p-Value Greater Than 0.05 Is Also Significant! *Journal of Lipid and Atherosclerosis*, *12*(2), 89–95. https://doi.org/10.12997/jla.2023.12.2.89

Landauer, R., & Swanson, J. (1953). Diffusion Currents in the Semiconductor Hall Effect. *Physical Review*, *91*(3), 555–560. https://doi.org/10.1103/PhysRev.91.555

Lin, L. H., Lin, F. C., Lien, C. K., Yang, T. C., Chuang, Y. K., & Hsu, Y. W. (2023). Electronic payment behaviour of consumers under digital transformation in finance—A Case Study of Third-Party Payments. *Journal of Risk and Financial Management*, *16*(8). https://doi.org/10.3390/jrfm16080346

Lippi, F., & Secchi, A. (2009). Technological change and the households' demand for currency. *Journal of Monetary Economics*, *56*(2), 222–230. https://doi.org/10.1016/j.jmoneco.2008.11.001

Mansour, H. (2022). How successful countries are in promoting digital transactions during COVID-19. *Journal of Economic Studies*, *49*(3), 435–452. https://doi.org/10.1108/JES-10-2020-0489

Mat Aripin, A., & Brougham, D. (2023). COVID-19 and disruptive technology in New Zealand. *Journal of Asian Business and Economic Studies*. https://doi.org/10.1108/JABES-12-2022-0311

Mui, D., Kee, H., Nuha, N., Hisam, B. N., Binti, N. H., Rashid, A., Sobbah, N., Aziz, B. A., Aqilah, N., Mazlan, B., Aimi, N., & Mahadi, Z. B. (2021). *The Impact of Using Cashless Payment during the Covid-19 Pandemic: A Case Study of Maybank*. *4*(2). https://www.maybank.com

New Zealand Government. (2023, May 18). *National population estimates: At 31 March 2023*. All Material Stats NZ Produces Is Protected by Crown Copyright. https://www.stats.govt.nz/information-releases/national-population-estimates-at-31-march-2023/

New Zealand Immigration. (2022, July 14). *A brief history*. Copyright 2023 New Zealand Government. https://www.live-

work.immigration.govt.nz/live-in-new-zealand/history-government/a-brief-history

Nguyen, T., & Watson, B. (2022). *Consumer Payment Behaviour in Australia*. https://www.rba.gov.au/publications/bulletin/2023/jun/pdf/consumer-payment-behaviour-in-australia.pdf

Polasik, M., Górka, J., Wilczewski, G., Kunkowski, J., Przenajkowska, K., & Tetkowska, N. (2022a). *Correction to: Time Efficiency of Point-of-Sale Payment Methods: Empirical Results for Cash, Cards and Mobile Payments* (pp. C1–C1). https://doi.org/10.1007/978-3-642-40654-6_29

Polasik, M., Górka, J., Wilczewski, G., Kunkowski, J., Przenajkowska, K., & Tetkowska, N. (2022b). Correction to: Time Efficiency of Point-of-Sale Payment Methods: Empirical Results for Cash, Cards and Mobile Payments. In *Enterprise Information Systems* (Vol. 141, pp. 306–320). https://doi.org/10.1007/978-3-642-40654-6_29

Reserve Bank of New Zealand. (2023b, April 20). *Why are we looking at the future of money?* Copyright 2023 Reserve Bank of New Zealand. https://www.rbnz.govt.nz/money-and-cash/future-of-money/why

Ross, P. T., & Zaidi, N. L. B. (2019). Limited by our limitations. *Perspectives on Medical Education*, *8*(4), 261–264. https://doi.org/10.1007/S40037-019-00530-X

Sahin, I. (2006). Detail review of Rogers' Diffusion of innovations theory and educational technology related studies based on Rogers' theory. In *The Turkish Online Journal of Educational Technology* (Vol. 5). https://eric.ed.gov/?id=EJ1102473

Srouji, J. S. (2020). *Digital Payments, the Cashless Economy, and Financial Inclusion in the United Arab Emirates: Why Is Everyone Still Transacting in Cash?* https://doi.org/10.3390/jrfm13110260ï

Szumski, O. (2022). Comparative analyses of digital payment methods from the pre and post COVID-19 perspective. *Procedia Computer Science*, *207*, 4660–4669. https://doi.org/10.1016/j.procs.2022.09.530

Thirupathi, M., Vinayagamoorthi, G., & Mathiraj, S. (2019). Effect Of Cashless Payment Methods: A Case Study Perspective Analysis. *International Journal of Scientific & Technology Research*, *8*, 8. www.ijstr.org

Trütsch, T. (2020). The impact of contactless payment on cash usage at an early stage of diffusion. *Swiss Journal of Economics and Statistics*, *156*(1). https://doi.org/10.1186/s41937-020-00050-0

Ul, B., Khan, I., Olanrewaju, R. F., Mehraj Baba, A., Langoo, A. A., & Assad, S. (2017). A Compendious Study of Online Payment Systems: Past Developments, Present Impact, and Future Considerations. In *IJACSA) International Journal of Advanced Computer Science and Applications* (Vol. 8, Issue 5). www.ijacsa.thesai.org

Venkatesh, V., Thong, J. Y. L., & Xu, X. (2016). Unified theory of acceptance and use of technology: A synthesis and the road ahead. *Journal of the Association for Information Systems*, *17*(5), 328–376. https://doi.org/10.17705/1jais.00428