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Introduction

The six papers in this edition of the ICL Journal offer a fine range of topic and substance, but what links them all is that they are grounded in real and current issues which have everyday relevance to us. This is the beauty of ICL's research; that it doesn't have to be remote as if delivered from an ivory tower. It can present, and demonstrably does here, accessible and readable essays on topics, most of which will interest most of us. Our researchers, seven of our staff and five of our students, have delivered practical insight to a diversity of ICL activity.

Early Childhood Education has enjoyed a surging renaissance with the launch of our Graduate Diploma in Teaching (ECE), and it is timely to mark this with a thoughtful analysis of the impact of ICT on the various stakeholders in the ECE setting. As we might expect, it is not all one way.

It is fitting that members of our research team look at climate change, the prominent challenge of our times, but it is a refreshing angle to compare and contrast what are apparently diverging media treatments of the topic. Perhaps it is no surprise that self-interest drives policy, but it is a concern when the stakes are so high.

And an ICL Journal in 2022 would not be complete without a reflection on Covid-19. But this paper is more than a little surprising in that it narrates an increase in the value of the top five US companies during the progress of the pandemic. There are always winners during hard times.

Again, our focus is offshore in a paper on information security management in China. A core element of our Master of Business Informatics is information security awareness, and this paper places it in the context of a fast-growing Chinese enterprise, learning through strategy and trial and error.

Back home, there is nothing more topical in our materialistic society than house prices, especially in Auckland. There will always be room for more analyses, but this one is particularly neat in that is uses information analysis to predict price change. The results may not make us all millionaires, but there are some useful insights.

Finally, back in the international setting, this time that of social media, we have a fine paper on how advertising on one of the major platforms, Instagram, affects users' attitudes and purchasing decisions. We wonder whether we might also be impacted, and how susceptible we are to influencers. There is room for a lot more research into this topic!

Ewen Mackenzie-Bowie
Chairman
ICL Education Group

The Impact of Information and Communication Technology on Early Childhood Education

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Abstract

This research describes participants' perceptions, knowledge, understanding and experiences of the impact of information and communication technology [ICT] in early childhood education in Aotearoa New Zealand. Three early childhood educational contexts within a town in Aotearoa New Zealand were the context for this study. Drawing on a mixed methods approach, and underpinned by a positivist and a interpretivist framework, the survey method was used for a sample size of 70 adults. Semi-structured interviews occurred with six adults. The quantitative data was analysed with SPSS while the qualitative data was analysed through thematic analysis. Findings revealed ICT has an influence on the development of young children's learning within the early childhood education context. From grandparents' perspectives, ICT seemed to have a negative effect on children's learning. For teachers and administration staff, further understanding of technological literacies was necessary. The strategies employed that position adults as key supporters in enhancing teaching and learning for ICT were central to this study. This research sets a platform for business and ICT research within the current COVID-19 era.

Key words: early childhood education, business, ICT, knowledge, perceptions.

Introduction

This research notes an interest that I have experienced in the context of Aotearoa during this COVID-19 era 2021. Informatics technology and business knowledge and understanding has always been a directive for me in my career choices. It is apt that this topic of information communication technology [ICT] supports my learning journey within education, early childhood education [ECE] and future directives for tomorrow as an ECE educator.

The role of technological literacies is embedded in the global society and improve methods of children's learning and development process and childcare by providing sophisticated understanding of the design, theory, philosophy and analysis of quantitative data in the process of research, as asserted by Dong et al. (2020). Dong (2018), states the logical consideration of research explores the behaviour of children, their interaction with technological updates in early children's learning and development processes. The deductive approach highlights the common areas of differences between the boys and girls along with attitudes using computers and other technology during learning. This approach delivers the degree to which computers can promote or inhibit children's collaboration with use of computers in comparison to other children's behavioural approaches towards activities and play during learning. As proposed by Nikolopoulou et al. (2019), the research methodology in this study seeks to find out about ICT in supporting the interaction of children for creating a collaborative environment.

Early Childhood Education in Aotearoa New Zealand

The need for teachers, parents and grandparents to articulate their understandings of ICT, is perhaps to some extent influenced by their personal experiences of ICT presented to them in their daily lives and for teachers in their initial teacher education program training. Within Aotearoa New Zealand, policies for Early Childhood Education (ECE) advocate access to quality education and care, and that all "children have access to all types of ECE services" (Ministry of Education, 2017, p.13) is high on the agenda of the government's education policies aspirations. ICT in this study is viewed as one avenue by which such policies can be fulfilled. With the ECE curriculum, Te Whariki in Aotearoa New Zealand being a bicultural document, the importance of Te Tiriti o Waitangi is paramount to consider when doing business and education within inter-disciplinary research. Te Whariki notes the importance of Te Tiriti o Waitangi principles (Ministry of Education, 2017; 2007).

Early Childhood Education is a context that provides education and care for children from infants and toddlers (6 mths – 2 yrs) to young children (3yrs –5 yrs) before they attend primary school and is not compulsory. Within Aotearoa New Zealand most children (95%) attend some form of ECE environment during the week usually for 20 – 22 hours per week. For 3 and 4 year-olds, the first 20 hours per week is government fully funded (newzealandnow.govt.nz, 2021). Due to no term breaks within the ECE system, most ECE centres operate through the school holidays. The national curriculum and policies (ECE regulations) are set to ensure that environments are maintained in every ECE centre. Teachers must be registered to teach nationally and internationally.

Te Whariki (woven mat) is the ECE curriculum document which aims to build on children's interests and abilities, provide space for children to learn and experience new things and help children to be ready to transition to the primary school system. There are 5,000 childcare and pre-school facilities nationally in Aotearoa New Zealand. These are outlined into two main groups of teacher-led services where 50% of the supervising adults must be qualified and registered as ECE teachers. They include kindergartens, education and care services; home-based services and Te Kura (the Correspondence School playgrounds); Te Kohanga Reo (centres that cater for young children in a Maori cultural environment where Te Reo is used); Puna kohungahunga (Maori) total immersion contexts with some bilingual use; Pasifika focused centres (Aoga Amata, Ako Teu) Tongan centres; and Punanga Reo (Cook Island centres). The second is parent-led, where parents and family or caregivers are the educators for their children. These include Playcentres and Playgroups. All centres must be licensed in compliance with the Ministry of Education criteria (Ministry of Education, 2017).

Information and Communication Technologies are considered a broader term or approach to Information Technology [IT] referring to all technologies regarding communication, including social networking, media applications, video conferencing, software middleware. ICT is a broad term for children's learning and development processes with the use of modern technology like satellite systems, software applications, television and other media. The learning of children can be enhanced with interaction where children can express their thoughts with live implementations. E-learning technology enables children's learning and the development process through distance learning (Jager & Lokman, 1999). For example, using computers, digital cameras, videos, mobile phones, online classes, programmable toys and online games helps to build the skills of young children and has transformed children's learning and development processes from teacher centric to children centric.

The primary objective of this research is:

- To determine the quality and influence of information and communications technology in early children's learning in ECE contexts
- To understand the necessity for the educators and administration to understand the concept of ICT
- To identify the multifunctional effects of ICT that can positively frame the behaviour of children

Research Questions

What is the role of Information and Communications Technology in children's learning and development processes?

- How can ICT influence children's learning and development processes?
- Why is it necessary for educators and administration of children's learning and development process institutions to understand the concept of ICT?
- Can ICT positively affect the behaviour of children during their young days?

This research sought to investigate the perceptions and understandings of adults, teachers, grandparents and parents about the role of ICT in looking at children's developing understanding of ICT. The issue of children's and adults' conceptions of technology (and ICT as a whole) is seen as important by technology educators (Mawson, 2008; Ministry of Education, 2007b). As technological literacies are an important aspect of the curriculum transitioning from ECE settings into primary school contexts, it is essential to find out the role of ICT has within the early learning context. Four centres in Hamilton, Aotearoa New Zealand were sampled for this research.

Literature Review

A developing educational plan progresses when researching what is socially applicable, mentally captivating, and important to children. In this model, adults and children collaboratively make decisions. This is what draws in children and what adults see as indispensable for students' schooling and improvement. It is constantly open to new possibilities that were not considered during the basic orchestrating measure. This unites interests of learners and responds to redirections as opposed to focusing on close, singular points (Tinio, 2002). ICT is considered a significant part of the children's world at present. In this digital era, technology is involved in the early development of children. Technology can effectively help children during play by setting up activities that develop different skills and abilities children need in their lives (Hikmah, Koeswantono & Fridani 2019). There are multifunctional effects regarding ICTs that can positively impact children's behaviour.

Teachers need to consider decisions regarding the extent and the nature of ICT necessary to be implemented in the learning environment (Akpan, 2016). Such decisions are influenced by various factors that include individual level of confidence members of administration and educators have with ICT along with their beliefs and values about teaching and learning in the early years. A range of literature contends that implementing effective professional development for both the educators and administration staff of an institution would help in developing an in-depth understanding of the nature, extent, and importance of the use of ICT in the learning environment (Dong, 2018; Mawson, 2003).

Educators and the administration would be able to question and analyze potential possibilities of how systems may be actioned differently to provide a holistic experience for both the children and teachers. Smart computerization of the administration system would help in sharing and managing information about children. Other necessary details, both internal and external, of the children's learning and development processes are also central (Akpan 2016; Mawson, 2003). An example is, smart computerization of systems would make it easier for administration to store important information, produce everyday reports, and do other necessary tasks to support in streamlining administrative operations. Therefore, with necessary children's learning and development about ICT, this enables administration to be able to establish common goals and connections to assist transfer of data within the ECE spaces to facilitate children's learning and development.

Adaptive ICTs can also be used in school settings to help reduce barriers that children with special learning and physical requirements experience during participation. By implementing ICT, educators are being able to scaffold diverse children, supporting learning (Aksenova 2018). ICT acknowledges different skills, prior knowledge, confidence, interests that children may have with experience that they can relate to. This recognizes that all children learn differently and have diverse learning requirements. ICT recognizes all children so it can be used for tailoring learning environments to match the IQs of children to develop holistically (Tondeur, Forkos, Prestridge, Albion & Edirisinghe, 2016). ICT can also be used for improving motivation of the learning environment. The attention span of a child consistently increases when the learning environment is enhanced with animation, sounds, and pictures. ICT can implement interactive commercial software into children's learning and development processes that can increase the attention span of children from three minutes to more than fifteen minutes (Chen, Lin & Liu 2019). This includes children with high to mild learning difficulties.

Fallahi (2011) studied the effect of ICT on the behaviour of youth and children in Iran from utilizing social media. Children developed with using ICT in their daily routine are suffering from social isolation. This study poses that there are both positive and negative impacts of ICT behaviour. Utilization of ICT in early years can help in improving knowledge and information. This availability of information makes children addicted to technological devices at a young age resulting in negative effects. Information and computerized technology are only significant when used wisely.

UNESCO (2020) highlighted the physical and mental issues related to ICT utilization in children's development. Education and children's development are transformed rapidly with the introduction of technology and internet. This research reported gaps in various contexts such as gender issues in ICT access, improper utilization of technological devices which are used more for improving socialization rather than educational perspectives. A digital policy and regulations in using ICT for educational purposes for effective results is needed. PC use among children has risen consistently thus creating worries over its negative impacts on social development. Concerns focus on the replacement of genuine relational cooperation with friends and guardians with virtual ones. PC users' relocation of time from "formatively praiseworthy" exercises (e.g., sports and social exercises), and becoming open to cyber bullying or other negative media content. For example, expanded PC use could uproot putatively more important social contact and debilitate social bonds with family and companions (Fairlie & Kalil, 2017).

This is similar to time spent on the web, on long range interpersonal communication destinations, playing PC games is by definition time that cannot be spent on sports, clubs, or other extra-curricular exercises. Interest in extra-curricular exercises is viewed as critical for keeping up existing companionships and growing new ones. Social disconnection may build children’s shirking of school through non-appearances or persistent lateness. Children who are "separated from everyone else time" on PCs may expand social connections by associating with others through virtual collaborations and rarely encourage collaborations face to face. PC possession may supplement, as opposed to substitute for relational collaborations. PCs are utilized widely for correspondence and social organizing by children (Fairlie & Kalil 2017).

Malamud and Pop (2011) ascertain that home PCs could promote social detachment among youngsters if communications are supplanted by virtual ones or if PC use exercises depend on or advance social commitment. Even with one movement, for example, gaming, youngsters may become disengaged, yet in addition get together to play the same games or intelligent games. The positive effects of technology in framing behaviour of children can be beneficial as instructional to children’s learning and development process practices, such as applications and games that establish a visual image of any subject which develops cognitive skills (Sumarni et al., 2019). Memory games can improve children's memory as playing brain games is safe. ICT is also considered important in terms of developing a valid, holistic, and integrated approach that can encourage children to develop their language.

There are some skills, such as ideas, expressing thoughts, memory, listening, and feelings that are connected to children's behaviour developed through ICT, as suggested by Pugach and Vertuhina (2020). Children can use the keyboard in terms of writing simple names and words with the help of ICT. Languages are significant to interface individuals locally and around the world. They are spoken locally, utilized universally, and have the purpose of informing the world. Oral, composed, and visual types of language interface us to the past and give us access to new and various floods of thought and to convictions and social practices. Learning another language broadens etymological and social understanding and capacity to cooperate fittingly with different speakers. Association in another dialect, regardless of whether vis-à-vis or innovatively encouraged, acquaints users with better approaches for pondering, addressing, and deciphering the world and their place in it (Pugach & Vertuhina, 2020, p24).

ICT lessons' priority is to provide software that the children will learn through exploring alternative approaches. Employing elements of play will help children in terms of developing their creativity by encouraging imaginative thinking (Ramdani & Ramdhani, 2020). Children prefer smart phones, games, and tablet computers to enable them to confidently press buttons and swipe screens. Wartella et al. (2000) contend that electronic toys encourage creativity and promptness. It is incredibly invigorating and permits youngsters to find various parts of involvement, enhancing their scholarly development and urges them to create innovative potential. Data innovation is contingent upon the way it can emphatically or adversely influence the youngster's turn of events.

Jackson et al. (2012) articulates that the potential positive effects identified with the cycle of intellectual turn of events outlines a range of considerations: the advancement of emblematic portrayal, improvement of consideration, openings and comprehension of the embodiment, plain and quicker characterization, dynamic, examination, comprehending of cause-impact connections, the development of memory, empowering inventiveness, empowering interest, creating creative minds, critical thinking measures and increment inspiration. Negative effects are identified with the decrease of inventiveness and innovative reasoning, lessening the capacity for fantasizing, poor concentration, issues with consideration and decreasing the persistence to work and learn.

ICT also develops social skills, like teamwork and sharing as children do projects in groups. Children communicate during their projects which develops good behaviour (Kurek, Jose & Stuart, 2017). Qustodio (2020) contends that the use of ICT develops social integration skills in children. Utilization of social media tools helps to generate connections in virtual and real-life environments. It improves the ability to express ideas and thoughts by improving communication skills. Many studies reported that children with social anxiety disorders recover well by maintaining virtual relationships. Children can share and achieve their common interest and goals with the help of ICT tools. Some facilities are not available in the local environment which includes guidance and moral support. There are various groups and communications available online which help children to learn by listening to their interests and fears (Mawson, 2008).

Methodology

This research used the mixed methods approach for data collection. The methodology of research helps to systematically design the study in order to ensure resources and data collected for the research are valid and reliable for addressing the aims and objectives of the research (Goddard & Melville 2004). The study utilised the quantitative approach of the survey research strategy in which primary data was collected from respondents through questionnaires (Noor, 2008). Research strategy is a gradual plan of action that are questionnaires and semi-structured interviews, checklists used by the researcher for conducting research successfully in terms of producing quality results with detailed reporting (Kothari, 2004) as stated by Hu et al. (2017). The questionnaire helped in identifying the multifunctional effects of technology over the behaviour of children both in positive and negative ways. The quantitative deductive research approach for this study is based on a particular hypothesis for keeping the process simple for the researcher to evaluate the importance of ICT in children's learning and development processes.

This research also utilised a qualitative approach which is an in-depth description of the understandings, experiences, behaviours and attitudes of the research participants (Punch & Oancea, 2014). Qualitative investigation uncovers individuals or groups in particular settings by gathering and analysing data to build general themes (Creswell, 2009, 2014). For qualitative research the objectives are to discover the realities and gain knowledge of the participants' world views and experiences (Punch, 2014). Qualitative research is a method where researchers make claims about knowledge according to social, cultural interactions and the lived realities and experiences of the participants (Lincoln & Guba, 2000). This approach emphasises inductive logic, open-ended questions, takes issues for discussion and scrutinizes them into themes, and examines them based on the participants' practical experiences (Mutch, 2005).

Research Mixed Methods

Research methods are the processes and techniques utilized in the data collection method for analysing the evidence to uncover information for a clearer understanding of the selected topic Quantitative methods of research analyze the data in numeric values while qualitative methods measure the data in a descriptive and subjective manner. This study used the survey questionnaire method. The quantitative research method used was semi-structured interviews with six adults, measuring the opinions of individuals with numeric data and supporting the study through a broader picture of young children's access to ICT in different environments across different ECE settings (Dong & Mertala (2019).

Data collection

This study used both primary and secondary data. This total sample size was 76 participants. For the quantitative approach regarding the questionnaire, data was collected from 70 participants. For the qualitative approach, 6 adults – 2 grandparents, 2 teachers and 2 parents – were involved in semi-structured interviews of a duration of 30 – 45 minutes for each interview session. The questionnaire was created by the researcher noting 20 questions. The secondary data sources are already published and collected (Singh, 2006; Nikolopoulou et al., 2019). Validity and reliability are an important focus for the quality of measurement, analysis and inferences. Validity is about whether the measuring instrument measures the behaviour or quality that is determined and is an assessment of the effectiveness of how the measuring instrument performs its planned function. Reliability is an indicator of the stability of the assessed values obtained in repeated measurements (Suruji & Maslakci, 2020). The systematic sampling method was used for this research.

Quantitative Data Analysis

The method of data analysis is the calculation of frequencies of variables and the differences between them. As posited by Dong (2018), the process of analysis will interpret different ways to apply fair and careful judgement on integration of ICT into distance learning and development process programmes for early childhood teachers-in-training. SPSS was used for data analysis. Data coding in the process of data analysis reduces large quantities of information into a simpler form and makes the research systematic and manageable with computer programs (Dong et al. (2020).

Qualitative Data Analysis

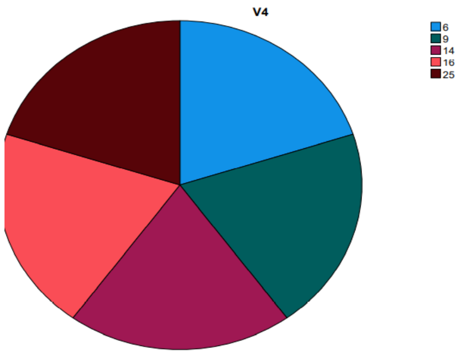
Thematic analysis seeks to identify patterns across data sets that are important to the description of a phenomenon associated with a specific research question. Braun and Clarke (2006) contend such an approach offers flexibility to understanding and interpreting data. What is important is the way in which a "theme captures something significant about data in relation to research questions, and represents patterned responses or meaning within the data set" (Braun & Clarke, 2006, p.82). Data analysis encompasses collecting and organising the data and minimising the data collected into themes in which the process of coding and condensing the codes is implemented (Strauss & Corbin, 1990).

Ethical Considerations

The participants of this research were informed regarding the objectives and purpose of the study. This research will be voluntary, participants may choose to leave at any time during the research and need not give a reason. The consent for participation is outlined in the Participant Information Sheet [PIS] form. The identity of the participants will not be disclosed and confidentiality and anonymity are assured. A summary of the findings is available on request. All ethical procedures followed the ICL Ethics Committee guide lines (ICLEC, 2021). Ethics approval for this research was given on 4 March 2021.

Findings

The findings below outline the description data generated by SPSS followed by pie graphs with percentages of responses according to the 20 questions of the questionnaire. The Pearson Correlation tool was administered to represent the responses with linkage to the research questions. Explanations of what the data means will be discussed after each matrix and correlation has been carried out. SPSS descriptive statistics outlines the details of the range of answers to specific questions, the minimum responses generated to the maximum. The sum, mean and standard deviation is displayed below. What is documented is the average of answers to the 20 questions of the questionnaire for the quantitative data and the average of interview responses from participants. The research questions posed were: How can ICT influence development and children's learning and development processes? Why is it necessary for the educators and administration of children's learning and development processes to understand the concept of ICT? Can ICT positively affect the behaviour of children during their young days? These questions were the directives for this study to investigate what the role of ICT in children's learning and develop process is about.
Figure 1: Question 2- Technology is playing an important role in children's development

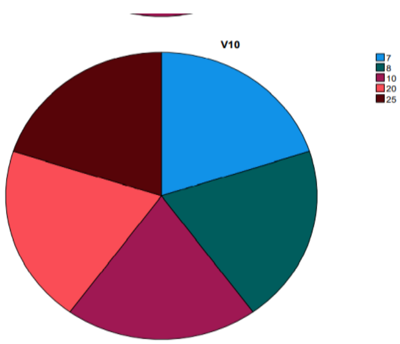


V4

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	6	1	2.2	20.0	20.0
	9	1	2.2	20.0	40.0
	14	1	2.2	20.0	60.0
	16	1	2.2	20.0	80.0
	25	1	2.2	20.0	100.0
	Total	5	11.1	100.0	
Missing	System	40	88.9		
Total		45	100.0		

Figure 1 explains the impact of technology in children's development. The respondents were asked to give their views on the importance of technology in children's development. The majority of the respondents were neutral regarding teaching i.e. 35.71%. About 20% of respondents partially agreed with context while 12% respondents partially disagreed. About 22.8% people strongly agreed this context and 8.5% of people strongly disagreed.

Figure 2: Question 5- ICT can help in the positive development of children's learning

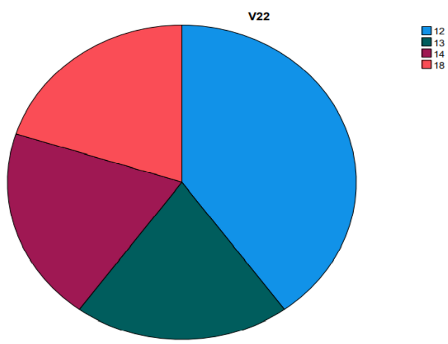


V10

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	7	1	2.2	20.0	20.0
	8	1	2.2	20.0	40.0
	10	1	2.2	20.0	60.0
	20	1	2.2	20.0	80.0
	25	1	2.2	20.0	100.0
	Total	5	11.1	100.0	
Missing	System	40	88.9		
Total		45	100.0		

Figure 2 represents the views of the respondents related to ICT and its help in the positive development of children's learning. Respondents were asked about their views and the highest precentage partially agreed (35.71%). Around 28.57% of respondents were neutral about the topic. However, 10% of respondents strongly agreed while 14.28% respondents strongly disagreed with it.

Figure 3: Question 11- School Administration should make ICT compulsory for improving children's efficiency

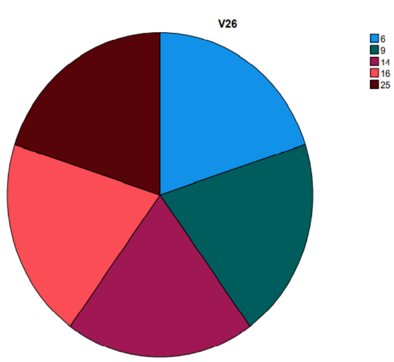


V22

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	12	2	4.4	40.0	40.0
	13	1	2.2	20.0	60.0
	14	1	2.2	20.0	80.0
	18	1	2.2	20.0	100.0
	Total	5	11.1	100.0	
Missing	System	40	88.9		
Total		45	100.0		

Figure 3 represents the compulsory of school administration regarding ICT. The views of respondents were recorded regarded the particular topic. It was recorded that 25.71% repondents were neutral regarding to this topic. Some respondents partially agreed (20%) to this statement and some of them partially disagreed (18.57%). It was seen that some respondents strongly agreed with this statement (17.14%) and on the other hand, there are some who strongly disagreed with it (17.14%).

Figure 4: Question 13- It is necessary to understand the multifunctional effects of ICT before adopting it for influencing a child's development

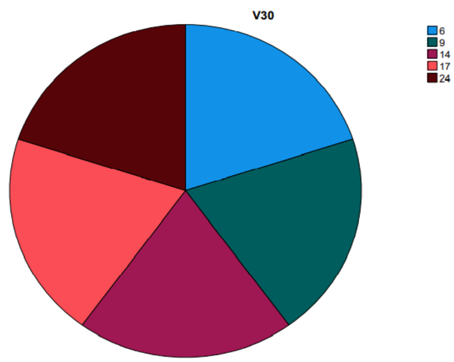


V26

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	6	1	2.2	20.0	20.0
	9	1	2.2	20.0	40.0
	14	1	2.2	20.0	60.0
	16	1	2.2	20.0	80.0
	25	1	2.2	20.0	100.0
	Total	5	11.1	100.0	
Missing	System	40	88.9		
Total		45	100.0		

Figure 4: represents the the necessity of understanding the multifunctional effects of ICT. The respondents were asked to give their views which were recorded. There are 20% of respondents who were neutral in this case. About 35.71% of respondents partially agreed with this statement and 8.57% partially disagreed with it. Some of the respondents strongly agreed (2.84%) to this topic while some of them strongly disagreed it (12.85%).

Figure 5: Question 15- Tech Support is needed in schools for making educators technologically efficient for students

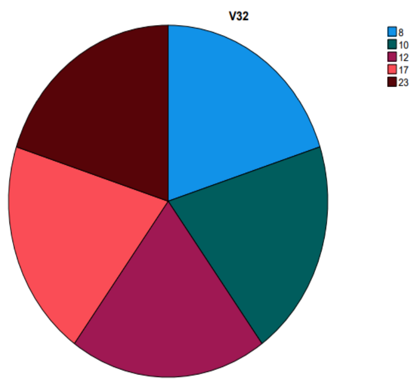


V30

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	6	1	2.2	20.0	20.0
	9	1	2.2	20.0	40.0
	14	1	2.2	20.0	60.0
	17	1	2.2	20.0	80.0
	24	1	2.2	20.0	100.0
	Total	5	11.1	100.0	
Missing	System	40	88.9		
Total		45	100.0		

Figure 5 represents the tech support for the technologically efficent educators. The respondents were asked to give their views and it was seen that around 34.28% respondents were neutral. Around 24.28% resondents partially agreed with this statement and 20% partially disagreed. Some respondents strongly agreed (8.57) with this statement while some strongly disagreed (12.85%).

Figure 6: Question 16- ICT helps influence a child's behaviour from a younger age

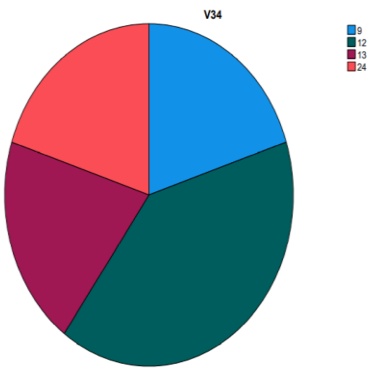


V32

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	8	1	2.2	20.0	20.0
	10	1	2.2	20.0	40.0
	12	1	2.2	20.0	60.0
	17	1	2.2	20.0	80.0
	23	1	2.2	20.0	100.0
	Total	5	11.1	100.0	
Missing	System	40	88.9		
Total		45	100.0		

Figure 6 represents the ICT and its influnce on children from their younger age. The respondents were asked to give their views on the topic. About 32.85% respondents were neutral about it whereas 11.42% respondents partially agreed with it and 24.28% respondents partially disagreed with it. Some respondents strongly agreed with this statement (17.14%) and some of them strongly disagreed (14.28%).

Figure 7: Question 17- ICT can have an adverse impact on the child

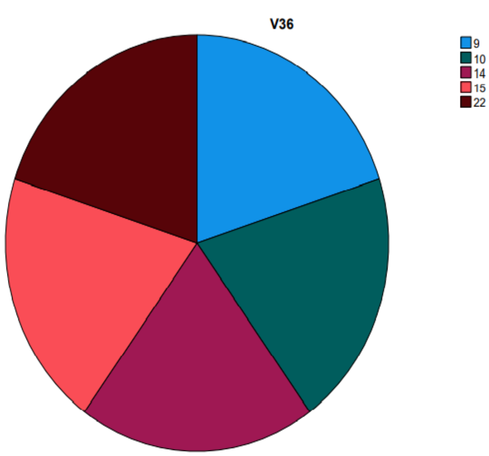


V34

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	9	1	2.2	20.0	20.0
	12	2	4.4	40.0	60.0
	13	1	2.2	20.0	80.0
	24	1	2.2	20.0	100.0
	Total	5	11.1	100.0	
Missing	System	40	88.9		
Total		45	100.0		

Figure 7 represents the impact of ICT on the child. The respondents were asked to give their views on the particular topic and it was seen that 34.28% respondents were neutral. Around 12.85% respondents partially agreed and 18.57% respondents partially disagreed with the statement. Some of the respondents strongly agreed (17.14%) while some strongly disagreed (17.14%).

Figure 8: Question 18- ICT can lead to unnecessary addiction among students

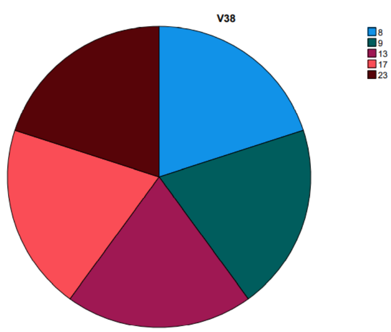


V36

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	9	1	2.2	20.0	20.0
	10	1	2.2	20.0	40.0
	14	1	2.2	20.0	60.0
	15	1	2.2	20.0	80.0
	22	1	2.2	20.0	100.0
	Total	5	11.1	100.0	
Missing	System	40	88.9		
Total		45	100.0		

Figure 8 represents what unnecessary addiction ICT can have among students. The respondents gave their views on this and it was seen that 31.42% respondents were neutral, 21.42% respondents partially agreed this statement, 14.28% respondents partially disagreed with this statement, 20% respondents strongly agreed, and 12.85% respondents strongly disagreed.

Figure 9: Question 19- ICT can create challenges in the learning and teaching process

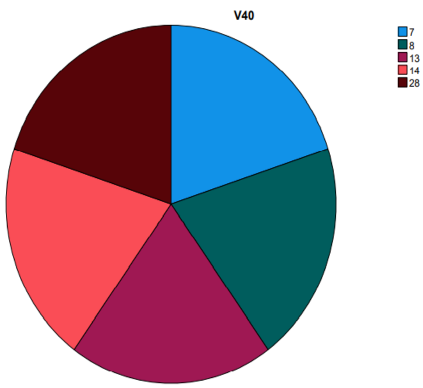


V38

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	8	1	2.2	20.0	20.0
	9	1	2.2	20.0	40.0
	13	1	2.2	20.0	60.0
	17	1	2.2	20.0	80.0
	23	1	2.2	20.0	100.0
	Total	5	11.1	100.0	
Missing	System	40	88.9		
Total		45	100.0		

Figure 9 represents the challenges that ICT can create in the learning and teaching processes. The respondents were asked to give their views and around 32.85% respondents were recorded as neutral. Around 24.28% respondents partially agreed and 18.57% respondents partially disagreed with this statement. There were some respndents who strongly agreed (11.4%) and while some strongly disagreed (12.8%)

Figure 10: Question 20- Parents should also have knowledge about ICT for enhancing children's learning



V40

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	7	1	2.2	20.0	20.0
	8	1	2.2	20.0	40.0
	13	1	2.2	20.0	60.0
	14	1	2.2	20.0	80.0
	28	1	2.2	20.0	100.0
	Total	5	11.1	100.0	
Missing	System	40	88.9		
Total		45	100.0		

Figure 10 represents the need of ICT for parents to enhance children's learning. According to the views, it was seen that 40% of the repsondents were neutral, 20% of the respondents partially agreed, and 11.42 % repondents partially disagreed with the statement. There were some responsdents who strongly agreed (10%) and some of them strongly disagreed (18.57%).

For the quantitative data set, testing the topic of research, statistical analysis of collected data was conducted through SPSS. The data analysis provides that children's learning and development can be possible if supported by information technology. Sample size of population for data collection was 70. Responses were collected from the questionnaire prepared. Questions were related to the role of information technology and children's learning. Descriptive statistics results show that the maximum population is either neutral in response to the question or they partially agree with the research topic. The majority of respondents believe that information technology is supportive of children's learning and development. Educators should know about the technology and the way they can use technology while teaching children. The mean value of all the responses was between 13 and 14 which means respondents partially agreed or were neutral in most of the questions. Each question is graphically outlined followed by the Pearson Correlation expressing the descriptive statistical analysis as a matrix table below.

Correlation

Descriptive Statistics

	Mean	Std. Deviation	N
V6	14.00	7.382	5
V8	14.00	6.856	5

Correlations

		V6	V8
V6	Pearson Correlation	1	.563
	Sig. (2-tailed)		.323
	N	5	5
V8	Pearson Correlation	.563	1
	Sig. (2-tailed)	.323	
	N	5	5

V 6 indicates whether responses collected towards information technology are potentially helping in early childhood education or not and V8 indicates responses collected for improvisation in the education system with the involvement of information technology. The result of correlation of these variables is positive which means information technology is important for improvising the quality of education and learning in early childhood.

Correlation:

Correlations

		V14	V16
V14	Pearson Correlation	1	.070
	Sig. (2-tailed)		.911
	N	5	5
V16	Pearson Correlation	.070	1
	Sig. (2-tailed)	.911	
	N	5	5

Descriptive Statistics

	Mean	Std. Deviation	N
V14	14.00	3.391	5
V16	13.80	7.396	5

V14 is for the response towards importance of e-learning for children and V16 is for e- learning is helpful for children to understand the concept. The correlation is 0.070 between variables which indicates a positive relationship between e-learning and early childhood. E-learning is helpful in early childhood.

Correlation

Descriptive Statistics

	Mean	Std. Deviation	N
V22	13.80	2.490	5
V24	14.00	6.892	5

Correlations

		V22	V24
V22	Pearson Correlation	1	.801
	Sig. (2-tailed)		.103
	N	5	5
V24	Pearson Correlation	.801	1
	Sig. (2-tailed)	.103	
	N	5	5

This correlation provides that administration of early childhood education centres must be updated with new e-learning methods so that children will develop easily and effectively.

Correlation

Descriptive Statistics

	Mean	Std. Deviation	N
V32	14.00	6.042	5
V34	14.00	5.788	5

Correlations

		V32	V34
V32	Pearson Correlation	1	.922*
	Sig. (2-tailed)		.026
	N	5	5
V34	Pearson Correlation	.922*	1
	Sig. (2-tailed)	.026	
	N	5	5

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

The table outlines responses for question 5 noting the frequency of 45 in total with a percentage of 88.9. The valid percent noting 20.0.

Descriptive Statistics

	Mean	Std. Deviation	N
V36	14.00	5.148	5
V38	14.00	6.164	5

Correlations

		V36	V38
V36	Pearson Correlation	1	.819
	Sig. (2-tailed)		.090
	N	5	5
V38	Pearson Correlation	.819	1
	Sig. (2-tailed)	.090	
	N	5	5

This calculation of correlation is extracted from responses collected regarding questions 18 and 19. The correlation value is 0.819 which means that information technology has put some challenges before us. With the extensive use of technology, children are now limited to the web world and their social interaction reduces.

Descriptive Statistics

	Mean	Std. Deviation	N
V18	14.00	4.899	5
V20	14.00	4.899	5

Correlations

		V18	V20
Pearson Correlation	V18	1.000	.615
	V20	.615	1.000
Sig. (1-tailed)	V18	.	.135
	V20	.135	.
N	V18	5	5
	V20	5	5

Correlation

The responses collected regarding questions 9 and 10 indicated a correlation 0.615 that is positive and this shows that information technology literacy in educators is beneficial for the development of ECE centres.

4.3 Findings of Qualitative Data

The study conducted a thematic analysis of semi-structured interviews regarding the impact of technology on the development of children. The six interviews took place at the ECE setting for 30 minutes to 45 minutes per participant. The responses were assigned themes for understanding the cause and impact relationship. From the analysis, findings revealed both positive and negative impacts of technology on the development of children. Pseudonyms were used to keep the identities of participants and their respective ECE centres confidential. Abbreviations were employed to differentiate between teachers (T-1a, T-2b), grandparents (GP-2a, GP-3b), and parents (P-5a, P-6b). For example, GP is accompanied with a hyphen and an initial to label participants. The themes are expressed as headings in bold italics.

The key research question that underpins this study is: *What is the role of Information and Communications Technology in child development and children's learning and development process?*

In order to unpack the main research question, sub-questions were incorporated. The English language was used to communicate with participants and the researcher transcribed scripts from taped conversations during interview sessions. The use of transcribing provided the essence of what was being said, and was not intended to be a word-for-word transliteration. In the researcher's view superfluous utterances have been removed. Two grandparents from two separate ECE centres took part. Two teachers from two different centres were participants; both were teachers within the ECE context and qualified as registered teachers. The following themes (Braun & Clarke, 2006) were identified: the positive impacts of technology on development of the child, effective record maintenance, helpful in global pandemic, improved communication between guardian and teachers, improves IQ level, and cognitive development with easy availability of educational content. From negative impacts of technology on development of child: lack of self-control, bad impact on children when teachers utilize technological devices, technology is used to keep children occupied, decreased social interaction and increased addiction over technology. 4.3.1 – 4.3.5 discuss the themes associated with positive impacts of technology on the development of the child and 4.3.6 – 4. 3. 10 outline some aspects noting themes about some negative impacts of technology on the development of the child.

Positive Impacts of Technology on Development of the Child

Effective Record Maintenance

The importance of understanding teachers' perspectives provided insight into how effective administration tasks are carried out within the ECE environment influencing current thinking and practice. This takes into account the ways in which ICT had been promoted to teachers overall and whether ICT utilised by teachers either hindered or enhanced further opportunities for ICT learning for young children. The example below outlines an average of comments made by teachers (T-1a, T2b), grandparents (GP-3a, GP-4b) and parents (P-5a, P-6b).

(T-1a) while talking about utilizing technological devices by teachers in child care respondents claimed that technology is very useful in recording the growth and development of a child. The applications are helpful in deciding or preparing the daily schedules and recording results of activities to generate final results. The outcomes are then shared with families and friends.

Helpful in Global Pandemic

The participants stated that due to COVID-19, ICT was helpful in a global pandemic. The range of ICT used and available aided teachers and parents for communicative processes.

(T-2b, P-6a) the technology is only tool for survival in a global pandemic. The respondents of the study stated that during lockdown, technology really helped teachers and parents for managing the learning and development of children. With the help of mobile phones and emails, teachers used to send pictures, daily activities and lessons to keep in touch with children.

(P-5a) technology is helpful for people to stay up to date, in surviving with pandemic situation. One respondent pointed about her daughter's behaviour on how she has settled her daughter in the childcare in the early stages and afterwards due to lockdown everyone was staying in their own bubbles. Teacher used to put everything on the Educa website such as mat time of read a story, sing child songs, to show kids activities and this was very helpful. I always show all things to my daughter, she always uses to call them with their names and one day teachers recap of children's journey, which helped to my daughter to remember her friends and teachers. After the lockdown she was very happy and excited to see her friends and lovely teachers.

Improved Communication Between Guardian/Grandparents and Teachers

Participant parents shared the use of ICT to be an effective tool especially during lockdown in communicating with teachers about their inquiries about attendance of their children during lockdown period.

(GP-2a) technology improved the ways to talk to the parents and guardians/grandparents. One respondent noted one day, teacher couldn't get to the parents and they called me about my friend's daughter's accident. I was at home and as a guardian I was allowed to take her from the childcare and see the other parents as well.

(P-6b) through technology, communication can be done immediately in case of any emergency. One respondent of the study says that…… I got an emergency regarding lessons, and I could not reach the childcare due to lockdown. I immediately contacted the teacher through a text message and I got an instant reply. My issue was solved immediately. I think technology is helping us to improve the development of children through many ways.

Improves IQ Level

Participants noted their perceptions about ICT improvement of knowledge connected with IQ levels for their children. The majority of the respondents clarified that various technological devices such as Ipads, mobiles, chrome books, laptops and tabs help in developing the learning capabilities of children. Some guardians/grandparents responded that their children learned multiplication, subtraction and other numerical tricks from various applications through mobile phones. Children were reportedly using the internet for watching plays and useful pictures or videos.

(P-5a) While talking about role of technology in enhancing the IQ level or intelligence, the majority of the respondents claimed that it is positive. As per one respondent ……..I am surprised that my child is so good at calculation. I never taught him to do so. One day he showed me an application in which he is learning numbers. It is a type of number game where basic mathematics is taught in a fun way. This is really helpful for the development of learning. These applications of technology help children to learn in an interesting way.

Cognitive Development with Easy Availability of Educational Content

Participants stated that there are various tools such as online games, online puzzles, and video games improve the mental ability and skills of children. Due to technology, the educational content is easily available on various platforms. One respondent (teacher) of the study noted the significance of ICT for research to support learning and teaching pedagogical perspectives.

(T-1a) One day my children asked me what is made up of the tongue? I was speechless during that time, but I immediately grabbed my tablet and searched it. I explained briefly and thanked technology.

(P-6b) I am much stressed that my child is addicted to using mobile phones. She always demands the phone. When we sit at the dining table she demands the phone. If I think about her mental ability, she is way more intelligent in handling mobile issues and applications. We can say that technology is developing the mental ability of children but extent of use is a necessary condition.

Negative Impacts of Technology on Development of the Child

Lack of Self-Control

One participant commented about ICT being used in transitions from ECE centres to the home. The participant claimed that there is a need to maintain balance between the utilization of technologies; devices and other activities such as going to park, outdoor games, indoor games and reading books and other things.

(P-6b) Some children do not want to go home because they are addicted to using devices provided in schools for learning such as Ipads. I went to pick up my friend's daughter; she was showing tantrums for leaving the technological devices.

(GP-2a) We have to force our kids to go play outside and make friends but they are more comfortable in playing with video games or watching YouTube. Our kids forget to eat something while playing or watching a movie. This is badly impacting their physical activity and daily routines.

Injurious Impact on Children When Teachers Utilize Technological Devices

Some of the respondents of the study feel that teachers are here to teach, not use technology. Numerous participants alerted to the fact that technology utilization in childcare must be allowed to specific reasons.

> (P-6b) My daughter sometimes uses the phone the whole day which is not tolerable because she watches in childcare that her teachers are using it. Sometimes, teachers tell children to watch some creative movies. I think watching movies all the time is impacting badly.

Another participant noted the use of ICT needs to be for a certain age group in order for effective learning to occur for children.

> (P-5a) Another respondent stated that using monitor in the 3 to 6 age is not

good if teachers are showing them pictures and other content. However, it may help in development of children in showing documentaries and other knowledgeable things related to geography and animal studies.

Technology is Used to Keep Children Occupied

A common thread stated in the interviews was that some teachers use technology for entertaining children rather than teaching them. Technology is being utilized in an awful way just to pass the time.

(GP- 2a) Technology is worse for the development of children if it is used for entertainment purposes during early development days of children.

(T-2b) I am working in a childcare and I see many teachers hold their mobile phones and allow children to play games on tabs while they are disturbing them for something. Using technology for distracting children is too bad for their development.

Decreased Social Interaction

Most of the participants within the interviews noted the decrease of children's social interaction with either their peers at home or siblings. Teachers have stressed the importance of social interaction for young children's total wellbeing.

(T-1a, T-2b) The excessive use of technology decreased the social interaction among children. Children nowadays are reported to be busy playing games online, watching movies and even studying on computers which results in minimizing the social circle. Social interaction is significant in child development which is negatively affected by technology. Children are not sharing their experiences, respect and love with parents.

(GP-2a) Social distancing is the new normal currently. Even education models are fully disrupted by decreasing social interaction at all. Not about just learning and development, children are even forgetting their family members. They want to live alone with their technological gadgets because there is so much entertainment. The attachment with parents and social circle is nowhere among children.

Increased Addiction Over Technology

Addiction to using ICT was noted to be a great concern for all participants in this research. The notion of spending time away from such devices in order to spend more eye-to-eye contact time with family and friends was strongly articulated.

(T-1a, T-2b, GP-1a, P-1a, P-2b) A majority of the respondents of the study claimed that children are addicted to technological devices. They cannot spend some quality time with family or friends without using some devices. This increased addiction may result in health issues such as vision problems, neck pain, quality of sleep and overstrain.

It is evident that comments made by most of the participants about the use of technology need definite attention and need to be moderated in usage for young children. One respondent of the study asserted that before COVID, my child was doing good but within one year he is reporting some serious issues related to his eyesight. When we went to the doctor, they told us he is suffering from dry eye syndrome due to excessive use of screen. All comments raise some interesting points about ICT within the ECE environment and linkage to children's learning.

4.4 Discussion

Unpinning discussions have been influenced by theories of ICT in the arena of early childhood education, early childhood education discourses, and child development theories advocated by the early childhood education curriculum, Te Whariki.   The basis of Te Whariki uses the theory of Vygotsky's socio-cultural theory or cultural historical theory (Bodrova & Leong, 2015) which employs to demonstrate how his ideas about interactions of young children within the learning environment are through play and socialisation has been used as a theoretical framework for guiding early childhood education practices. An essential part of play is the usage of ICT for young children in their development learning processes. Participants' conceptualisations about the role of ICT in early learning draws on children's interactions with their peers, teachers and parents and usage of a range of ICT within the ECE settings. For teachers and administration, it has become an effective tool to use in order to be accountable for pedagogical and administrative practices daily (Ministry of Education, 2007; 2017).

The quantitative data results assert the role of information and communication technology is complex and is dependent on usage within a range of contexts. For educators and administration, ICL usage is a daily necessity to uphold and continue recording systems of young children's learning and development processes. It is evident in the analysis of data that respondents' views ranged from neutral regarding teaching at 32% to respondents who partially agreed at 25%

concerning the experiences of teachers in the ECE context. A general blanket understanding of participants concerning the efficiency of ICT for children's learning and development was balanced with some voices asserting a 22.8% strongly agree level. With this notion in mind, it is clear to see that most teachers, parents and grandparents/guardians remained neutral for the remainder of questions posed about the teacher.

This could be due to an understanding of respectful cultural norms and protocols of the centre supporting culturally responsive and inclusive practices (Ministry of Education, 2011; 2018). These policies and documents contend that culture and protocols are maintained within the ECE environment and that children learn in their own time and space. Perhaps this is the reason for the neutral responses gained from the data of the questionnaires and also the semi-structured interviews. Concerning the data results for administration, this also suggested that usage of ICT was directly related to tasks to be carried out daily by administration staff as well as teachers for recording and accountability purposes required by policies and regulations within the ECE environments and the Education for the 21st Century initiative from 2020 to 2030 (Ministry of Education, 2007; 2007; 2017; 2018). The systems are utilised for administrative and teaching purposes concerning assessment and evaluation processes that include parents' online purposes such as making consistent and professional social bonds with family (Fairlie & Kalil, 2017).

Without the consistent professional guidance for teachers and administration staff regarding the extent of ICT usage and interface knowledge, ICT within the learning arena for children may be limited. The nature of ICT needs to be implemented daily and integrated into interdisciplinary activities which are negotiated by the children themselves and encouraged by teachers (Akpan, 2016). The confidence levels of teachers and administration needs more attention as such factors will perhaps be a hinderance (if levels of comfort in using ICT by teachers and administration is not developing into a positive level), but may be a great support when such levels are raised. Thus, the more confident the teachers and administration are in using ICT, the more empowering their teaching with children about ICT is. The cognitive and socio-emotional development of children will develop positively when adults use and teach the nature of information and communication technology to children. This aids children's confidence levels in understanding the nature of ICT and the importance of usage (Dong, 2018).

Themes

From the collected data of the qualitative approach using semi-structured interviews, ten themes were generated as outlined in the findings section. The emerging themes were grouped into two categories: 1) the positive impacts of technology on the development of the child and 2) the negative impacts of technology on the development of the child. The sub-themes generated in 1) were effective record maintenance, helpful in global pandemic, improved communication between guardian/grandparents and teachers, improved IQ levels, and cognitive development with easy availability of educational content. The sub-themes noted in 2) were lack of self-control, injurious impact on children when teachers utilise technological devices, technology is used to keep children occupied, decreased social interaction and increased addiction over technology. It is evident by participants' perceptions, knowledge and understandings shared within the semi-structured interviews, that the use of ICT had five positive points and also five negative points. Examples within the transcribed data echo the significance of the usage of ICT to some extent. For teachers, ICT was a mechanism that was used as a resource for pedagogical practice, an assessment tool to record children's learning dispositions supported with other assessment systems used within ECE. For grandparents, there was a predominantly strong voice that ICT hindered children's development due to the focus of children choosing less social interaction with peers and whanau. For parents, ICT was a tool to communicate with other members of families, computers were used to support learning to some extent. Parents strongly supported the use of ICT in this COVID era as a safe educational communicative resource for learning.

Conclusion

ICTs or Information and Communication Technologies significantly influence the development of children's learning and development process. ICTs play a vital role in developing childcare and child behaviour as it has some multiple and effective qualities and effects that can help frame children's behaviour. Some of the studies concluded that ICT is not appropriate for ECE, however other authors claimed that ICT is appropriate if it is utilized systematically. There is lack of clear understanding regarding ICT and ECE. ICT influences the early likelihood of children in helping develop early learning more effectively. ICT is considered a practical tool for supporting conventional learning. Multifunctional effects of ICT, like increasing IQ, developing mental skills, developing language, creativity, and confidence have been discussed in the thesis.

This research information adds an updated understanding about ICT for ECE contexts within Aotearoa New Zealand to the early childhood education literature. The aim of the research was to seek what the impact of information and communication technology in ECE in Aotearoa New Zealand is about. The significance of this research was to find out about the multiple methods in which ICT is utilised within the ECE setting by teachers, administration staff, grandparents, parents and other adults. For children's learning and development, the sociocultural context of the ECE environment supports that all children learn from their peers and adults. Concerning ICT, this has aided to scaffold children's cognitive development by usage of material and resources posed within programmes accessed by usage of ICT by children. Teachers need to be confident in usage of a range of technological literacies to support children's learning within the ECE environment and also for administrative purposes.

The results have answered all the research questions. For the first question, the research noted that the role of ICT had definite positive effects as well as equally negative impacts. Secondly the literature displays that there are some factors that influence young children's behaviour also effected by ICT, where sometimes children show adverse behaviour. For the second question it was noted a high percentage of teachers and administration staff agree with the use of ICT within their daily tasks in order to meet pedagogical and administrative requirements. The sub-question was, 'can ICT positively affect the behaviour of children during their young days? Results aligned from a positive and a negative level noting that children's behaviour while interacting with any ICT device may be addictive as children play online games and also become anti-social. Although children learn from their peers, using ICT may become a barrier for learning and development when over used.

For the qualitative data collection from semi-structured interviews of six adults, it was found that for participants the role and use of ICT within the ECE setting for teachers is positive with a high percentage of respondents answering strongly agree in support of ICT helping teachers and administration staff to carry out their daily tasks. However, for teachers, some participants noted a high level of neutral responses. The reason this research asserts is that perhaps it is due to respect and cultural norms, that such responses have surfaced in both data sets (quantitative and qualitative approaches). This research has described participants conceptualisations and views about how effective ICT is for teaching and administrative purposes. For parents and grandparents, the responses have been mostly neutral for teachers' use of ICT, but for grand-parents, a strong alert voicing that ICT is detrimental to children's learning and development. Parents have asserted that ICT usage may be considered helpful for their children's learning and development but only in a balanced mode (Fairlie & Kalil, 2017). All the research questions have been answered and addressed.

Implications of Study

The implications posed by this study have revealed the need for teachers, administrators, grandparents, parents and other adults to engage in ongoing professional development. Although the research participants expressed a form of understanding about ICT, this needs to be developed further. The necessity to update new knowledge and research is critical. The opportunity to engage in professional dialogue was beneficial for teachers and administers, and perhaps for parents, grandparents and other adults, more discussions via social events and parent-days need to be consistent. This lends itself to acquiring particular skills in relation to being a reflective practitioner. Teachers and administration need opportunities to critique, discuss and reflect on their own practices and being supportive of children's learning and development in using ICT within the ECE setting. The nature of a small-scaled quantitative and qualitative research project has limitations to what could potentially be conducted. Given that within Aotearoa New Zealand there are multiple diverse ECE environments (private, public, community-based, home-based programmes), this study has only focused on four contexts. Consideration of other contexts would be ideal.

Further to this is the consideration on where the research is conducted. There needs to be a comparison between perhaps rural and urban centres and teachers, administration, parents and other adults who attend this context daily. This study only had participants that had a relationship with the centres. Participants' demographics such as gender and age were not part of this research concentration. It is being noted that this research is a small scale sample and is not representative of all early childhood education environments.

In focussing on data by participants, it is clear that the impact of information and communication technology in the early childhood education environments in Aotearoa New Zealand has been positive as well as having a negative outcome for children's learning and development within the four centres where this research was carried out. The findings for this research assert many aspects that are significant for ICT such as teachers' usage of ICT for the purpose of uploading updates online and storage of daily data on the drive. This study has shown that for adults who answered the questionnaire a high percentage of responses outline the role of ICT is to sometimes aid learning and teaching practices but for some parents, this may be considered a hindrance for young children's education due to the negative effects of ICT usage.

For the qualitative data set, data from the semi-structured interviews from six participants of two grandparents, two teachers and two parents may be used as a guide to noting the voice of adults about the role and use of ICT within ECE settings within Aotearoa New Zealand and perhaps within the international context. Pedagogical perspectives have been alerted as using the collaborative teaching approach for teachers, administration and parents. Specific strategies have been outlined to support learning and teaching for young children when using ICT. The voices of adults have been a strength for this part of the research as well as the quantitative data. All questionnaires and semi-structured questions have been answered by the participants.

Limitations and recommendations

There are some limitations to this research. Firstly, the sample size is only 70 adults for the quantitative research and six for the. There were time limitations as well, some of the parents and grandparents seemed very busy and they didn't have enough time to talk about ICT. Another limitation is the context was only within four centres. Perhaps if the contexts were varied according to other early childhood education centres, for example, Maori Te Kohanga reo, Pasifika early childhood initiatives like Ako Teu (Tongan centres), Aoga Amata (Samoan centres), Pununga reo (Cook Island centres), Kainga and home based care settings, the results could have been different concerning usage of ICT and technological literacies strategies, Kaiako teaching and learning strategies and administration procedures would also differ. Language usage and culture would have been more varied and documented from a range of theoretical, epistemological and ontological perspectives and more information could have been gained. Research to seek further understanding of ICT from a range of ECE localities within Aotearoa New Zealand could also be a focus for future research. A comparison of data collection may view some emerging inter-disciplinary and multi-cultural aspects toward ICT and usage.

Some possible questions could be asked:

- How has ICT been an effective pedagogical mechanism to enhance further learning for children?
- Why is ICT a cultural barrier to children's learning and development in the ECE arena?
- What curriculum area is ICT most used in daily for children's learning?
- What resources online are used by children and teachers for literacy or numeracy learning?

A further limitation of this research is that concentration has only been about ICT within the ECE environment. Other curriculum areas could be researched further to note ICT usage from a range of curriculum perspectives within the dispositional learning of young children. Perhaps some other techniques for data collection would strengthen further research by using observational schedules: anecdotal records, diary descriptions, time and event sampling, resource time sampling, videos of children's interactions and usage of ICT. A language focus could also be used as a research methodology noting ICT usage of languages used by teachers or parents in scaffolding learning with ICT devices. As technological literacy is a complex field, perhaps further research in another technological aspect would be another research interest.

Concluding Remarks

This research sought to find out about what the impact of information and communication technology in the early childhood education environment in the Aotearoa New Zealand context. For an emerging researcher, this study has signalled a personal interest in the importance of how ICT is viewed by adult participants within the early childhood education environments of three centres in Hamilton south of Auckland City. All young children in Aotearoa New Zealand and internationally should be given more opportunities to access quality education and care. This study provides a platform to continue to explore the ways in which ICT can cater to the holistic development of all children. This research aims to add more awareness of teachers working within the ECE settings and grandparents, parents and other adults who frequent the ECE setting daily. It brings to the fore an important message regarding the role of the teacher and the positives and negatives of ICT usage for young children's learning, and the influences they have on young children's learning and development processes.

What is presented can inform teachers' practices, guide policy directives and influence curriculum planning and development.

The study has identified areas for improvement accepting the use of ICT and for teachers, grandparents, parents and other adults, their knowledge of the curriculum and pedagogical perspectives will need to advocate for change in Aotearoa New Zealand. Equally, establishing and maintaining relationships with grandparents, parents and families will ensure all stakeholders can learn and work collaboratively and authentically to enhance quality opportunities for learning and teaching through the monitoring and usage of ICT. This study calls for all teachers to critique through discussions that are ongoing with parents and grandparents, the ways in which they engage with children and their families in order to optimise the benefits of ICT.

No reira, tena koutou katoa
Nga mihi nui

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2-Varied Narratives of Climate Change in Global Media

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Abstract

The recent rapid, turbulent, and catastrophic changes in climate have gained the attention of the entire world. Media is the main mode through which people become informed about climate change. The present study focuses the representation of climate change in the media. The trends in climate change reporting raise two questions; firstly, why has there been a recent amplification in climate change media coverage? And secondly, why does the coverage offer such varied understandings of the issue, despite widely accepted scientific consensus on anthropogenic climate change? The findings of the study reveals that media reports about climate change are surprisingly increasing dissimilar. The media has its own agenda in giving coverage to these issues, but is also influenced by the agendas of politicians, celebrities, and the rich and powerful. The media's representation of climate change affects people's perception of the problem, which subsequently influences their responses and the actions that they might take to address the issue. In addition, policymakers rely on media information when making decisions.

Key Words: Climate change reporting, politicization and celebrities agendas concerning climate change, media coverage in the North and South

Introduction

Many studies have been conducted on media coverage of climate change around the globe. For example, in the USA (Antilla, 2005; Boykoff & Boykoff, 2004, 2007), Canada (Fisher, 2010) the UK (Boykoff, 2007, 2008a; Carvalho & Burgess, 2005; Doulton & Brown, 2009; Smith, 2005), Belgium (Mormont & Dasnoy, 1995), Finland (Dispensa & Brulle, 2003), Germany (Weingart et al., 2000), France (Brossard, Shanahan, & McComas, 2004), Portugal (Cabecinhas, Lázaro, & Carvalho, 2008), New Zealand (Bell, 1994; Howard-Williams, 2009; Kenix, 2008), Japan (Sampei & Aoyagi-Usui, 2009) and India (Billett, 2010;

Boykoff, 2010; Panagariya, 2009), Peru (Takahashi, 2012). These studies on the one hand observed media coverage and on the other hand focused on different factors like politics, celebrities and elitism, scientists, environmental non-governmental organizations (ENGOs), sources of reporter knowledge, multi-scale factors shaping media reporting, journalistic norms of balance and bias, limitations of media routines, climate change certainty and uncertainty, scientific consensus, influential contrarians, fear and alarm, tipping points, masses and policy makers' perceptions and skepticism, and concerns of developing countries. No doubt there are other means of climate change coverage like direct publication of scientific literature, reports of seminars and conferences, reports of ENGOs, Intergovernmental Panel on Climate Change (IPCC), United Nations Framework Convention on Climate Change (UNFCCC), and environmental fictions etc. but the major part of the dissemination of the climate change is through media, and it is the main source of public and policy makers' information, awareness, and perception of environmental issues (Sampei & Aoyagi-Usui, 2009).

According to Boykoff (2006), the first documented coverage of anthropogenic climate change was Cowen's 1957 article in the Christian Science Monitor. This article was entitled "Are Men Changing the Earth's Weather*?*" and stated, "Industrial activity is flooding the air with Carbon Dioxide gas. This gas acts like the glass in a green house. The gas is changing the Earth's heat balance". Since that time media coverage of climate change has continued to grow (Doulton & Brown, 2009); however, the focus has not been consistent or regular (Boykoff, 2007; Sampei & Aoyagi-Usui, 2009). In addition, wide international research on the phenomenon of climate change reporting demonstrates that media reports about climate change are surprisingly varied.

Increase in media coverage.

Liu, Vedlitz, and Alston (2008), reviewed 795 news articles about global warming and climate change printed in the Houston Chronicle from 1992 to 2005. The study revealed that the frequency of articles covering climate change increased over this period and that the greater portion of the articles focused its harmful impacts. Between 2003 and 2006, two major increases in American and British media coverage of climate change occurred, Boykoff (2007) revealed in a study that these increases in coverage coincided with international conferences, special large-scale scientific inquiries, and film/book launches. The first conference of significance was the G8 Summit in Gleneagles, Scotland, which created increased scrutiny of greenhouse-gas emissions from air travel. This G8 summit strategically followed a joint-statement from 11 top international science bodies – including the UK Royal Society and the US National Academy of Sciences – stating that “it is likely that most of the warming in recent decades can be attributed to human activities” (Joint Science Academies Statement 2005). The media included this statement in their reportage of the G8 meeting. Since the UK summer is a peak travel period, this fueled further debates and critiques of “carbon offsetting” in the media. September–November 2006 brought another increase in media coverage of climate change. This coincided with the UK release of Al Gore’s film “An Inconvenient Truth” and the Britain’s Royal Society’s open letter to the UK division of ExxonMobil. The documentary showcasing Al Gore’s efforts to educate the public about climate change was a box-office success, and the Royal Society’s letter suggesting that ExxonMobil was deliberately spreading propaganda to undermine scientific consensus on climate change, was very controversial (Adam, 2006). Immediately after that, Richard Branson gave a much-publicized “donation” of three billion dollars to fund renewable energy initiatives and bio-fuel research. This personalized story was widely published; it was appreciated as a philanthropic act, but also criticized because the money was invested in Richard Branson’s own company, Virgin Fuels. The Stern Review is a 700- page report released on October 30, 2006 by economist Nicholas Stern that accounts for the additional growth in media coverage during this period. The report concluded that the benefits of strong early action on climate change far outweigh the cost of not acting. The review provides the potential impacts of climate change on water resources, food production, health, and the environment. Heavy media exposure of the Stern Review was followed a week later by coverage of the Twelfth Conference of the Parties to the United Nations Framework Convention on Climate Change (COP12) meeting held in Nairobi.

Media coverage acted to frame public sentiments regarding climate change and created demands for policy action; for instance, the public rally “Stop Climate Chaos” attracted thousands of people to London’s Trafalgar Square in November 2006. Also in November, the US Supreme Court examined whether the Environmental Protection Agency’s (EPA) had authority to regulate greenhouse-gas emissions under the Federal Clean Air Act. Boykoff (2007), claims that all these events enhanced media coverage of climate change. He concludes that public events such as high-profile international conferences, scientific statements, film launches, court cases, and publicized celebrity philanthropy directly shaped media coverage of climate change around the world.

Differing media coverage.

Though there is currently scientific consensus that global warming will cause significant and devastating climate change, the media continues to present ambiguous information. Some media provide mixed messages about the reality of global warming/climate change and others completely deny that anthropogenic climate change is occurring. This shows that climate change is not simply a national and international environmental-ecological issue, but one that is subject to a variety of narratives linked with other public issues.

The two major contrasting narratives about climate change in the last decade are due to climatologists' conflicting points of view. Wilson (2000), examined reporters' understanding of climate change by identifying the sources of their climate change knowledge. The results revealed that reporters who heavily relied upon scientists or scientific journals for climate change knowledge, and who spent more time in environmental reporting had the most accurate climate change knowledge. Public confusion greatly increases by reporters who misconceive the fundamental scientific principles of climate change (Gorman, 2020; Wilson, 2000).

One school of thought claims that human actions are contributing to climate change while the other denies that claim; instead they claim that climate change is a natural fluctuation in a long-term weather patterns. Earlier the scientific understanding of the causes of climate change was somewhat limited; however, there is now broad scientific consensus that human actions are major contributory factors to climate change. Even so, the exact extent of human attribution is still being determined. Oreskes (2004), claimed that there was a unanimous agreement about the presence of an obvious human signature on modern climate change data. In 2007, the United Nations sponsored the Intergovernmental Panel on Climate Change (IPCC). It is Fourth Assessment Report (AR4) from Working Group One narrated, "Most of the observed increase in globally averaged temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic greenhouse gas concentrations" (p. 12). This clear declaration of scientific understanding was developed through a multi-stage process of peer-review and consensus building, including the comments of 30,000 experts. Risbey (2008), noted that the variation in climate change discourse demonstrated a serious conundrum. Some climatologists viewed the shift in narrative as related to the science community's perception of the nature of problem (alarming). Others thought that the shift was simply rhetorical and inconsistent with the science (alarmist). Climatologists were also divided about the urgency of the issue- one group predicted that global warming would break down the Greenland and West Antarctica ice -sheets within the next centuries, causing sea levels to rise to disastrous effects.

The second group considered that the melting of ice-sheets might possibly be a slow process spanning millennia. Much of the relevant dynamics of ice-sheet breakdown have not been currently included into climate change models, so the timeframes for quick breakdown are not well known. However, the climatologists in the "alarming" school of thought consider that the rate of ice-sheet break down can only be faster than the IPCC estimates. This discourse adopts a firm standpoint regarding both the problem and the solution.

Additionally, the interests of industry that use atmospheric carbon increasing fossil fuels have exercised notable influence on some scientists, and subsequently on climate policy in the US and the UK. These scientists and policy makers who challenge the importance of human contribution are often called climate contrarians. They have been originally based in United States universities, think tanks, and lobbying organizations (McCright, 2007). These contrarian voices appeared in the US in the late 1980s considerably through the Global Climate Coalition, which represented a consortium of mainly US-based coal and oil interests. These groups have been highly influenced climate policy makers since that time (Leggett, 2001). Therefore, media coverage of climate change since the 1980s has reflected the divergent information offered by scientists in the US and the UK. Media coverage is now becoming increasingly convergent as the body of scientific evidence for this has become so compelling that no matter what industry they represent cannot help but agree that climate change is a reality. Additionally, journalists and editors have begun to contextualize and label the categories of climate change reporting- censorship of dissenting views is now seen as a tactic of media manipulation. Research has shown that placing differing climate change information in the broader political and social context has mitigated media bias and the subsequent public misunderstandings uncertainty and confusion (Corbett & Durfee, 2004).

A study conducted by Bohr (2020) analyzed the coverage of climate change in 52 US newspapers over 20 years found that newspapers' partisan orientation shaped the prevalence of coverage for some aspects of climate change. The New York Times article "Exxon Backs Groups that Question Global Warming" is the direct criticism of the contrarian's point of view (Lee, 2003, pp. C 5, May 28). This article discusses the media coverage of climate change in the US before 2005. It reports Exxon's viewpoint on anthropogenic climate change as well as disclosing the multifaceted philanthropy of ExxonMobil. An article entitled "Exxon Spends Millions to Cast Doubt on Warming" by the UK publication, the Independent, also cast doubt on the integrity of reportage based on scientific studies backed by the carbon and oil industries. This added to the confusion about the scientific consensus on the human contribution to climate change (Buncombe & Castle, 2006). An article in the newspaper, USA Today, summarized the differing scientific viewpoints with the intention of questioning the credibility of environmental scientists whose findings gave evidence of anthropogenic climate change. Pat Michaels, a well-known contrarian, relied upon this article to question the integrity of climate change science.

As media discourse attempts to provide balanced coverage, it reports contrasting views. Actually, this can lead to unintentional biases. Antilla (2005), described in a study of numerous US newspaper articles that the coverage of climate change focused on debate, controversy, and scientific uncertainty. There was a clear-cut inclination towards journalistic balance; however, this led to unintentional bias in defining the contours of climate change since they reported the views of climate skeptics who had strong ties with the fossil fuel industry. This bias in coverage is explored empirically by Boykoff and Boykoff (2004) that when the journalistic norm of balanced reporting was adhered to by these publications from 1988 to 2002, there was a significant divergence between the popular discourse and the scientific discourse. The study revealed that the prestige-press' insistence on balance, in fact, lead to biased coverage of both anthropogenic contributions to global warming and resultant action. In this endeavor, the US media has been more tactical than fair in interpreting the true meaning of climate change. The shift from balance to bias in the US media also represents a shift from convergence to contention. Boykoff (2007), describes the transformation in media representation of climate change to a focus on the differing scientific viewpoints. Boykoff evaluated the US media's focus on anthropogenic climate change related factors between 1995 and 2006. He reviewed newspapers and television news sources and conducted semi-structured interviews with climate scientists and environmental journalists. He used power and scale analytic methods and collated the issues of journalistic framing into the categories of "certainty" and "uncertainty". He discovered that the differing frameworks were not random but systematic; presenting climate change through the lens of socioeconomic and political power relations, as well as the journalist norms of balanced reporting. Boykoff and Boykoff (2007) continued to study journalistic norms about climate change and observed through content analysis of US newspaper and television coverage of anthropogenic climate change between 1988 to 2004 that the journalistic norm of creating interest by; personalization, dramatization, and novelty had significantly affected the norms of authority, order, and balanced coverage. This led to misrepresentative and biased media coverage of the climate change issue. Thus, the journalistic norm of balance has been Janus-faced in informing the public about the emerging scientific consensus about the role of human actions in global climate change (Boykoff, 2007). They especially noticed in an analysis of “balanced climate change reporting” in US and UK newspaper coverage between 2003 and 2006 that there was a significant divergence from scientific consensus in the US during 2003-2004, but UK coverage showed no major divergence.

Additionally, Boykoff (2008) also studied the role of broadcast media with the purpose of evaluating climate change reporting from the balanced/biased perspective. His article “Lost in translation?” quantitatively describes the US television news coverage of anthropogenic climate change between 1995–2004 in the ABC World News Tonight, CBS Evening News, NBC Nightly News, CNN Worldview, CNN Wolf Blitzer Reports and CNN News Night. The results revealed that 70% of US television news clips had delivered balanced coverage of anthropogenic contributions to climate change vis-à-vis natural radiative forces, but a significant difference was recorded between this television coverage and scientific consensus of anthropogenic climate change during that period. Therefore, through the institutionalized journalistic norm of balanced reporting, US television news coverage had carried out an informational bias by clearly diverging from the scientific consensus on human contribution to climate change. This has created a domino effect whereby the media of other countries reflect the US media’s point of view, despite the emerging scientific consensus that recently noted climate changes are anthropogenic. Additionally, a content analysis study of the US print media coverage of global warming from 2005 to 2008, focusing on specific linguistic elements, showed that media published by journalists, sociologists and geographers, gained a pronounced degree of certainty after the UN Climate Change Conference in December 2007 (Kuha, 2009). Boykoff (2008), research discusses the cultural politics of climate change discourse in four UK tabloid newspapers. The period of study of representation of climate change in these newspapers is from 2000 to 2006 focusing on triangulated Critical Discourse Analysis, framing and semi-structured interviews. Framing of news articles on climate change was predominantly through weather events, charismatic mega-fauna and movements of political actors and rhetoric, contrarily few articles emphasized on climate justice and risk. Furthermore, headlines were overwhelmingly highlighted with plenty of fear, misery and apocalyptic endings. The climate change had not been an interesting topic until it was placed in the decision-making process of the political system. The media covered the climate change issues when they were related with the elites.

Politicization and Celebrities Positions on Climate Change

Public figures are actively engaged in maintaining and managing their positive image in the eyes of the public (as seen and reported by the media). Moreover, symbiotically the publicity drawn by politicians and celebrities as they highlight climate change, or visit areas impacted by natural hazards influences the general public's views. Certain sudden disastrous weather events become focal points of attention that the media exploits in an alarming and thrilling manner. Russill and Nyssa (2009), call these moments "tipping points" in the climate change dialogue. Their study revealed that tipping points underline moments or intervals of high popular sensitivity to sudden and irrevocable climate changes, and identifiable quarters of danger.

When a political figure or celebrity is shown at the site of a catastrophe, or discusses it in an interview, the environmental issues of region where the natural hazard occurred, as well as the public figure involved, get extended media coverage. The trends of charismatic mega-fauna have changed from polar bears and wild moose to human celebrities shaping new discourses on probabilities for environmental governance and day-to-day action. In the last decade a significant increase in the media coverage of celebrities connected to climate change, has been observed in the various media outlets. New trends of neoliberal spaces have been generated by growing privatized and individualized modems of talking about environmental issues. U2 front man Bono in his interview with Vogue in October 2002, presented many complex, interwoven and contradictory factors very gracefully when he orated, (the word) "celebrity is a bit silly, but it's currency of a kind". Critics debated that whether such movements denoted betterment of the people or whether it was a rather plutocratic and extraordinary elitist behavior of distraction (Doyle, Farrell & Goodman, 2017; Park, 2019; Park, 2020).

Media transmit information through frames that shape people's understanding about climate change as well as the actions they are ultimately willing to take to address the issue. Climate change has become an interesting topic now that it has been championed by public figures. Therefore, scientists gave a push to the climate change media coverage with the politicization of the environmental issues. Similarly, personalized stories got more space in the media. Scientists, media reporters and politicians perceived and communicated differently and differences between them were systematic. Weingart, Engels, and Pansegrau (2000), maintained that the ecological risk of climate change might be a fact but its communication differed among the people of science, politics and media, for example, some perceived the risk of climate change through social construction and communicated it in different ways from other sectors. The differences between these three sectors were not random, but systematic, given the particular risk perceptions each of them encountered. In the German discourse on climate change, scientists politicized the issue, politicians reduced the scientific complexities and uncertainties to CO2 emissions reduction targets and the media overlooked the uncertainties, rephrasing them into a sequence of events leading to disaster, and needed immediate rectification. The interference of discourses was attributed to specific selectiveness - both inclusions and exclusions – happening as the issue of climate change was communicated. The issue was not truly or appropriately defined, rather it was assumed that the differences in perception were irreducible.

Political will without winning public opinion for climate change cannot be made operational and effective for which global public is yet to be effectively engaged. Gavin (2009), observed the climate change coverage plays its role in a public sphere, which is international in character, but in a modest way making political intervention difficult. Schipper (2007), wrote a paper focusing on the exploration of the international discourse on adaptation to climate change and the meaning of adaptation to climate change in the context of development. The work on adaptation until 2007 had concentrated on responding to the impacts of climate change instead of sufficiently focusing on the underlying factors that yielded vulnerability. Though there has been a significant shift in adaptation to be better placed in development all around but still there is a lot to do to get it. The successful adaptation process needed to properly address the underlying causes of vulnerability and that is the role, which development has to play. However, Liu et al. (2008) found that the emphasis on the solution of issues was placed more on mitigation strategies than on adaptation behaviors. Both governmental and non-governmental responsibilities and actions were proposed for handling climate change.

Media frames represent climate change issues by transmitting a purely scientific knowledge in contextualized and de-contextualized forms shaping contemporary cultural power politics of environment where a complex web, of formal environmental science and policy making in direct relation with everyday life, is evolved. Media representations of environmental, political and individualized actors, policymaking, governmental actions, predicaments and development are the key and vital influences, which devise media discourses about climate change. Boykoff (2009), suggests that legitimate claim makers are being consistently challenged and interrogated. Leiserowitz (2005) considers these arenas of claims making and framing are “exercises in power- those with the power to define the terms of the debate strongly determine the outcomes” (p. 1441). The comments and quotes of scientists, business and ENGOs actors helped to occupy more space in popular culture, especially in contemporary entertainment media and such developments have changed the structure and strategy of the cultural politics of climate change. Similarly, Finnegan (2006) observed that Arnold Schwarzenegger approved a California bill to cap industrial greenhouse gas emissions and cashed in on his popularity in his re-election campaign. Moreover, when Democrats turned up in the US Senate, Californian Democrat Barbara Boxer replaced Republican James Inhofe from Oklahoma as Chair of the Senate Environment and Public Works Committee. Inhofe (2003), in his famous comment on the floor of Senate declared, “Could it be that man-made global warming is the greatest hoax ever perpetrated on the American people? It sure sounds like it” (p. 33). Simon (2006), maintains that Boxer, in contrast, has declared global warming to be “the greatest challenge of our generation” and revealed plans for Congressional legislation to cap emissions of anthropogenic greenhouse gas.

The best-selling fiction author of “State of Fear” and the renowned anthropogenic climate dissenter Michael Crichton has reportedly been consulted by the ex-President George W. Bush on the issues of climate policy (Janofsky, 2006). These contrarians as well as carbon and fossil fuel industry interests persuaded media coverage by discursive pull and highlighting the existence of climate contrarianism. In February 2007, the Guardian examined that the US-based American Enterprise Institute, which was funded by the ExxonMobil, had offered $10,000 for article that emphasize the shortcomings of [then released] report from the UN IPCC (Sample, 2007). These apparently evident strong ties between carbon and fossil fuel industry, contrarians’ lobbying and policy actors of United

States Federal Administration not only proved the funding sources but also, as Oreskes (2004) mentioned, revealed that contrarian research was funded by such sponsors, which wanted predetermined results and interestingly researchers already knew what might be the outcome of their research. Such activities produced clear conflict of interest, undermining the integrity of the research conducted.

Accuracy challenges to media coverage of climate change.

Journalistic pressures and routines to cover climate change in enough depth to be considered accurate. Media coverage of climate change itself is a controversial and debatable issue which strongly influences public awareness, perception, opinion and knowledge, and negatively in the areas of scientific uncertainty, miscommunication and public misunderstanding. Media are the most important and heavily relied upon interpreters of scientific environmental knowledge and governmental policy information. Media are driven by commercialization, editorial pressures, media routines, journalistic norms and values, political, economic, social, cultural and institutional challenges as well as power relations, which affect the framing of environmental issues. The great environmental gestalt swindle of media has been a discursive battlefield of contrasting theories of climate change. It covers international scientific consensus on anthropogenic climate change on the one hand and on the other hand raises question marks concerning the sources and multifaceted factors of media coverage. The roots of partisan divisions over climate change are found in journalistic practices, technological changes along with individual level factors such as ideological and partisan identity have played in fostering polarization. It has caused a consequent uncertainty and confusion that yields to the lack of proper and timely governmental actions on grave environmental issues like global warming, glacier melting and sea level rising, which are intrinsically threatening human life, their livelihood and existence of the planet itself.

There are many associated political, economic, social, cultural and institutional challenges to allocate space and time to climate change issues in media. Media people such as reporters, journalists and editors often work within a competitive environment. Journalistic routines, norms and power relations engage them in the production of news articles and stories that can attract more audience or generate more revenue. With the increase of media coverage as well as non-media publications, stakeholders raising claims about environmental issues have continued to expand in numbers and this has not been decided yet even negotiations among international bodies that who are authorized definers, spokespersons and legitimate stakeholders of environmental issues. ENGOs have recently gained popularity and occupied the position of legitimate claim makers with their expertise and focused work plans on environmental issues (Boykoff, 2009). Scientists are actually engaged in their research and innovative pursuits of knowledge; they are least interested in sharing their findings related to impending dangers of climate change (Antilla, 2005). This vacuum of sharing knowledge with the public for their benefit is partially filled by the ENGOs taking responsibility of sharing scientific knowledge using their available funds and well-designed strategy to approach the masses. Other actors are governments, International organizations and multinational companies dealing with carbon and fossil fuel industry. However, the masses neither have easy access to, nor, are easily attracted towards distinct scientific knowledge disseminated by the non-media sources; however, media have a far greater influence on the general masses. Climate change reportage is subservient to socio-political factors and these factors are further affected by industry and economic concerns (Anderson, 2009). Many cultural and structural factors affect their individual journalistic decisions and other routine factors like limited time to press, limited word counts, segment timings, deadlines, limited funding for investigative journalism, and space considerations, editorial preferences and decisions and publisher pressures also influence their performance. Smith (2005), observed that media had to work under the influence of sourcing of story-making, competitive and time-pressured newsrooms, and timely trimming of news items into short news pieces. Howard-Williams (2009), maintains that media representations had been almost always positive towards climate change issues but often they were found connected with consumerists' values and were generally in favor of the social and political status quo. Commercialization of media with the modern multinational media organizations protecting developed countries' interests has either consolidated their media coverage operations or closed the desks concerned due to economic pressure. Lack of journalistic training also affects the quality of reporting. Block (2010), conducted a study to discuss the significance for journalists of undergoing interdisciplinary training to prepare them for reporting and communicating scientific and environmental knowledge. The poor scientific knowledge of the media and journalism has created skepticism in the public concerning facts of climate change and global warming. The author suggested that incorporation of environmental education in journalism schools was needed in order to better prepare graduates for environmental reporting. These structural issues intersect with processes such as journalistic norms and values - personalization, dramatization, novelty, authority-order bias and balance - precision, accuracy, fairness and objectivity, translating hypotheses into certainties and theory into practice.

Media coverage of climate change in North and South.

Media coverage of developing nations showed a different path from the media coverage of developed countries. The issue of development from the perspective of environmental issues, which is directly related with the carbon and fossil fuel industry and greenhouse gas emissions, is in conflict with the question of clipping the unruly development and the developing countries seem to be its victim, already dependent on western nations for their development. The impacts of impending catastrophe due to climate change on the development require immediate action to reduce them. This has increased the media coverage of climate change in UK newspapers. While discussing climate change the UK media highlighted and continued the predominantly held views of developing countries as being unfortunate victims confronting another set of disasters, which were already dependent on western nations (Doulton & Brown, 2009).

There is much scholarship available on media and climate change in the western world; however, few scholars have examined the developing countries' standpoint about anthropogenic climate change. Billett (2010), examined India's four major national circulation English language newspapers quantifying and qualifying the framing of climate change issues. The results displayed a strong contrast with previous studies of developed countries when the framing of climate change was studied along with a "risk-responsibility divide". The Indian national press adopted a highly nationalistic position on climate change, which divided the issue on developmental and postcolonial lines. Boykoff conducted a follow-up research in 2010 in response to Billett's paper "Dividing Climate Change" (Boykoff, 2010). Billett's research was a great catalyst, which initiated further investigations in India, in other countries as well as comparing countries and media forums. Billett disclosed both the feelings of hope and despair in his analysis of Indian media climate change coverage against the background of global trends. Billett's work demonstrated worn-out and nonproductive discourse along with a risk responsibility divide. This study showed a steady increase in Indian English-language national newspaper climate change coverage. The shift in Indian media discourses might be the start of shaping and scaling the prevailing challenges of North-South relations, risk-perceptions, matters of responsibility, and issues of mitigation, adaptation, justice and equality. In Panagariya's (2009)

view, India felt the impact of climate change in the last century, which showed that India needed enough preparation to be able to adapt to probable extreme weather change effects. Otherwise it would cause a problem maintaining high rates of growth and poverty alleviation.
The proposed efficient solution to mitigation can be reached either by imposing carbon tax or internationally tradable emission permits. The developed countries bear the major responsibility to compensate the developing countries bearing in mind past emissions. Media coverage of the North and South as well as developed and developing countries show that climate change is a global issue and needs attention from the perspective of justice and fair play, because media coverage affects public perceptions and opinions. However, research in the last few decades have revealed how these influential individuals and groups had projected competitive discourses, disabling emerging climate science and rephrasing climate science and policy matters as being uncertain, consequently causing public misunderstanding and confusion (McCright & Dunlap, 2003; Zehr, 2000). Similar to Billett (2010), a study of Peruvian media showed an absence of controversy regarding the scientific research of climate change (Takahashi, 2011). Interestingly, these results were different from the US and Europe media coverage of climate change (Boykoff & Boykoff, 2004; Carvalho & Burgess, 2005). Corbett and Durfee (2004), in their study examined whether simple and common elements of controversy and context in news framing affected readers' understanding of scientific uncertainty.

The contextual information in the news stories played a significant role in readers' certainty about scientific claims. The readers of newspaper stories containing contextual knowledge were more certain of global warming than those readers who read news stories with controversy or stories having neither context nor controversy. Bell (1994), made a comparison of the New Zealand public talk and media discourse of climate change focusing on the understanding of people about climate change. This author Identified and analyzed examples of overstatements, over-certainty and confusion in media text. The study revealed that there had been a significant mismatch between media reporting of scientific environmental knowledge and the public's understanding of that information. People generally over-estimate scientific measurement of temperature and the rise of the sea level. They confuse the differences between the greenhouse effect and ozone depletion. People have little knowledge of the greenhouse effect. This misunderstanding is socially and politically frustrating because it leads people away from concentrating on an issue of western consumer society most closely associated with the consumption of fossil fuels. Kenix (2008), found one that one of the reasons people do not understand climate change was coverage in New Zealand in the mainstream press– The New Zealand Herald - and alternative media – news site of Scoop. M Mainstream media coverage of climate change was inadequate while alternative media had been distinctive in framing the issues. However, coverage of climate change science in both mainstream and alternative media concentrated on extreme predictions instead of creating a conceptual understanding of root cause of climate change. This is in contrast to countries such as Pakistan where public awareness of climate change is growing. However, it is still low compared with advanced countries due to limited coverage of climate change in Pakistani news media (Sharif & Medvecky, 2018).

The media needs to educate the population to bring human change. Much of the media discourse revolves around creating technological changes that will address the climate change issue. US media coverage supports the dominant paradigm which serves the scientific, economic and governmental communities in their quest to promote technological rather than human solutions to climate change (Wilkins, 1993). According to Takahashi (2012), the dominance of political and industry discourse in Peru is related to technological solutions and possible economic losses, which excludes the effects on more vulnerable population. Likewise, in the Brazilian press, the ideology on environmental issues underlying most news is one in which the legitimacy of techno-centrism is presented as the best way of looking at environmental crises. Other environmental ideologies that would criticize advanced capitalism and the status quo do not receive the same amount of attention in the media (Guedes, 2000). The greater the coverage of an issue, the more powerful its effect: there is no doubt that media coverage is enormous yet it is not regular nor is it continuous. Sampei and Aoyagi-Usui (2009), observed that the analysis of coverage of global warming from 1998 to 2007 in Japanese newspapers and the impact of that coverage on public opinion during that period demonstrated that the public opinion about climate change was directly affected by its coverage. A dramatic increase in coverage in 2007 was directly related to an increase in public concern of the climate change issue. Media coverage of global warming had a short-term impact on public concern. The number of front-page articles on global warming significantly affected the public concern for climate change issues. Therefore, it is the media, which must educate the public on a regular basis being more responsible, cautious and impartial by allocating proper space and time to the coverage of climate change – an issue affecting the entire world.

Summary

This present study has revealed the complex opinions and socio-political dynamics that surround the reporting of climate change. Climatologists are divided on the degree of urgency that should be reflected in climate discourse, and the media attempt to reflect a balanced view. However, they are also under pressure from the fossil fuel industry to present a viewpoint that support *their* interests. Additionally, the public understanding of the issues is muddied by the politicization and celebrity involvement in the climate change rhetoric. A stronger sense of the real dangers of climate change should be emphasized in the media discourse.

To cushion the effects of climate change, there is thus a need for the media to use the power of the pen to push policy makers to prioritize climate change in decision-making. It can lobby for political commitment to make global leaders more responsive to vulnerable communities' needs and demands through consistent reporting.

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Analysis of the Impact of COVID-19 on the Share Investment of Top Five US Tech Companies

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Abstract

This research analyzed the impact of COVID-19 on the share investment business of the top five US companies: Facebook, Apple, Amazon, Microsoft and Google (FAAMG). This study used a mixed-methods research approach and secondary data to conduct a comparative analysis from pre-COVID-19 and post-COVID-19, which considers from March to December 2019 as the pre-COVID-19 period and from January to September 2020, after the arrival of the virus, as the post-COVID-19 period. This study has used data associated with quarterly revenue, disaggregated revenue, segments revenue, ROE ratio, and PE ratio with a view to analyzing the changes over this period. This research found that COVID-19 had a modest positive impact on FAAMG companies' revenue and net earnings by comparing quarterly operating results. As countries have adopted measures to prevent the spread of the pandemic, there has been a surge in demand for online trading and social interactions, so FAAMG companies' operating performance has increased. After a short period of decline, those five companies' share prices all reached historical highs. It is evident that Amazon's share price and operating performance have benefited the most, while with the significant rise of the share price. Apple, Facebook, and Microsoft have benefited both on business operating and share prices while remaining attractive investment opportunities. Google's share price rose the lowest, corresponding to relatively slow business growth and deteriorating investment opportunities. The findings of this study may be of interest to academics, researchers, businesses, investors, and policymakers.

Key words: COVID-19, share market, return on equity (ROE) ratio, price-earnings (PE) ratios

Introduction

The COVID-19 virus emerged in late 2019 and was declared a worldwide pandemic on March 11, 2020, by The World Health Organization (WHO). The pandemic's spread speed and range are almost the fastest in the recent 100 years of human history, far more severe than the Spanish flu, Ebola and SARS. The number of infections kept growing day by day. According to Reinhart (2020), the pandemic had infected approximately 3 million people and caused 227,000 deaths by April 30, 2020. The S&P 500 Index fell by 22% from January 21 to March 31 since the first case was declared in America. The reactions of the markets showed a likely worse scenario than the 2008 global financial crisis. Subsequently, governments adopted various prevention and control measures and related economic stimulus policies to the pandemic globally. Those control measures included regional lockdowns, restrictions on travel and business operation, temporary closures of shops, and quarantines (Toda, 2020). The pandemic and the control measures adopted by governments have significantly affected companies' operations and caused massive stock market volatility. This study has investigated the impact of COVID-19 on the share investment of five top US tech companies: Facebook, Apple, Amazon, Microsoft and Google (FAAMG).

The FAAMG companies are significant tech organizations and have been the engine and cornerstone of the American economy in the last two decades. FAAMG are the five largest American technology companies that have a specific representative significance for their research. Jasinski (2017) stated that these five companies covered mobile phones and computer hardware, software, applications, and services. Similarly, they play a dominant position in e-commerce, social networking platforms, cloud computing services, search, advertising, and streaming services. Forsyth (2020) argued that the whole US share market's overall performance could depend on these five stocks. As the consistency of reinvesting in their businesses, the market share of the biggest tech companies is more concentrated, and their growth investment ratios are twice the average of the S&P 500 (Weingarten, 2017). In 2017, FAAMG's net income contributed more than 30% of the total S&P 500 profit. Many stock commentators believe that FAAMG will continue to be the most important market players in the next decade. Their stock price changes are also a microcosm of the US stock market's economic changes, and their research is of great significance to the future trend of the US economy (Jasinski, 2017). The five US companies are the most important providers of consumer electronics, e-commerce services, cloud computing, social networking, and online search in the global market.

Facebook, Inc. (FB) is an American social network company. It’s useful and engaging products, including Facebook, Instagram, Messenger, WhatsApp, and Oculus. The company’s software and ecosystem allow billions of people around the world to connect. The majority of the firm’s revenue comes from advertisement selling. Facebook has also invested heavily in research and development in the field of virtual reality and artificial intelligence technologies (Facebook, 2020).

Apple Inc (AAPL), the world's most valuable company, designs, manufactures, and sells consumer electronics, and provides relevant software and online services. The company’s hardware products include smartphones, computers, the iPad, wearables, Home and Accessories. Apple’s services include iOS operating systems, digital content stores, streaming services, AppleCare, iCloud, and licensing. Apple is the only company that successfully integrates hardware and software digital products simultaneously. It became the first trillion-dollar market value company in 2018, and it broke through 2 trillion U.S. dollars in July this year (Apple, 2020).

Amazon.com, Inc. (AMZN) is the world-leading E-commerce and cloud computing corporation. Amazon is the largest Internet retailer globally, and the business can be divided into three segments: North America, International, and Amazon Web Services. The company also provides advertising services to sellers and third-party providers. In recent years, Amazon has kept being the number one measured by revenue and market capitalization of an E-commerce enterprise (Amazon, 2020).

Microsoft is well known as the operating system, Microsoft Windows, provider. The U.S. technology giant has demonstrated great strength in cloud-based solutions in recent years. The company is investing significant resources in the intelligent cloud and intelligent edge (Microsoft, 2020).

Google is an American internet-related technical enterprise that focuses on the search engine, cloud technology, smart-phone operating system, software and hardware, and algorithm technology. Google’s primary products and services include the Android operating system, Chrome, Gmail, Google Drive, Google Maps, and YouTube. Beyond advertising, Google is investing heavily in AI and quantum computing technology innovation to create new opportunities (Alphabet, 2020).

As reviewed in the literature, existing studies have found the US and Europe's share markets had an adverse reaction immediately after the first case of COVID-19 infection. The social policy announced afterward, also negatively affected the share markets' performance (Heyden & Heyden, 2020). Some economics experts warned of the severe impact of COVID-19 on social welfare and the economy, particularly on share market trading, global import and exportation, supply chain, and fuel prices. However, this research found that COVID-19 had a modest positive impact on FAAMG companies' revenue and net earnings by comparing quarterly operating results. In contrast, as countries have adopted measures to prevent the spread of the pandemic, there has been a surge in demand for online trading and social interactions, so FAAMG companies’ operating performance has increased. And after a short period of decline, those five companies’ share prices all reached historical highs. It is clear to see that Amazon’s share price and operating performance have benefited the most, while, with the significant rise of the share price, it would be risky to invest in the current situation. Apple, Facebook, and Microsoft have benefited both on business operating and share prices while remaining attractive investment opportunities. Google’s share price has risen the least, corresponding to relatively slow business growth and deteriorating investment opportunities.

This study has provided a comparative analysis of the pandemic impacts on the five companies’ quarterly business operations, return on equity ratio (ROE), price-earnings (PE) ratios, and the change rate’s calculation and comparison are essential for the conclusion. Similarly, it has adopted a formula to calculate the change rate of the variables from FAAMG companies' pre-and-after the COVID-19 outbreak to understand how the pandemic has impacted their business operation and share prices. Thus, this study is intended to provide practical and reliable evidence of how COVID-19 has affected FAAMG’s share investment business.

Literature Review

The outbreaks of pandemics can cause severe economic, social, and political disruption**.** A pandemic is defined as a new worldwide spread of disease that most people do not have immunity against. Carpenter et al. (2011) explored the same kind of disease in an outbreak in California. They found the pandemic affected the economy in those areas. Bloom and Mahal (1997) studied the relevance of AIDS and economic growth, but they found no evidence of causality among the two factors. Hulbert (2020) compared the share market performance between the 1918 Spanish Flu pandemic and COVID-19. He stated that both viruses caused fast-spreading global contagion, but the two eras' share market performance had a vast difference. For example, the Dow Jones Industrial Average was never lower than 5% during the Spanish flu event. In contrast, in March 2020 the Dow dropped 37% below the previous month. Hulbert stressed that the reason for the difference is there were no lockdowns in 1918. The lockdowns have led to barriers for the economy to recover and increased the uncertainty of businesses.

Lee (2020) stated that the COVID-19 pandemic has caused the most economic damage worldwide because of closer international integration and faster transmission. It appears there are different fundamental impacts compared with SARS and Ebola on share market performance in recent history. Many researchers have studied infectious diseases’ impacts on share price reactions, and they all got negative conclusions in the general markets except in some industries, such as pharmacy and biotechnology. Wang et al. (2013) studied biotechnology companies' share performance in the outbreak of several infectious diseases in Taiwan, including SARS and N1H1. They found that the biotechnology share performance appeared positive at the beginning of the outbreak. However, their share performance seemed to worsen as the diseases spread more broadly. Chen et al. (2007) reported the effects of SARS in Asian countries. Funck and Gutierre (2019) analyzed the impacts of Ebola in America. Ichev and Marinc (2018) found that the Ebola outbreak strongly affected companies' stock prices in the West African countries and America, close to the pandemic outbreaks.

In a recent study, Gormsen and Koijen (2020) forecasted the annual share dividend growth would drop almost 50% in the EU and the US in the next three years. Furthermore, GDP growth would also have a predicted 2.6% decline. Investors' confidence level about economic growth was reduced by 20% from the previous 90%. Baker et al. (2020) indicated an 11% year-on-year contraction of the American GDP at the end of 2020 by using an illustrative model. He et al. (2020) used conventional t-tests and non-parametric Man-Whitney tests to examine the relationship between the spill-over effect of COVID-19 and share market performance. They got a negative result on the investigation. They argued that the measures taken to prevent the transmission of COVID-19, such as social distancing policies, restrictions on travel, lockdowns, and monetary policy changes, have increased pressure on the economy.

Heyden and Heyden (2020) investigated the impact of COVID-19 on share markets worldwide. They pointed out that the US and Europe's share markets had an adverse reaction immediately after the first case of COVID-19 infection. Furthermore, they identified that the social policy announced afterward also negatively affected the share markets' performance, while later government monetary policy played a positive role in market stability. Daily FT (2020) elaborated that the Nikkei, the Tokyo Stock Exchange, has experienced a dropping trend since the outbreak of COVID-19. In particular, the Colombo Stock Exchange declined 9% in its All Share Price Index and had to close trading three times in one week. On the other hand, Onali (2020) signified no impact of COVID-19 on US share market returns and no evidence of a negative relationship between Italy's share market prices and France’s share exchange and the COVID-19 pandemic. The study concluded that the risk of COVID-19 to investors would be limited to a short time. The financial markets were in an uncertain situation, so it was challenging to determine the trading direction.

Ramelli and Wagner (2020) explained that the market reactions to COVID-19 and the subsequent financial policies adopted by governments changed firms’ values. They insisted that evidence showed share markets had fairly quickly responded to the possible economic consequences of COVID-19. Segal and Gerstel (2020) stated that investors seriously worried about the uncertainty of the financial markets’ investments. That appeared as a result of the severe volatility of share markets and share prices’ significant drop. Fear of COVID-19 outbreak has spread from health care to the share markets. Meanwhile, the US financial markets have shown a substantial decline in response to the impact of the COVID-19. In March, the Dow and the S&P experienced the most significant one-day drop since 1987. In the following few days, the S&P 500 index fell more than 20% from the start point of 2020 (Fernandes, 2020). As Baldwin and Mauro (2020) stressed, the manufacturing sector, the import and export activities among countries, and the consumption behaviours were all postponed. People had to wait for what would happen in the future. World Economic Outlook (2020) published that “the Great Lockdown” caused by COVID-19 could shrink the global economy by 3%. The damage would be much worse than the 2008 world economic crisis.

Lee (2020) used an event study method on the COVID-19 daily number of infections, and the results revealed that COVID-19 had impacted the share markets in China and America. The researchers used the daily confirmed COVID-19 cases data in March to compare with the two countries' contemporary share index performance. They found that there was a negative relationship between those two figures. Liu et al. (2020) revealed that investor sentiment affected share price changes. The pessimistic sentiment of the COVID-19 pandemic led to a fall of share indices. They showed an example of changes in Asian share indices. Those indices dropped more deeply than others at the beginning of the COVID-19 outbreak, while Asian share markets showed a trend of quicker recovery at the later stage of the crisis. A recent study, including three different datasets, showed that China, Korea, and Spain's share market performance had a relevant relationship with the number of COVID-19 cases. The study compared the number of deaths related to the pandemic, total COVID-19 cases, and share indices. But in some European countries, they surprisingly found less connection between COVID-19 and share markets, and those countries’ investors were not affected by the increased number of COVID-19 cases (Zeren & Hizarci, 2020).

Toda (2020) states that many governments have placed restrictions on travel, entry of overseas travelers and social distance measures, and business closures to stop the disease's spread. Many people had to stay at home and major events were closed down including schools. Besides, the global supply chain has been affected, and the global economic system has been experiencing disruption. Fiscal Monitor (2020) reported that governments worldwide took immediate actions to support affected businesses and protect the financial market. Many governments have formulated economic stimulus plans and injected capital into the markets. The US Federal Reserve lowered their interest rate to 0.25% on

March 15, 2020, which was the lowest in its history. Following the American counterpart, the European Central Bank (ECB) announced a negative rate after a few days. Governments worldwide came out with policies to support enterprises and employees. According to estimations, many affected countries' GDP will drop more than 10% (Fernandes, 2020). Gormsen and Koijen (2020) studied future share market growth expectations in response to COVID-19 and the government policy response. They found that share dividends were vital tools for forecasting models in applied research regarding share markets.

COVID-19 has as well impacted companies' businesses operating around the world. Some companies are experiencing a decline in revenue and net income, higher operating costs, or cash flow challenges, while others have the opposite results (Jim, 2020). Research on the labour market by Cajner et al. (2020) shows that, compared with 9 million people losing jobs in America in the 2008 Great Recession, 13 million people lost their jobs in just two weeks in March 2020. The hospitality industry suffered the most with around 4 million people having to leave work, and the unemployment rate reaching about 30%.

Yan et al. (2020 revealed that the lockdown and the increased medical electricity services requirements improved electronic medical service companies' share performance. The recommendation to investors was to short travel, technology, and entertainment companies' shares. At the same time, online entertainment and education were named defensive choices in this critical time. Li et al. (2020) also recommended that the healthcare sector would be an excellent place to locate money. Still, luxury companies' shares would be dangerous because of the high volatility of share price performance. Therefore, governments should take crucial action to limit the spread of COVID-19.

Some researchers studied different aspects of the financial market reaction during this abnormal period. Halling et al. (2020) focused on studying corporate bond issues affected by the COVID-19 crisis. They argued that bond financing became the primary means for companies to obtain funds during the crisis, and policymakers should support eliminating the default risk for loan borrowers. Their investigation showed mixed evidence that both market segments and liquidity channels had influenced the market reactions. Baret et al. (2020) argued that COVID-19 has seriously affected the financial markets, and bond yields, oil, and share prices have fallen deeply. Trillions of dollars across all markets are struggling to find a safe place. Sherif et al. (2020) argued that the outbreak of

COVID-19 and the volatility of oil prices negatively influenced the stability of the US share market through their examination of the relationships between the pandemic, oil prices, and the US share market. Because of the COVID-19 risk increasing in the world financial markets, many investors started to switch investments from share markets to the gold market during the pandemic (Zeren & Hizarci, 2020).

Harjoto et al. (2020) found that COVID-19 negatively impacted share markets worldwide. After the Federal Reserve Bank's (Fed's) stimulus policy announcement on 9 April in 2020, the US share market experienced a quick bounce back compared to other countries. They found that larger firms garnered more positive abnormal returns than small companies in America. Ma et al. (2020) stressed that the aggressive government stimulus monetary policy could effectively subsidise negative GDP growth. Nevertheless, emerging countries may suffer more economic and health difficulties from the COVID-19 pandemic. McKibbin and Fernando (2020) found that the negative impact of COVID-19 on emerging countries' share markets was more severe. They emphasized that the disadvantage of fiscal and monetary policy infrastructures, lower liquidity, and limited healthcare systems are the main reasons. Ramelli and Wagner (2020) conducted an event study on the relationship between corresponding firms' share performance and the stimulus policy from the Fed stimulus policy announcement. Although the Fed's stimulus policy intended to help more small businesses, larger companies with more market capitalization may gain more benefits than those small ones because they have excellent capital management capability (Farre-Mensa & Ljungqvist, 2016).

Methodology and Research Design

This study used a mixed methods research approach to analyze the impact of COVID-19 on FAAMG's stock investment. Mixed methods are a combination of both qualitative and quantitative methods. Bentahar and Cameron (2015) stated that mixed methods research could utilize qualitative and quantitative data to maximize optimization time and the efficiency of using resources in the research process. They argued that quantitative research collects and analyses numerical data to find patterns and averages, examines causality, creates forecasting, and recapitulates results to broader populations. In comparison, qualitative research uses non-numerical data, such as the natural and social sciences contexts, from a specific group of people. This study selected mixed methods to overcome shortcomings associated with either method and combine both methods' strengths. This study has used secondary data from published literature, FAAMG companies' financial statements, and related articles. Similarly, this study also used FAAMG companies' business operating statistics, ROE, and PE ratios related to the share performance. For making a comparative analysis, this study used the advantages of mixed methods over any single method, either qualitative or quantitative.

The research used only secondary data from publicly available domains and sources because secondary data is adequate to achieve its objectives. As described by Sherif (2018), secondary data analysis tries to answer the original research question with advanced statistical techniques by using previous academic information. Secondary data can help gain a full overview of the topic and a better understanding of other researchers' opinions. While it takes more time for primary data, gathering those sources in 16 weeks would have been difficult. On the other hand, secondary data is adequate and sufficient to answer the research questions and achieve the research objectives. Those data are valid and available on many public websites, and anyone can access and download those materials. Therefore, this study is only focusing on secondary data.

The data sources include online resources such as Google Scholar, ProQuest, ScienceDirect, ResearchGate, Academia, Edu and other resources. The majority of the literature resources came from ScienceDirect, ResearchGate, ProQuest, as they provided many similar search articles. Google Scholar and other websites also had many alternative materials. Similarly, data was collected from FAAMG companies' quarterly and annual reports, statements, and other publications. I collected those data and financial statistics by visiting Facebook, Apple, Amazon, Microsoft, and Google's official websites. In addition, some financial ratios and stock prices were collected from different financial websites, including Yahoo.com, MacroTrend.com, and Nasdaq.com. Companies' financial statistics were gathered over a period of 18 months, from March 2019 to June 2020, for data analysis.

This research used comparative analysis to contrast the changes in FAAMG companies' business operating, key share investment indicators, and share prices of pre-and-post COVID-19 periods. This study has used these variables, including net income, revenue, ROE, and PE ratios. The rate of change shows the specific change ratio during the two periods for the comparison. The rate of change is calculated using the ordinary growth rate (Talukder, Chile, 2013) calculation formula as shown below:

Rate of change: $(\frac{Q_1 - Q_0}{Q_0}) \times 100$;

where, Q_1 : current quantity and Q_0: previous quantity.

Analysis of Findings

The basic financial information of the five companies is presented in Table 1. These data are collected from Facebook (FB), Apple (AAPL), Amazon (AMZN), Microsoft (MSFT), and Google's (GOOG) 2019 annual reports on December 31, 2019, which was just on the outbreak of COVID-19. Apple had the highest market cap, above $1,360 billion, while Facebook had the lowest, less than $600 billion. On the other hand, Amazon's share price was the highest at $1,847 per share, but Microsoft's share price was the cheapest, at $157 per share. Amazon had the highest (80 times) PE ratio, which showed its share price had already been over purchased by investors. However, Apple's PE ratio was the lowest (23 times) compared with earnings per share; Apple's share price was the most attractive one. Overall, all five companies were profitable. Though Google had the lowest Return on Equity ratio (ROE), it still reached almost 20%. Facebook and Amazon's ROEs were above 20%, while Microsoft and Apple stand out with a very high equity return rate, both above 40%. ROE means dividing net income by shareholders' equity. Shareholders' equity is equal to total assets minus debt. It is considered as the measurement of how effective assets are being used to make money. The five companies appeared extraordinarily profitable at the end of 2019.

(a) Stock Price Reactions after the Outbreak of COVID-19

As shown in Figure 1, the FAAMG companies' share prices experienced a noticeable fall in the middle of March 2020 when COVID-19 was considered a severe pandemic. However, the share prices saw a V-shaped recovery right afterward and reached historical record highs. After the outbreak of COVID-19 and following lockdown and shelter-in-home restrictions imposed by the governments, FAAMG companies' share price was affected negatively in March.

However, the reduction was short. After all, online marketing requirements suddenly surged because people had to stay at home. In the second quarter, the stock price started to rise and kept the uptrend till September. All five companies' share prices reached historical highs at the end of September.

On the other hand, although the trend of FAAMG share price changes was consistent, the share prices of these five companies varied significantly in the process of rising and falling. The stock price of Amazon and Apple plummeted slightly but rebounded hugely afterward. However, Facebook and Google's stock price showed a massive decline in the early period and a smaller increase later. Amazon, Apple, and Microsoft's share price dropped around 20% in March then skyrocketed to above 40% in the middle of September. The stock prices of Amazon and Apple have even increased by 80%. Therefore, the pandemic impact appeared differently in the five companies. Amazon, Apple, and Microsoft's stock price showed the characteristics of being more resilient and rising than Facebook and Google.

(b) Quarterly Net Income Results Comparison

As shown in table 2, Microsoft and Apple's net income was as high as Amazon and Facebook's. This year, Apple and Microsoft's net income was similar, as high as around $11 billion each quarter. In comparison, Amazon's first quarter net income was the lowest of the five companies at only $2.5 billion, but it increased to $5.6 billion in the second quarter, which was higher than Facebook's $5.1 billion. Facebook's net income increased the most of the five companies in both quarters by an astonishing 101% and 98%, respectively. Amazon's net income declined in the first quarter because of the increased cost of protection facilities and training. According to Amazon (2020a), the company invested $4 billion in controlling the infection of COVID-19 internally and externally. However, Amazon's net income increased sharply by over 90% in the second quarter. Apple's net income dropped slightly in the first quarter but recovered by 12% in the second quarter. Microsoft's net income was increased by 22% in the first quarter, while it fell by 15% at the end of June. Google's net income stayed the same as last March, while the figures dropped dramatically in the second quarter. In sum, Facebook and Amazon's net incomes were positively affected by the outbreak of COVID-19. In comparison, the impact of the pandemic on Apple and Microsoft's net incomes was not visible. But Google's capability to make money was negatively impacted in the same period.

4.4 Quarterly Revenue Results in Comparison

As shown in Table 3, Amazon had the highest revenue among the five companies, while Facebook's revenue was lower than the others. Amazon maintained the highest quarterly revenue increase among the five companies after the COVID-19 outbreak. Compared with the previous year, it increased by 26% and 42% in the first and second quarters, respectively. At the end of June, Amazon's quarterly revenue reached $88 billion. Facebook and Microsoft's quarterly sales conservatively increased a little above 10%. In contrast, Apple and Google's sales increase level was the same, both only increased by around 10% after two quarters. Overall, the pandemic has significantly promoted Amazon's sales performance the most. Facebook and Microsoft's revenue also benefited from the sales increase from online demand. However, the impact of COVID-19 was not apparent in the sales changes of Apple and Google.

(c) Quarterly Disaggregated Revenue and Segment Profile Comparison

The categories of disaggregated and segmented revenue observe the nature, amount, sources of income and cash flows. The disaggregated revenue data showed detailed changes in different businesses, while the segment profile represented the revenue from different regions or departments. Therefore, comparing those two figures can identify the precise impact of COVID-19 on the companies' business performance.

As Table 4 shows, above 90% of Facebook's revenue comes from advertising, and that income kept growing after the outbreak of COVID-19. The increase rate was above 10% during the first and second quarters on a year-over-year basis. Although the other revenue section increased more rapidly, the proportion was still deficient. Facebook's global business increased significantly by above 14% in the first quarter, and the Asia-Pacific and North America kept a high increase in the second quarter. Facebook is the most widely used social media globally, so its advertising business has increased conservatively and rapidly due to many people staying at home for global lockdown and restriction policies.

As table 5 shows, Apple's hardware sales were affected materially during the first quarter of 2020 because of its supply chain disruption in China and physical store closures worldwide. While in the second quarter, those hardware sales retrieved and reached a high growth rate, iPad sales increased above 30%, Mac computer sales rose more than 20%, and iPhone sales were up 1.7%. Meantime, Apple's wearables, home and accessories, and online services sections, which did not need the physical stores channel for selling, have kept a double-digit increase during the two quarters. Nevertheless, in the geographic segment, the European and Rest of Asia Pacific markets kept growing during the two quarters after the outbreak of COVID-19, while the rest of the markets declined in the first quarter and bounced back in the second.

As table 6 shows, Amazon's online sales, including online stores, third-party seller services, subscription services, AWS, and others, all had incredible increases above 20% in the consecutive quarters of 2020. In comparison, its physical stores made a 7% increase in the first quarter but a 12% decrease in the second, which proved that online businesses benefited from COVID-19 compared with the negative impact on physical stores. The overall increase in the first quarter was more than 25%. In comparison, the rise in the second quarter expanded to a staggering over 40%. Sales in North America, which accounts for 60% of Amazon, has achieved high progress because it provided the necessary items that people needed to shelter-in-home to avoid the severe infection spread. The COVID-19 pandemic has extensively promoted Amazon sales as its e-commerce attributes and the advantage of the AWS cloud service.

As shown in Table 7, Microsoft's server products and cloud services contributed to the most significant revenue increase of 30% by the end of the first quarter. LinkedIn and office products and cloud services also grew by around 20% and 10%, respectively. In comparison, sales from gaming and devices declined slightly. On the other hand, the intelligent cloud segment sales increased the most in the segment profile, growing by 27% and 17% in the first and second quarters, respectively. The sales of the productivity and business processes, and more personal computing segments all increased modestly. Microsoft's business operating was not seemly affected by the pandemic.

As table 8 shows, Google's total revenue in the first quarter increased by 13% in the first quarter but decreased by 1.7% in the second. Google's cloud business and YouTube advertising income grew sharply in both quarters. Google's cloud revenue increased consistently, while its proportion of the total income was still deficient. In comparison, the most critical sales sources, Google search and

Google network member's properties, rose slightly in the first quarter but dropped in the second. In the segment profile, Google's sales in different regions showed the same characteristics: an increase in the first quarter while decreasing in the second. In the largest market, the US, Google's revenue maintained growth, although the increase was only 0.75% in the second quarter. Unlike APAC's consistent growth, sales in EMEA and other America's regions fell in the second quarter.

(d) Quarterly ROE and PE Ratio Comparison

Return on equity ratio (ROE) and Price-earnings (PE) ratios are the basic concepts and most popular valuation ratios to assess share value, especially for the companies' comparisons against their own historical record or other companies in the same industry. The higher ROE ratio means more profit-making efficiency, while the lower PE ratio indicates a better position to buy for the same company.

As shown in Table 9, Facebook's ROE remained stable at over 20% before and after the outbreak of COVID-19. Although it dropped 9% in the first quarter year-on-year, it rose 14% in the second quarter. Facebook's PE ratio continued to fall in the first and second quarters, which means Facebook's share price became more attractive according to its per-share earnings. Facebook's ROE and PE ratios depicted the company as having always remained reasonably priced and profitable. Thus, it is evident that COVID-19 had a more positive impact on Facebook's stock investment.

Apple's ROE and PE ratios both jumped significantly after the outbreak of COVID-19. Apple's ROE ratio rose 25% and 35% year over year in the first and second quarters, respectively. The increase indicated that COVID-19 has not affected Apple's profitability but has even improved its operational efficiency. As Apple's profits increased, its share price also skyrocketed even more than the earning making speed. Its online service businesses continued to grow with the recovery of the manufacturing and sales channels, its revenue and net income increased in the second quarter. Although the company's PE ratio also soared 26% and 66% simultaneously, Apple's stock still remained in a good position for investors at the end of the second quarter of 2020 because its ROE was as high as 70.66%, and its PE ratio was at a reasonable 27.69 level. COVID-19 has had a positive impact on Apple's business and stock investment.

Microsoft's revenue and net income experienced a moderate increase after the outbreak of COVID-19. Considering its ROE ratio has been around the 40% high level, Microsoft's business has remained highly profitable. The pandemic had little impact on Microsoft's business operation results, and the company has kept a very high-profit efficiency. However, with the sharp rise of the share price, Microsoft's PE ratio was at a high 35 level, which means it was not a suitable opportunity to buy at the end of the second quarter.

Amazon's ROE ratio dropped significantly by 38% in the first quarter after the outbreak of COVID-19 and continued to decline by 22% in the following season. In comparison, the company's PE ratio consistently increased by 25% and 35%, respectively, since the beginning of 2020. This phenomenon shows that Amazon's stock price has soared; meanwhile, its increase in profitability efficiency could not follow the same speed. On the contrary, the value of the share investment has fallen. The sharp rise in stock prices has caused the ROE ratio to fall and the PE ratio to rise. COVID-19 had a positive impact on Amazon's business, but excessively rising share prices make buying Amazon's stock risky now.

The ROE ratio of Google was increased by 8% in the first quarter while it was decreased by 19% in the second quarter compared to the same period in the previous year. Simultaneously, its PE ratio dropped by 20% in the first quarter, while it jumped by 42% in the second quarter. The figures show that both Google's ROE and PE ratios showed signs of deterioration. Its price increased the least of the five companies. Therefore, it is evident that COVID-19 negatively affected Google's business and stock value.

In sum, Apple has shown the highest efficiency of profitability of all time; even its PE ratio has increased remarkably. By the end of June, Apple's share price reached its historical high while it was still worth buying. Facebook and Microsoft were both in profitable business operating conditions, and their share price was reasonable. Amazon had the highest business increase rate while its share price rise was also the most elevated, which means risks have been accumulating. Google's ROE and PE showed it had been impacted the most by the pandemic on business performance. The lower ROE ratio and higher PE ratio in the second quarter indicated the company had experienced a declining business operation trend.

5. Conclusions

From the above analysis, it is evident that the five companies' share prices were affected significantly by the pandemic in the first quarter after the outbreak of COVID-19 because of governments' restriction policies and panic sentiments in markets. Nonetheless, it is also important to note that Amazon, Apple, and Microsoft's share price performances were more resilient than those of Facebook and Google. The five companies' share prices rebounded in the second quarter but presented a vast difference. Although Amazon's share increase was above the other companies, the growth of its revenue and net income could not keep the same speed as shown in the decline of the ROE ratio and the rise of the PE ratio. With the rising price, the investment value went down. Facebook, Apple, and Microsoft's share investment value remained reasonable, and Facebook's revenue and net income showed a higher increase rate than the other companies. In contrast, investors should be alert to Google's operations changes. The net income drops and deterioration on the ROE and PE ratio in the second quarter showed that COVID-19 has negatively impacted Google's primary income source: advertising. Google's share price also reflected the company's business operating results as they declined the most in the first quarter while they rose the least during the recovery.

The study has found that, due to business differences, the impact of COVID-19 on the five high tech companies' business operating varied greatly. Amazon gained the most revenue and net income increase in its all-business segments, not only online sales but AWS cloud computing. The company's second-quarter revenue was increased notably by over 40% on the year-over-year basis. The quarantine had a significant impact on physical stores but promoted online business which was the reason many Google customers reduced advertising expenditure, which led to a decline in its revenue and net income. On the other hand, Facebook's advertising business increased because of more increased users due to it being the most popular tool for people to remain in connection with others at home. Moreover, the comparison of ROE ratio changes for FAAMG companies showed Apple owned the most effective profitability even after significant share price rises. Furthermore, it is not only the company's operation that affects the decision to invest in shares but also whether they can be bought at the right price. The changes in the PE ratios of FAAMG companies provide an excellent investment reference. Although Amazon had the highest revenue and net income increase, the PE ratio (100) makes its share investment riskier.

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Evaluation of the Factors Affecting Information Security Management: The Case of Hempel China Ltd

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Abstract

With the development of emerging technologies, organizations are facing emerging cybersecurity issues and challenges. Organizations are vulnerable to sophisticated cyber-attacks that pose data privacy concerns. The purpose of this research is to understand the most fundamental factors that influence organizations to establish an information security framework. As for contributions, this research provides recommendations for understanding organizational security practices and further improvements, focusing on issues in information security management.

This research used quantitative analysis to analyze the collected data. Key findings highlight the factors affecting the establishment of an information security framework in Hempel China Ltd. Security awareness of employees is the most decisive factor, and the most effective means to enhance safety awareness is education and training. The most important factor that influences the effectiveness of training is an organization's security culture. Therefore, for small and medium-sized enterprises, with limited resources, the most effective way to establish information security is to cultivate an information security culture.

Keywords: Cyber security, information security awareness, information security culture, information security management

Introduction

In the 21st century, the main goal of information security is to identify and prevent potential risks and threats in key business processes (Rok, Borka & J-Blazic, 2008), protect financial resources (Yang et al., 2005) and corporate reputation, and strengthen internal compliance (Von Solms, 2005). With the continuous improvement of information technology and the expansion of global business, information security involves many areas, such as the Internet of Things (IoT), Cloud Computing, Bring Your Own Device (BYOD) etc. As well as the expanded scope and scale requirements of computer science and information security, companies need to obtain a comprehensive understanding of the security issues and challenges of critical networks to explore and mitigate their vulnerabilities and effectively protect their confidential and valuable data. Modern network information has brought rapid development to business, and ensuring information security is the primary challenge for all enterprises and consumers. Successfully establishing an information security framework is very important in a fast-growing enterprise like Hempel China Ltd, which is in the process of establishing an information security framework. The most important factors such as government policies, third-party payment companies, senior corporate leaders, Enterprise IT staff, terminal sales staff or consumers' awareness of their information security affecting the construction of an information security framework should be found.

The Hempel Group was established in 1992 by Zhiwei Gao. It is a large-scale enterprise integrating manufacturing, brand retailing, and trade export. The headquarters is located in Hangzhou, Zhejiang, China. Hempel group has nine subsidiaries and more than 10,000 employees in mainland China and Hong Kong (Hempel, 2020). According to Zhou Tao, the director of the company's information department, Hempel has a lot of hidden dangers in the construction of information security, including the awareness of information security of the company's senior management is not great. The awareness of information security of organizations and customers is the most important factor for improving information security. This mainly includes the awareness of the company's internal senior leaders and related employees, and consumers' awareness of the protection of personal information (Torten, Reaiche & Boyle, 2018). According to Kay (2016), athough 72% of people think there is a serious personal information leakage problem, there are still 55% of people who do not indicate the purpose of copying their personal information, and 34% choose to connect as long as there is a free network without considering security. It was also found that the company's senior management's awareness of information security is also very weak. Even if the company has enough funds to support the construction of an information security framework, it is not willing to arrange manpower to support it.

There are three reasons that motivated this research. First is that the retail industry is characterized by frequent transactions, and online sales in the apparel industry are particularly popular (Calisti, Proietti & Marchini, 2019). At the same time, customer management and supplier procurement management are also very critical upstream and downstream elements of the apparel retail industry. In this process, a large amount of data of the company/supplier/customer is generated, and the security of this data is the responsibility of the enterprise. This has attracted special attention from hackers, so data breaches in the retail industry have been particularly serious these years. For example, Home Depot lost more than 50 million card numbers in 2014 due to a data breach (Brett, 2019). Moreover, the credit card data of 5 million Sax and Lord & Taylor customers was recently stolen in 2018 (Green & Hanbury, 2018). Information leakage incidents continue to occur in different industries every year, and as the traditional retail industry is transforming into a new model, the impact of each information leakage incident on multiple companies is fatal. According to Equifax in the United States, 145.5 million Americans' sensitive financial information was exposed due to violations of company systems. These make the construction of information security urgent and important. So, how to establish an information security framework and find the key factors that determine the success or not in modern enterprise systems, including third-party cooperative companies, such as supply chain companies and third-party payment systems should be given high priority.

This study's objective is to identify the most fundamental causes that affect enterprise information security, and then help to build a proper information security framework and protect individual and corporate information security. The purpose of this research is to find these factors and the relationship of these factors and then provide operational and referenceable theories and data support for enterprises to establish an information security framework. Moreover, the significance of this research is that it can help Hempel understand the importance of information security and find the key factors which influence the establishment of information security. Whether from an enterprise or consumer perspective, everyone may start to care about information security and prevent information leakage.

Research Methodology

The method of finding the answer to the research question constitutes the research method, and the methodology is to give reasons for using this research method and analyze the influence of the researched theory on the method of use (Groves, 2009). Methodology mainly includes qualitative, quantitative or a mix of both. This research uses a quantitative method as the main methodology. Due to the methodological choice, the philosophy used in this research report is deductive reasoning. The role of deductive reasoning ranges from the more general to the more specific. This top-down approach first narrowed the scope of the study in the form of a questionnaire to collect data from the employees of Hempel's headquarters and stores based in Chengdu. Finally, the hypothesis based on the data collected by the questionnaire is verified to validate our original theory.

Research Design

This research aims to answer the question *What are the key factors that affect the establishment of Information Security in a modern enterprise such as Hempel China Ltd?* An online survey questionnaire method was used to collect data from the Hempel's headquarters employees and terminal sales staff. A quantitative analysis was performed to analyze the data collected through the survey questionnaire. In this analysis process, univariate analysis and bivariate analysis were used to analyze the collected data from multiple perspectives. This ensured that the collected data could more comprehensively find the key factors that affect the establishment of Hempel's information security.

Research Hypotheses

The following hypotheses were developed to answer the research question:

H1. The information security awareness of internal employees determines whether the information security process is strictly implemented following the guidance of the information security framework. The higher the awareness of information security, the higher the degree of execution.

H2. The company's framework structure or assessment mechanism determines the degree of implementation of the information security framework. If the company regards the completion of the implementation of the information security framework as an evaluation indicator, it will help the establishment and implementation of the information security framework

Data Collection

A total of 150 participants were contacted to collect the data through an online questionnaire. They were mainly divided into two groups: one is the terminal staff in Chengdu, the other group is from employees in headquarters. It should be mentioned that the performance of the entire sales of the Chengdu area accounts for nearly half of the Hempel women's brand, and its position is self-evident. All Chengdu regional terminal staff have mature terminal sales skills, and most of them are veteran employees who have worked in the company for more than five years. They are very mature in company processes and VIP customer management. Also, Chongqing, which is close to Chengdu, is an important city in the southwestern region where the economy is currently developing rapidly. Therefore, the results of the questionnaire on the terminal stores in Chengdu are very representative and represent the safety awareness and attitude of information in the entire terminal retail industry in China's rapidly developing southwestern region. On the other hand, the questionnaire for internal employees of the company started from within the company to dig out employees' understanding of information security in different positions, and at the same time understand the impact of information security awareness of employees as an information department at the company headquarters. In this way, the information security awareness of employees working in different positions and different regions are surveyed to gain a more comprehensive understanding of whether other related factors affect or determine their awareness and behaviour in addition to the employees' consciousness. This is also the key human factor that ultimately affects the smooth implementation of the information security framework.

Data Analysis

A total of 150 responses to the online questionnaire were received, mainly from terminal store employees and headquarters employees. The following sections explain how the collected data was analyzed.

Univariate Analysis

Univariate analysis was performed to describe the data and to find the patterns to reflect the basic information contained from the sample data in the simplest general form. Moreover, univariate analysis helped us to describe the centralized or discrete trends in the sample data. Although it does not deal with causes or relationships, it can picture the data and find structure in it. Some methods for displaying univariate data include frequency distribution tables, histograms, frequency polygons, and pie charts (Jong, 1994). Univariate analysis mainly focuses on the description of univariate and statistical inference. It uses the simplest general form to reflect the basic information contained in a large amount of sample data and describe the centralized or discrete trends in sample data. Univariate statistical inference is used to infer the overall situation from the sample data.

Through the security perception analysis, it can be seen that the perception level is mainly concentrated in insecurity (Table 1). 57 respondents (38%) think Hempel's information is insecure, and 27 people (18%) think the company's information is very insecure. Only 33 people (22%) think the company's information is safe. Through the analysis shown in Table 1, we can see, and even find out why, employees are dissatisfied with the company's security and, even if they know it is insecure, still choose to ignore the company's security policies.

Table 1. Security Assurance

		Frequency	Percentage	Effective Percentage	Cumulative Percentage
Effective	A	33	22.0	22.0	22.0
	B	33	22.0	22.0	44.0
	C	57	38.0	38.0	82.0
	D	27	18.0	18.0	100.0
	Total	150	100.0	100.0	

It can be seen from Table 2 that 63 people (42%) think the company does not have relevant information security training, 25 people (16.7%) strongly believe that the company has no information security training at all, and only 34 people (22.7%) think that there is some information security training. This also explains why a total 58.7% of the people (42% + 16.7%) need training on information security knowledge in terms of training needs. This is also what organizations need to consider. Since there is such a high training demand, it means that the training will be supported by employees, but at the same time how does the training achieve the preset goals?

Table 2. Security Training

		Frequency	Percentage	Effective Percentage	Cumulative Percentage
Effective	A	34	22.7	22.7	22.7
	B	28	18.7	18.7	41.3
	C	63	42.0	42.0	83.3
	D	25	16.7	16.7	100.0
	Total	150	100.0	100.0	

Bivariate Analysis

This research focused on using bivariate analysis to analyze the collected 150 valid questionnaires. The goal of bivariate analysis is to determine the correlation between two variables and to measure the ability to predict or explain them. Bivariate statistical analysis techniques include correlation analysis and regression analysis (Valdez, 2001). First, correlation analysis was done to analyze the collected questionnaire survey data. Correlation analysis refers to the analysis of two or more correlated variable elements, to measure the closeness of the two variable factors.

The SPSS analysis tool was used to analyze the key factors of the 15 questions. First, the A/B/C/Ds in the answers were converted into 1/2/3/4s for data statistics, and the relationship coefficient between each variable was obtained. A positive correlation coefficient indicates a positive correlation between the two. The larger the correlation coefficient, the higher the correlation is, while a negative correlation coefficient indicates that the two are in a negative correlation (see Table 3).

Table 3. Correlation coefficient

Correlation Coefficients

	Ever leaked	The private secret to login	Contact when not work	Connected to external devices	Customer leakage incident	VIP info registration	Fell secure degree	Firewall enabled	Security assured	Security training	Report security risk	Work password
Ever leaked	1.000	-.255**	-.035	.008	.159	-.018	.415*	.168	.041	-.025	-.073	.186*
The private secret to login	.255*	1.000	.242*	-.055	.070	.048	.180*	.089	.019	.006	-.066	-.114
Contact when no work	-.035	-.242**	1.000	-.176*	.003	.044	.059	.183*	.059	-.033	.104	.015
Connected to external devices	.008	-.055	-.176*	1.000	-.168*	.098	-.105	-.073	.013	.062	-.120	-.177*
Customer leakage incident	.159	.070	.003	-.168*	1.000	-.194*	-.086	.093	-.133	-.010	-.089	-.034
VIP information registration	-.018	.048	.044	.098	-.194*	1.000	.137	.007	220*	.162*	.115	.039
Fell secure degree	.415*	.180*	.059	-.105	-.086	.137	1.000	220**	389*	231**	.177*	-.021
Firewall enabled	.168	.089	.183*	-.073	.093	.007	220**	1.000	203*	.113	.092	-.035
Security assured	.041	.019	.059	.013	-.133	.220**	389**	.203*	1.000	408**	.057	.054
Security training	-.025	.006	-.033	.062	-.010	.162*	231**	.113	408*	1.000	.114	-.076
Report security risk	-.073	-.066	.104	-.120	-.089	.115	.177*	.092	.057	.114	1.000	-.164*

Work password		.186*	-.114	.015	-.177*	-.034	.039	-.021	-.035	.054	-.076	-.164*	1.000

For example, the correlation coefficient between "Fell secure degree" and "Security assured" is 0.389, the correlation coefficient between "Security assured" and "Fell secure degree" is 0.389 as well, the correlation coefficient between "Security assured" and "Security training" is 0.408, and the correlation coefficient between "Security training" and Security assured is 0.408. There is a clear positive correlation between each pair of variables.

In addition, this study also used cross-tab analysis to analyze the relationship and influence between two or three variables. Table 4 analyzes the demand for information security training of different genders and ages.

Table 4. Age, Security Training, and Gender

			Security training				total
			A	B	C	D	
Gender A	Age	A	7	3	1	2	13
		B	3	5	9	4	21
		C	2	1	5	1	9
	total		12	9	15	7	43
Gender B	Age	A	9	2	7	4	22
		B	9	15	34	10	68
		C	4	2	7	4	17
	total		22	19	48	18	107
Total	Age	A	16	5	8	6	35
		B	12	20	43	14	89
		C	6	3	12	5	26
	total		34	28	63	25	150

Finally, linear regression analysis was used to analyze the relationship between the dependent variable (fell secure degree) and the independent variables (VIP information registration, Firewall enabled, Security training and Report security risk). According to Table 5, perceived security level is closely related to VIP information protection, firewall settings, security training and reporting security risks. And security training affects perceived security level most closely, the value reaching 0.132.

Table 5. Linear Regression Analysis

Coefficients

Model		Unstandardized coefficients		Standardized coefficients	t	Sig.
		B	Std. error	beta		
1	(independent variable)	.783	.302		2.589	.011
	VIP information registration	.114	.069	.133	1.659	.099
	Firewall enabled	.127	.065	.156	1.940	.054
	Security training	.132	.057	.188	2.335	.021
	Report security risk	.113	.069	.132	1.634	.104

a. Dependent variable: fell secure degree

Findings

This section presents finding of the data analysis.

Correlation Analysis Results

From the results of the correlation analysis, the variables "Fell secure degree", "Security assured" and "Security training" have a very close positive correlation, and the correlation coefficient distribution reaches 0.389 and 0.408. That is to say, when the company improves the security training, the employee's "Fell secure degree" will increase, and then the "Security assured" will also increase. It can be seen from this research that information security training is the most important factor that affects the establishment of information security for Hempel, and it is the basis for promoting other influencing factors.

In addition, "VIP information registration" and "Security assure" also have a relatively close positive correlation, with a correlation coefficient of 0.22. This shows that employees recognize that the company's VIP form registration is unreasonable and there is a risk of information leakage, and this one is often ignored by many companies. This further shows that the company has irrationality in VIP business process management, which invisibly affects the establishment of company information security.

At the same time, the relationship between "Firewall enabled" and "Fell secure degree" and "Security assured" is also a more obvious positive correlation, the correlation coefficients are 0.22 and 0.20, respectively. A firewall is a basic guarantee to ensure employee safety. The company must install the firewall on each computer, and it needs to update the latest version in time.

From another perspective, the negative correlation between variables can also be seen from the correlation analysis. “Ever leaked” and “Fell secure degree” has a very obvious negative correlation -4.15, which means that the higher “Ever leaked” is, the lower “Fell secure degree” is. In other words, if you want to improve “Fell secure degree”, you have to reduce “Ever leaked”. At the same time, it can be seen from the correlation table that it is also negatively related to “Private secret to login” (-2.55).

Regression Analysis Results

Assessing regression assumptions involves independence of observations and linear relationship (each independent variable related to the dependent variable and between the dependent variable and the independent variable). In addition, the data shows that there is no multicollinearity (the highest variance expansion factor VIF is less than 0.4216), and there are no obvious outliers or significant values, except that the residual error is approximately normally distributed. Previous Table 5 shows that perceived security level is closely related to “VIP information protection”, “firewall settings”, “security training” and “reporting security risks”.

Table 6. Data Findings

Key facts	Results
Training/awareness/education	1. Serious lack of information security knowledge training 2. Weak information security awareness 3. Strong willingness to obtain relevant knowledge training 4. The company's performance appraisal is centred on sales, weakening the emphasis on information security
Technical support	1. Weak technical support and low financial support 2. Weak consciousness leads to disregard for existing technology
Process implementation (enterprise system)	1. The lack of effective data collection and evaluation will lead to the risk of data leakage, such as VIP form collection and collection of useless information
Access management	1. No access management supervision 2. Don't know the importance, lacking the knowledge about it

Testing Hypotheses

This research uses these findings to clearly state the results of each hypothesis test. For Hempel, these key elements are also the basic factors and affect the establishment of an information security framework, even in most companies in China.

Hypothesis H1

For testing Hypothesis H1 that employees' information security awareness has a positive impact on information security, data analysis of the questionnaire was conducted. In the results of correlation analysis, "Fell secure degree", "Security assured" and "Security training" have a very close positive correlation, and the correlation coefficient distribution reaches 0.389 and 0.408. Here "Security training" has the highest positive influence on the establishment of confidence and safety, while "Security training" is the most effective means to influence employee awareness.

As shown in Table 5, the compounded effects of each module on the average of the main facts remained relatively in accordance to Table 5, where "security training" still had the highest value of 13,2%, as well as "firewall enabled" (12.7%), followed by "VIP information protection" (11.4%) and "reporting security risks" (11.3%). Consistent with the results of correlation analysis, “security training” is still the core and most critical factor for the establishment of information security. The training of information security knowledge on the one hand, reflects the lack of information security knowledge of users, so there is a strong need for learning or seeking answers; on the other hand, the ultimate goal of information security training is to increase the user awareness through the dissemination of knowledge. At the same time, among the four factors in the regression analysis, "report security risk" is also one of the key factors although not the most influential (11.3%). This factor is the most direct manifestation of employees’ security awareness. Only when employees’ awareness is raised, will they be reported to the relevant departments when they face the risk of safety leakage or before the risk occurs, to prevent the occurrence of the risk or reduce the cost of occurrence. In addition, regarding “firewall enabled” (12.7%) and “VIP information protection” (11.4%), it is also an issue of consciousness domain. If you do not have security awareness, you will not realize the importance of firewalls, nor will you question and improve the rationality of VIP forms for the organization’s information security. Therefore, the results showed obvious support for Hypothesis H1.

Hypothesis H2

About Hypothesis H2 that the company’s performance appraisal system is positively related to the establishment of information security, the results of this data analysis have no obvious support, but there is still data to verify this hypothesis. Whether it is sharing Office Automation System (OA) access passwords in the terminal area, sharing personal passwords in the store, or the IT department’s lack of financial or human support from the company headquarters, the reason given by the respondents is “all affairs need to be given way to sales”. It can be seen that the company's assessment target is sales as the first or only indicator. The appraisal indicators directly affect the behaviour and awareness of employees, they just follow the company's appraisal performance to complete the appraisal goals. Regarding the influence of the corporate assessment mechanism in the establishment of corporate information security, it determines whether the company provides training services. According to the results of data analysis, information security training is the most important factor affecting the establishment of corporate information security.

Discussion

The discussion part analyzes and summarizes the research issues in order to find an understanding of the target theories from the origin, explore the neglected blank areas and obstacles, and propose improvements and related academic literature. The purpose of this discussion is to understand why companies perform poorly in these sections and find the key influence factors, to emphasize cybersecurity practices for parallel organizations.

Existing research (Chen, Zhao, Liang & Mei, 2014; Carbó & Rodríguez, 2012; DiPietro, 2017; Coull & Szymanski, 2009; Sankhwar & Pandey, 2017) highlights that IT technologies can prevent information security leaks, such as Windows Embedded POSReady 2009 installed with HIPS capability, P2P encryption, firewall and so on. The authors used a lot of data to verify that these technical methods are indeed very good and effective means to prevent information leakage. The data analysis results of this research also show that firewalls have a very high positive impact on the establishment of information security. The continuous upgrading of technology can indeed overcome hackers' attacks. Mbodila, Ndebele & Mbodila (2019) point out that Cloud Computing, Big Data, Internet of Things and other technologies in various fields and the mobile internet are accelerating the superposition and cross-border integration. Data explosion and model innovation will reach unprecedented levels, which will greatly exceed the traditional network security defense scope and industry management ideas and the technical means of security protection will face major challenges. Especially in the era of big data, important national industries and key areas such as electric power, transportation, and medical care are gradually accumulating strategic big data resources. The basic information of individual users and social activity information are also converging into important national data resources. Traditionally, system security and border security targeted protection methods will not be able to resist attacks aimed at data theft, and existing security protection methods will gradually be phased out. In addition, cloud-based computing and storage capabilities and virtualization management methods will bring huge challenges to the existing network security management system. New technology and high technology will be the most effective means to solve these challenges (Peters, 2019).

However, it was found that existing research did not mention about how to solve the problem of high prices of the latest security technologies. A lot of data proves that latest technologies can prevent information security leakage, but you have to pay a high price for the latest technologies, and it is difficult for ordinary small and medium-sized enterprises to pay the high cost of new technologies, especially developing small and medium-sized enterprises like Hempel China Ltd cannot afford to pay for high-tech expenditures. Even some large-scale retail enterprises in developed countries often choose to abandon high-tech upgrades in order to save high-tech expenditures. For example, in order to save costs, a famous retail company in the United States, Home Depot, did not update the company’s computer system in time and did not install anti-hacking P2P encryption, allowing hackers to take advantage of it. In September 2014, over 50 million card numbers were stolen during data breach (Brett, 2019).

Improve users' information security awareness through education and training

Employee behavioural awareness is the most basic element to achieve information security, and training is the most effective means. The data analysis results of this research also verify this. In the analysis of Hempel's questionnaire, the training requirement has the highest positive correlation with information security, and it is the most influential factor among all key factors. However, few existing articles mention how to optimize the training effect. In the data analysis of this research, it was observed that "the company only focuses on sales indicators", which has become the biggest factor affecting employee awareness. This reveals a hidden problem - the company's evaluation indicators, which means that the company's key performance indicators (KPI) are sales as the only indicator or a multi-dimensional evaluation that includes indicators such as information security. On the whole, this involves corporate culture, a culture of information security awareness.

Security culture is different from corporate culture. Ross (2011) mentions that there is no safety policy, standard, guideline or procedure that can foresee a situation that will be explained in all circumstances. So, if stakeholders are not based on security culture, they may take improper actions. However, Malcolmson (2009) says that security culture is not an end in itself, but a way to achieve and maintain other goals (such as the correct use of information). Organizational security culture needs to be supported by the organization's management. These are reflected in the organization's security practices and strategies, the level of compliance and understanding of these practices and strategies, and the awareness and understanding of organizational security threats. Regarding employee behaviour and awareness, Ross (2011) proposed that organizations need to recognize the level of information security culture and take measures to enhance it. Therefore, the promotion of a security culture within the organization is a clear case to ensure that the necessary practices become part of the natural behaviour of employees. However, Cristea (2015) concluded that security culture also means that safety issues are regarded as part of the organization's operations. Therefore, awareness and understanding of information security are essential to establish a successful information security culture. In addition, for implementing and cultivating a newly developed security culture, corporate culture changes are required.

Implications

Information security is a rapidly developing field. Any organization, regardless of its size, must take measures to improve and optimize its information operation environment under highly uncertain circumstances. The establishment of an information security management system will increase employees' awareness of information security, enhance the level of enterprise information security management, and enhance the ability of social organizations to resist catastrophic events. It is an important link in the construction of enterprise information and will greatly improve the security and management of information. The reliability of security makes it better serve the business development of the enterprise. Secondly, through the establishment of an information security management system, the ability to control information security risks can be effectively improved, and information security management can be made more scientific and effective by linking with hierarchical protection and risk assessment. Finally, the establishment of an information security management system will make the enterprise's management level in line with the international advanced level, and thus grow into strong support for the enterprise's international development and cooperation.

The implications of this research lie in the partial verification of the results of many previous studies, and the discovery of gaps that were previously ignored. In this research, it was verified that employee awareness is the biggest influence factor in the establishment of information security, and it also demonstrated that information technology support has a very positive influence on the establishment of information security. Regarding the influence of employee awareness in corporate management, some scholars mention that it can affect employee behaviour. This research finds the factor that affects employee awareness, that is, the company's assessment mechanism. The ideology of employees is closely related to personal income, and employee income is closely related to the company's performance appraisal. Therefore, the most effective way to change employees' security awareness is to start from the company's senior management's performance appraisal of the entire enterprise. In an era when sales are king, how can the establishment of an information security system be incorporated into the company's performance appraisal? This research introduces the concept of an information security culture, which is a concept different from a corporate culture. Only when this kind of cultural atmosphere is formed can it affect the company's performance appraisal indicators, and affect the awareness of employees and ultimately help the company to successfully establish an information security system and implement it smoothly. This research result has obvious significance for future research in this field, that is, how to influence and change employee awareness from the cultural field to successfully achieve the establishment of information security.

Conclusion

With the continuous development of new products, new markets with new types of consumers, companies are desperately looking for connections between them to share the benefits of digitalization. China's Internet economy is developing rapidly, and new digital models are constantly escalating. For example, Taobao and TikTok's live streaming products are in full swing. Every company wants to get its share, but many companies have not yet done so in response to the risks posed by the new wave, including cybersecurity issues brought by digital technologies and platforms. This research provides an extensive overview of the key factors affecting the establishment of enterprise information security. Through a large number of literature reviews and data analysis, we have found the key factors that influence information security management and determine their direct relationship. Through the review, we can see the rapid development of the organization and the improvement of the internal information security infrastructure; most information businesses have established standardized processes to manage information security issues and incidents. On the other hand, security is not only the concern of the IT department, but is the responsibility of all employees in all departments. To improve its position against security risks, the company should continue to strengthen its security plan. The company's performance appraisal is the fundamental means to change security awareness, and the direction of performance appraisal is related to the corporate security culture. Only when this security culture is formed, can companies respond to emerging cyber risks and defend against cyber-attacks in key areas.

This research fills the gap between the existing key factors that influence the establishment of organizational security practices and the factors that further enhance change. It also provides a benchmark for companies to quickly check their key practices. Generally speaking, this study is useful for Chinese companies who can benefit from the results of this research, while at the same time they need to consider how to carry out their information security development. It focuses on the changes in the field of information security and demonstrates how to respond to these changes and adapt to the new possibilities and challenges in the digital world during growth.

Limitations

Due to time constraints, 150 survey responses were received from Hempel's Chengdu area and headquarters, so this might raise a question about insufficient data for analysis. In addition, this research only investigated the information security establishment of Hempel. Although Hempel is a new and developing company in China, which is very representative in the research topics, from the perspective of data integrity, the amount of data is not large and comprehensive enough. Secondly, because information security requirements are changing, daily conditions and business conditions of different companies are also different, so the factors that affect the establishment of information security are also constantly changing. However, this research found that in the era of e-commerce development, companies often pursue sales as their first goal, leading to the common vulnerable practice of the entire company's culture centring on performance. The data analysis results obtained from the investigation and research clarify the importance of corporate training in the establishment of information security and analyze that the formation of a security culture may be the most fundamental means to improve the effectiveness of training. Companies can use this information to focus specifically on enhancing their information security practices. This is important for companies with limited budgets and information security resources.

Recommendations and Future Directions

Today, the Internet of Things has become a hot topic in many industries. This is also a serious topic from an information security perspective because connected devices create a huge potential for cyber-attacks. Therefore, the research potential is based on the risks associated with the Internet of Things when developing network equipment in different scenarios, combined with the management and security vulnerabilities previously discovered. In addition, with the emergence of new technologies, companies need to hurriedly develop new products and new sales channels without considering information security. It is worth finding out the unfavourable factors of each department and each development block for them so that the benefits of the Internet of Things can be maximized and the information security risks can be minimized.

Therefore, in the future, the scope of the research can be extended to the small and medium-sized developing retail industries in China, regarding their information security management. In terms of data collection, it is best to consider leading Chinese e-commerce companies, such as Alibaba, because they are at the forefront of China's information security construction, and their ideas are more forward looking. On the other hand, their ideas determine the degree of establishment of enterprise information security to a certain extent, and can also give other companies more reliable practical significance, and the collected data is also more reliable and representative. At the same time, the scope of the questionnaire survey needs to be expanded to the entire retail company, and the number of questionnaires needs to be expanded to the basic requirement of at least 500 to ensure the comprehensiveness of the data. In addition to the expansion of the scope of data collection, the key factors that affect the establishment of an organization's information security culture can be considered.

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Analysing Online House Transactions to Predict House Prices in Auckland

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Abstract

Recently, the Auckland real estate market has received sustained attention from overseas investors and local buyers. At the same time, affected by various factors including immigration policies and the economic environment, housing prices in Auckland experienced relatively large fluctuations in 2019. Various factors influence the real estate price in Auckland. Due to the lack of professional knowledge and IT background, ordinary buyers find it difficult to make an accurate forecast of housing prices, which also directly affects the judgment of investors or buyers when making real estate investment decisions. The objective of this research is to establish a prediction model of housing prices. The factors that have a major effect on real estate prices in Auckland have been determined through objective and scientific analysis of previous real estate data collected from online platforms in Auckland from July to September 2019. Specifically, the results of data analysis showed that the main factors affecting house prices in Auckland are land area and floor area. This research provides practical significance for the prediction of house prices in Auckland and provides reference for similar studies.

Keywords: Real Estate Industry, House Price in Auckland, Online Housing Transaction Data, Multiple Linear Regression, Prediction Model.

Introduction

According to the International Monetary Fund (IMF), New Zealand's economy grew by more than 3 percent in 2018. Over the past four years, New Zealand's economy has been the best since 2007, growing 3 percent in 2017, 4.1 percent in 2016, 4.2 percent in 2015 and 3.2 percent in 2014. The economy is expected to grow a further 3 percent in 2019 and 3.1 percent in 2020. According to the 2018 Auckland economic document, real estate-related industries account for 19 percent of the national economy, including 5.5 percent of construction, 7.9 percent of leasing, employment and real estate services, and 5.6 percent of owneroccupied operations. A total of 19 percent of the most important contributors is Auckland's economic growth (Auckland Economic Profile, 2018).

The Property Council of NZ commissioned a survey by Urban Economics; the results show that 53,050 people work in real estate, ranking fourth among all industries, behind manufacturing, professional medical services, and retail in Auckland (Urban Economics, 2017). Auckland's real estate value is NZD137 billion, of which commercial property is NZD38.8 billion (Property Council, 2014).

Why invest in Auckland

Auckland is one of the economic centers of the Asia-pacific region and one of the most business-friendly markets in the world. New Zealand's unique location between Asia, Australia, and the United States gives Auckland a distinct advantage in global connectivity, inter-city relationships, and investment. These advantages have attracted more than one hundred global multinationals to locate their Asia-Pacific headquarters in Auckland.

Another reason to invest in Auckland's real estate is the massive and sustainable population inflow. Statistics New Zealand's forecast of Auckland's population shows that Auckland's population growth is mainly due to an increase in births and net migration. The community will grow from 1.6 million in 2016 to 1.9–2.1 million in 2028 and is predicted to be 2.0–2.6 million in 2043 (Stats NZ, 2017), as shown in Figure 1.

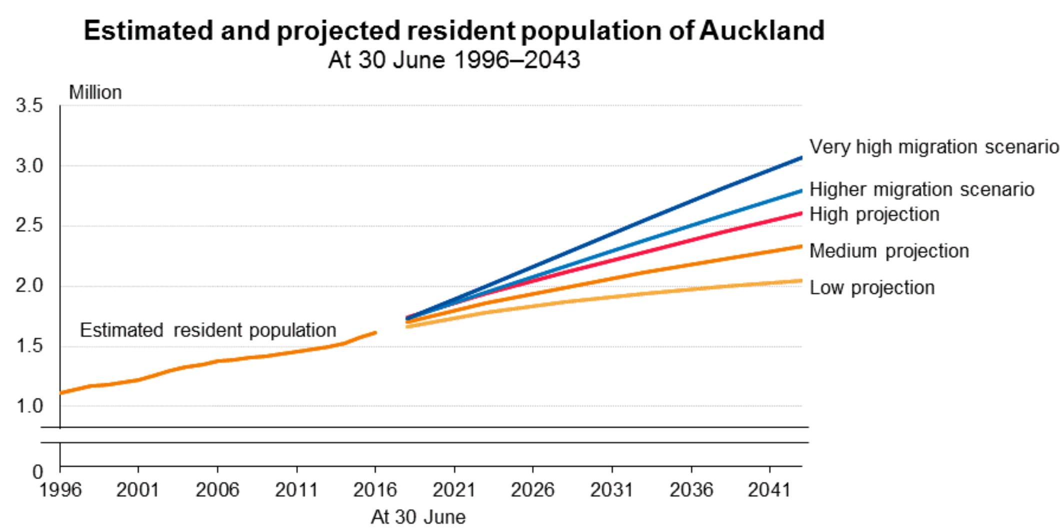

Figure 1. Estimated and projected resident population of Auckland (Stats NZ,

2017)

Auckland housing sales account for about 25 percent of New Zealand's total real estate sales, with an average price of about NZD826,000. It is currently the most expensive city in New Zealand. At the same time, construction activity has continued to increase over the past seven years. House prices have remained high, especially in Auckland (Norwell, 2019).

Data from multiple sources show that housing costs in Auckland are relatively high compared to the other regions of New Zealand. According to data from the Real Estate Institute of New Zealand (REINZ), Auckland has experienced more widespread and sustained price rises than other areas (REINZ, 2018). In a recent media interview, Bindi Norwell, the REINZ CEO, said that Auckland's housing prices had increased by 100 percent in the past decade, and there was a shortage of 104,000 homes in New Zealand, with a lack of 56,000 to 60,000 homes in Auckland (Norwell, 2019). As the number of immigrants increases, the influx of large numbers of people creates more demand.

However, with the implementation of the Overseas Investment Amendment Act on October 22, 2018, the real estate market in Auckland has been affected. The legislation limits the purchase of residential property in New Zealand by foreigners other than Australian and Singaporean citizens (New Zealand Parliament, 2018). The implementation of this legislation has affected a large number of overseas investors hoping to buy a residential property in New Zealand. At the same time, the global economic slowdown affected the rate of economic development in New Zealand. Recently housing prices in Auckland have fluctuated (Stats NZ, 2017). This makes it difficult for potential buyers who wish to invest in real estate in Auckland to determine the appropriate price for a house and to decide whether to buy a house or not. The same problem applies to house owners; it is very hard for them to calculate the value of their houses roughly.

The main factors that affect predicting Auckland house prices

In Auckland, there are two main factors influencing housing valuation: the first is the external market environment and policy factors, and the second is the physical features of the real estate (McCue & Kling, 1994; O'Donovan & Rae, 1997).

1. External Market Environment and Policies

To forecast Auckland house prices, external factors need to be considered. These typically include many macroeconomic variables, such as per capita disposable income, mortgage rates, affordability, land supply, and construction costs, including labour costs and construction materials. These are long-term determinants and will not be elaborated and analysed in this study.

2. Physical Characteristics of the Property

For house price prediction, the physical standards and characteristics of the building itself must be considered. Many factors can affect the value of a real estate property, such as location, age of the building, land area, floor area, internal structure of the building, and crime rate in the area (Candas et al., 2015).

Problem Statement

Real estate is a necessity for most Auckland people; it is not an ordinary consumable for most families (Frame & Newton, 2007). At the same time, compared with other consumer goods, real estate has a more stable value. In addition, some external factors such as technological progress and social development have a relatively small impact on real estate. In a healthy economic environment, people's demand for real estate generally shows a long-term upward trend, mainly due to the scarcity and non-renewability of land resources, and the increase in population and the improvement of residents' living standards will also lead to people's demand for real estate. Therefore, real estate investment has always been one of the most popular investment methods for investors (Hines, 2001).

Many factors affect the price of a house in Auckland. It is very complicated to determine the main factors that affect the value of a home. Therefore, there is a need for a model that helps to estimate the prices. Analysis of information collected from digital platforms like APPs and websites is one of the essential parts of such a model. The digital platforms can offer information by setting searching criteria to provide information on the factors that concern buyers most when they purchase a house in Auckland. Through this model, a system can be developed to guide investors' decisions regarding when to buy a home, and what is a reasonable price. This can promote sales and the rapid return of funds in Auckland.

Through the housing price forecast, evaluation of the appropriate value of buildings accurately enough for investors to invest, reduces the influence on the investment policy environment and economic environment of objective factors. These factors, such as pushing Auckland as New Zealand's most prosperous city makes it more attractive to investors and promotes the economic development of the city and staff employment, thus improving Auckland's status in the world.

This study aims to help those investors who do not have IT professional skills to use a simple method to collect transaction data for Auckland real estate from websites and applications. Intuitive, easy-to-use, reliable data to analyse and predict the price of real estate, reduces the risk of investors' misjudging housing prices.

This study aims to give answers to the following research questions:

- *What are the factors that affect house prices in Auckland?*
- *How is it possible to predict house prices by analysing online house transactions in Auckland?*

This study aims to achieve the following research objectives:

- *Develop a model that can be used to predict house prices in Auckland*
- *Identify the relationship between the factors identified and house prices in Auckland*

Significance of Research

Real estate investment is considered an essential form of investment worldwide (Lieser & Groh, 2014). If buyers can predict prices accurately, they can make the right decisions when they buy a home, earn higher returns on their investments and spend less on their purchases. But it is hard for ordinary buyers to predict prices. This study analyses and identifies the factors that affect house prices and develops a mathematical model to predict housing prices in Auckland, thus helping buyers to make good decisions. Through this research the following additional outcomes will arise:

1) The study can serve as a reference to Auckland real estate investment for both local and offshore investors.
2) The research results will provide some new perspectives for Auckland house price prediction.
3) The research might be helpful for buyers who do not have enough professional knowledge of real estate in Auckland.
4) The research identifies the critical factors that affect house prices in Auckland and how these factors are helpful for investors.

Literature Review

Many people consider real estate as a worldwide investment target. According to Case and Shiller (2003), house purchase is an investment made by buyers to realise the expectation of future house appreciation. In San Francisco, 63.8 percent of San Francisco people buy houses purely as an investment which shows the importance of real estate investment (Case & Shiller, 2003).

Real estate investment is considered the most significant expense in the average household budget, while housing is often the biggest saleable asset and the primary savings method. O 'Donovan and Rae's (1997) research showed that housing accounts for 19 percent of the average household's spending, and almost three-quarters of its total assets.

Bourassa (2010) analysed real estate investment and pointed out that the investment concept used in real estate investment is a narrow one. They said that real estate investment refers to people's investment activities in the development, management, operation, service, and consumption of real estate directly or indirectly to achieve specific predetermined goals. Real estate investment is designed in the fields of land development, housing construction, real estate management, and personal investment property. So, the investment here is advance funds (Bourassa et al., 2010).

Manganelli (2015) has given a more detailed definition of personal real estate investment in his study. Real estate personal property investment is referred to as an investment activity in which an investor purchases a property to meet their living or leasing needs and gains resale income when he or she is unwilling to hold the property. The object of property investment can be a newly built property or a second-hand property in the real estate market. Generally speaking, from a long-term investment perspective, real estate investment can obtain the benefits of preservation, appreciation, income, and consumption (Manganelli, 2015).

Investment in real estate is popular because of its advantages and because of the characteristics of real estate (Gholipour Fereidouni & Ariffin Masron, 2013). For example, Wurtzebach et al. (1991) have studied the effect of inflation on real estate and think that the real estate is an industry in the industrial category. It is generally believed that inflation has a relatively small impact on the industrial sector, so that once inflation sets in, the value of real estate will "rise with the overall price level" (Illing & Liu, 2006). Real estate has durability, so real estate is a good investment (especially long-term) and can yield a relatively large profit. For the vast majority of investors, real estate investment has a significant effect on fighting inflation and increasing personal income (Wurtzebach et al., 1991).

Factors Affecting House Prices

The factors influencing real estate prices are diverse and complex (Niu et al., 2016). Different scholars hold different views. The main factors influencing the price of real estate can be summarised as follows: the characteristics of the real estate, the external environment (social environment, real estate development, land supply, living environment, community environment) of the real estate, the economic environment, and the physical conditions of housing, (Candas et al., 2015; O'Donovan & Rae, 1997).

Feng, Li, and Zhao (2011) believed that the characteristics of real estate affect house prices. Real estate consists of three parts: land, buildings, and other aboveground objects. It is also a complex of physical objects, equity, and location. The characteristics of the land determine the characteristics of the real estate. From the perspective of real estate value, real estate is mostly immovable, unique, long-lived, limited in supply, huge in quantity, poor in liquidity, diverse in use, mutual in influence, and susceptible to external factors, value preservation and appreciation. The above characteristics of real estate determine that its price is different from general commodities. The cost of purchasing real estate, that is, the price of real estate, is also determined by these characteristics of real estate. Moreover, the expectations of consumers and investors for future real estate will affect the value of real estate directly. Due to the significant difference between real estate and general commodities, when real estate prices rise, people's expectations for future prices will rise. At this time, the number of investments in real estate will increase, which will lead to an increase in investment real estate holders and market supply. Conversely, when real estate prices fall, people's confidence in real estate prices will diminish, and investors will wait and see. This will reduce the demand for real estate in the investment market. At the same time, investors will sell real estate one after the other, causing panic about falling prices. At this time no one takes on purchasing, and demand continues to decline, further exacerbating the decline in prices (Feng et al., 2011).

Jiang (2012) believed that social stability is one of the crucial factors that affect house prices: if there is a stable social environment and a good social security system, people will be happy to make residential and commercial real estate investment. However, in the event of a major policy change, or social unrest or war, people will invest in assets which are easy to carry and liquidate, such as gold. This kind of social situation will seriously affect the proportion of investment in real estate, resulting in a decline in property prices (Jiang, 2012).

Mak et al. (2012) considered that the main factor that affects real estate prices is housing supply. The impact of real estate supply had three main factors: the proportion of real estate development investment; cost of real estate investment, and completed area (Mak, Choy & Ho, 2012).

Hui et al. (2007) believed that the factors influencing the real estate price lie in the community environment, including the ecological environment, living environment, physiological environment, social and cultural environment, and psychological environment.

The combined effect of the above four environments produces a psychological environment. The more a property meets the requirements of the overhead context, the higher its price will be (Hui, Chau, Pun, & Law, 2007).

O’Donovan and Rae in 1977 conducted the first comprehensive regional econometric analysis on the drivers of house prices in New Zealand. By simulating data on house prices in fourteen regions, they found that economic performance, agricultural commodity prices, and population size were the factors that affected relative house prices. Their analysis also found a negative correlation between unemployment and housing prices. They analysed the data in different regions and found a strong positive correlation between the impact of commodity prices on housing prices, but this relationship did not apply in Auckland or Wellington (O'Donovan & Rae, 1997).

Similar research has been conducted by Otto (2007). He considered that the factors that affect house prices may consist of several variables. He set six elements as the variables that affect house prices: population change, employment change, mortgage interest rate, unemployment rate, number of new housing starts, and per capita income. Interestingly, these variables not only affect house prices but also influence each other. For example, the number of new housing starts may represent a supply constraint. In other words, new construction is likely to be low in areas where supply is constrained, pushing up prices. Builders, on the other hand, respond to higher rates by building more homes. Similarly, changes in employment are likely to have a positive impact on house prices as an indicator of demand. Rising home prices, however, have been shown to harm job growth in a state by making it difficult to attract people to jobs in an area with high housing costs (Otto, 2007).

External economic and environmental factors such as macroeconomic policies, population, and loan interest rates are considered as well. Gu (2018) presented eight factors affecting housing prices, from supply and demand of these two aspects by analysing house prices in London from 1996 to 2016. These factors are real estate development investment, permanent residences completed, permanent dwellings started, interest rate, consumer price inflation, gross value added, gross disposable household income, and population per square kilometre. The author concluded that three factors had the most significant influence on house prices: income, population density, and the gross value added through scientific and objective analysis of estate market trends in London (Gu, 2018).

House Transaction Data Collection

For house transaction data collection, many researchers chose state-level home price indexes; however, some researchers found that underestimating the volatility of home prices in metropolitan areas was likely using state-level home price indexes.Case and Shiller (2003) found that they encountered some problems in collecting data from the Office of Federal Housing Enterprise

Oversight (OFHEO), but there was no reliable income data at the metropolitan level. Further, the OFHEO home price indexes used in most states do not reflect the high end of the market because they are based on sales of homes eligible for loans, which do not include the most expensive homes. Thus, the index probably underestimates the rise in the price of expensive homes. Because the accuracy of the data was an issue, the authors supplemented the data with surveys (Case & Shiller, 2003).

In the study by Nur et al. (2017), the research team used Value of Selling Tax Object-based house price data from the land and building tax payment agency. The biggest problem with the data was that the authors had only limited access to the land and building tax systems. As a result, the authors used only a nine-time series of housing data from 2014 to 2017 in Malang. The normalisation of data is to completely empty data within a specified period. It was assumed that land prices change every two years and that building prices tend to be stable (Nur et al., 2017).

Research Methodology

In this study, explanatory research is conducted to answer the research questions and meet its objectives. The purpose of explanatory research is to increase our understanding in a certain area, and to assist in this, the researcher explains how and why things happen. The researcher's intention is to produce actionable definitions based on requirements and to provide a better model for research (Becker & Schram, 1994). Explanatory research is used to find the cause-and-effect relationships between variables that focus on explaining in detail all aspects of what the researcher is studying.

In this study, an experimental strategy was employed to answer the research question. An experimental strategy is a scientific study in which one set of variables remains the same and another set of variables is measured as an experimental object (Christensen, 2007). The goal of this study is to find out the relationship between the factors affecting Auckland house prices; therefore, the researcher will study causal links between the variables affecting house prices and the house prices in Auckland. Eight variables are tested in this research by experimental study. There are two different approaches to social research:

quantitative research and qualitative research (Saunders et al., 2016). For this research, quantitative analysis methodology is more suitable due to the nature of the collected data.

Data Collection

In this study, secondary data is considered. The data the researcher needed to use for this research are data related to the housing itself, including the distance from the city centre, the housing area, the number of bedrooms, the land area, the number of toilets, the number of parks, the regional crime rate, the school zone score, and sold price. Through multi-online platforms comparison, it was found that the data provided by Oneroof best met the research requirements.

OneRoof is considered as a new home for real estate with hundreds of thousands of listings, the latest real estate news and market insights to help buyers make easier decisions: local schools, crime statistics, commute time, property value, market trends, mortgage calculation devices. OneRoof uses a range of publicly accessible data from local and regional councils to display details like previous sale prices and RVs. OneRoof aims to enhance New Zealand's real estate transactions through their core real estate market research and professional insights.

This study used data for only 80 houses in time series scattered throughout the Auckland City area between 2014 and 2017. Data is normalized by completing blank data at specific times and assuming that land prices change every two years, while construction prices tend to stabilize.

The transaction data of houses sold in Auckland during the three months from July 2019 to September 2019 were collected. By filtering the transaction data, 541 housing transactions were eligible. Meanwhile, considering that the housing price with investment property is close to or even higher than the median housing price published by the Auckland council, housing transaction data less than NZ$ 700,000 and more than NZ$ 7 million were removed to obtain 354 sets of housing sales data. Finally, through manual screening, a total of 80 datasets that met the research requirements were obtained.

The data tabulation offers information on the houses including house location, construction year, building area, number of bathrooms, land area, number of bedrooms, number of carparks, distance from city centre (km), school zone average score, crime rates, and sold price. All of these selected features were presented in number to allow for easy prediction using a linear regression model. The city centre in this study is defined as the location of the Auckland CBD. The distance to the city centre was calculated using Google maps.

Data Analysis

In this study, to identify the factors affecting house prices in Auckland as well as to develop a model to predict the house prices in Auckland, descriptive statistical analysis, correlation coefficient analysis and multiple linear regression method are used.

Research Hypotheses

In my study, a deductive approach was used as the research approach. In this study, nine hypotheses which cover nine factors that may affect the housing price in Auckland have been proposed. For each hypothesis, H_0 presents the null hypothesis while H_1 means the alternative hypothesis. The study aims to assess the following hypotheses, as shown in Table 1:

Table 1. Research Hypotheses

#	**Hypothesis**
H_0:	The location (Distance from City/kilometres) has no effect on the house price
H_1:	The location (Distance from City/kilometres) has an effect on the house price
H_0:	The decade built (Age) has no effect on the house price
H_1:	The decade built (Age) has an effect on the house price
H_0:	The number of bedrooms has no effect on the house price
H_1:	The number of bedrooms has an effect on the house price
H_0:	The number of bathrooms has no effect on the house price

H_1:	The number of bathrooms has an effect on the house price
H_1:	The car parking has an effect on the house price
H_0:	The car parking has no effect on the house price
H_1:	The floor area has no effect on the house price
H_0:	The floor area has an effect on the house price
H_1:	The land area has no effect on the house price
H_0:	The land area has an effect on the house price
H_1:	The school zone has no effect on the house price
H_0:	The school zone has an effect on the house price
H_1:	The crime rate has no effect on the house price
H_0:	The crime rate has an effect on the house price

Theoretical Framework

Based on reviewing the related literature, a theoretical framework was developed. In this research, the factors affecting house prices in Auckland are defined as follows: the distance from city; number of bedrooms; house age; number of bathrooms; land size; floor size; number of car parks; school zone; and crime rate, see Figure 2.

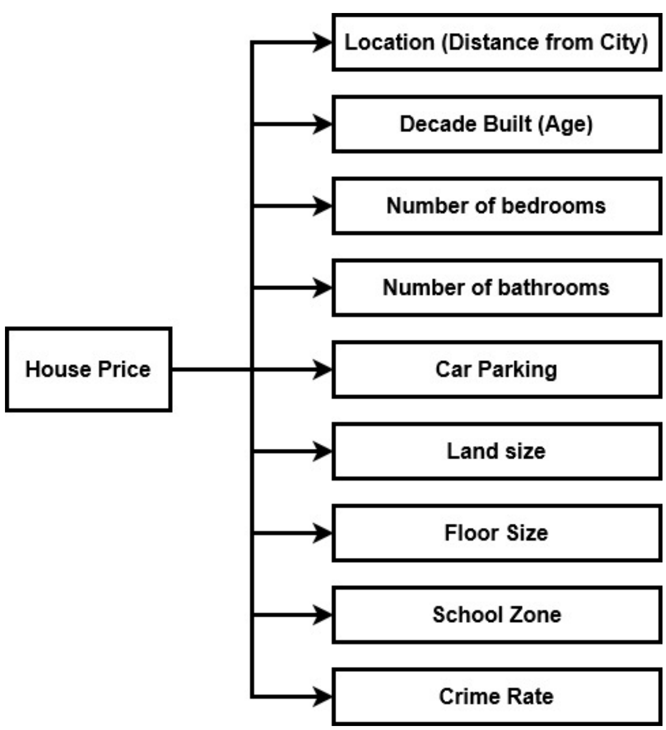

Figure 2. A theoretical framework (source: Author)

Findings

Descriptive statistic

In this study, a descriptive statistic is used to describe, summarise, and display trends in the data. Mean (average), mode (the value that occurs most frequently), minimum value, maximum value, and standard deviation (the average spread of scores around the mean) were calculated.
Table 2 shows the calculated values, where *N* represents the sample size.

Table 2. A descriptive statistic of data

Descriptive Statistics

	N	Minimum	Maximum	Mean	Mode	Std. Deviation
Location (Distance from City/kilometres)	80	2.2	67.0	20.247	21	11.6381
Decade Built	80	1900	2019	1982.24		29.578
Age	80	0	119	36.76	39	29.578
Number of Bedrooms	80	2	6	4.03	4	1.079
Number of Bathrooms	80	1	5	2.15	2	1.057
Car Parking	80	1	4	1.88	2	.603
Floor Area	80	72	585	205.44	190	105.713
Land Area	80	195	18076	1375.45	501	2851.639
School Zone	80	1.0	10.0	6.595	10	2.4926
Crime	80	1	2	1.06	1	.244
Price	80	722500	6850000	1418825.44	1,225,000.0	1072923.113
Valid N (listwise)	80					

In order to examine trends between the house price and these factors, appropriate diagrams were used to visualise and present the data. Figure 2 to Figure 10 show the relationships between the house price and each factor.

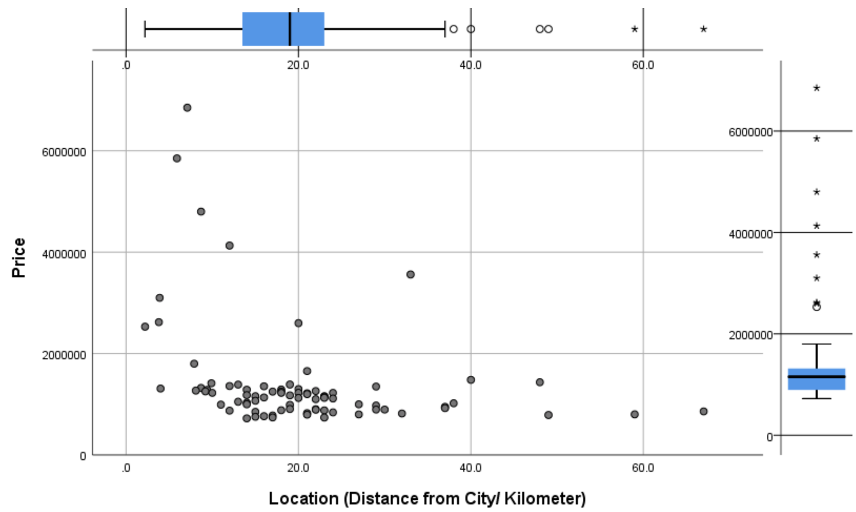

Figure 2. Relationship between location and house price

As shown in Figure 2, the house price decreases as the distance to the city increases. The highest price appears when the location of the house is about five kilometres from the centre of the city. Later, as the distance between the house and the city centre increased, the real sales price of the house did not increase significantly, and most of the house prices were concentrated between NZ$800,000 and 1.3 million.

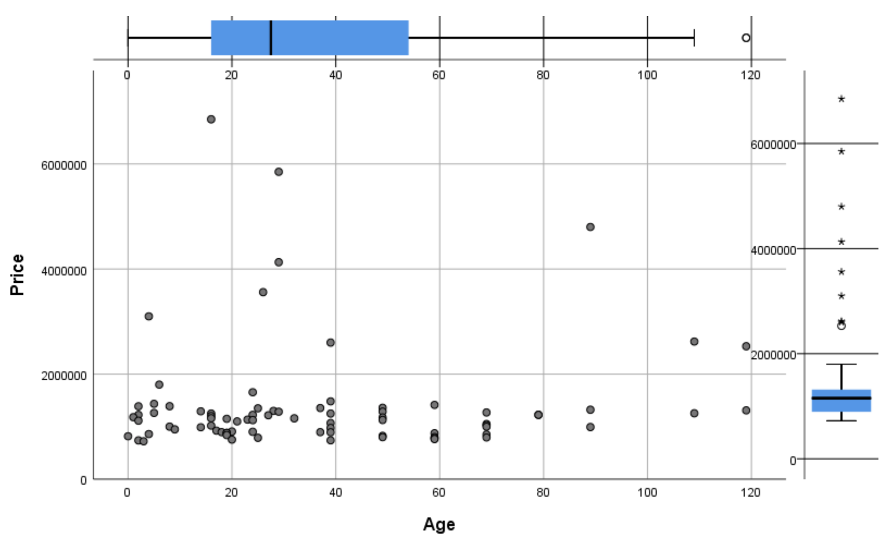

Figure 3. Relationship between age and house price

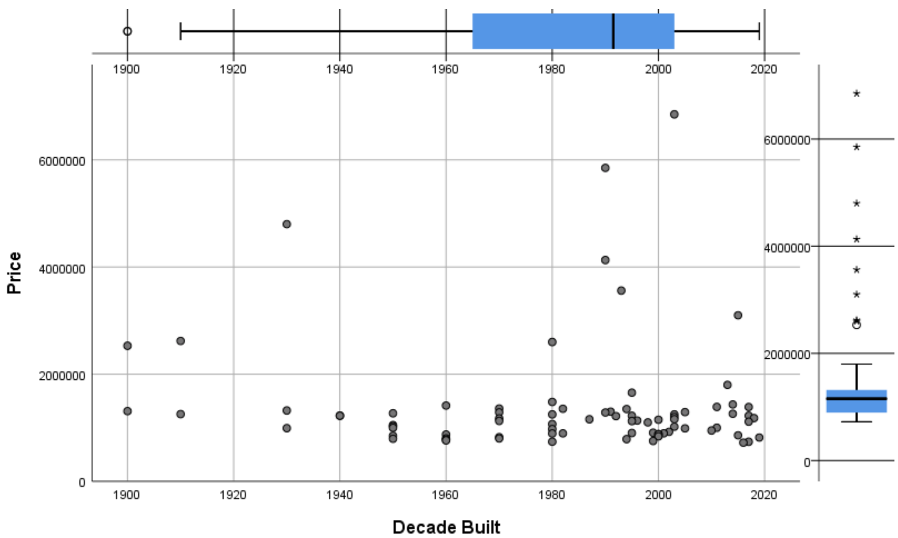

Figure 4. Relationship between decades built and house price

As shown in Figure 3 and Figure 4, the age of the house and the construction time of the house are the result of a set of mirror reflections. As can be seen from these two charts, the price of houses gradually decreases with the age of houses. As the houses get old, the prices of the houses decline. In the range where the age of the house is less than 40, it can be seen that the price of some houses decreases with the increase of the age of the house. But data on the age of homes between 40 and 80 years does not show a significant decline in house prices as the age of homes increases.

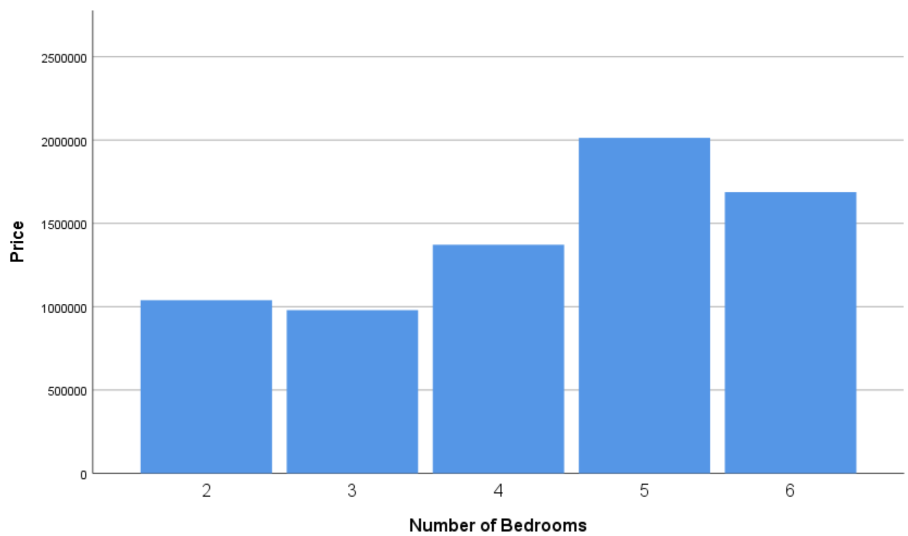

Figure 5. Relationship between number of bedrooms and house price

Figure 5 indicates that the obvious trend is when the number of bedrooms in a house exceeds three, the price of the house increases with the number of bedrooms. The value of a five-bedroom house is the highest, reaching an average price of $2 million. Yet six-bedroom houses are worth less than five-bedroom ones.

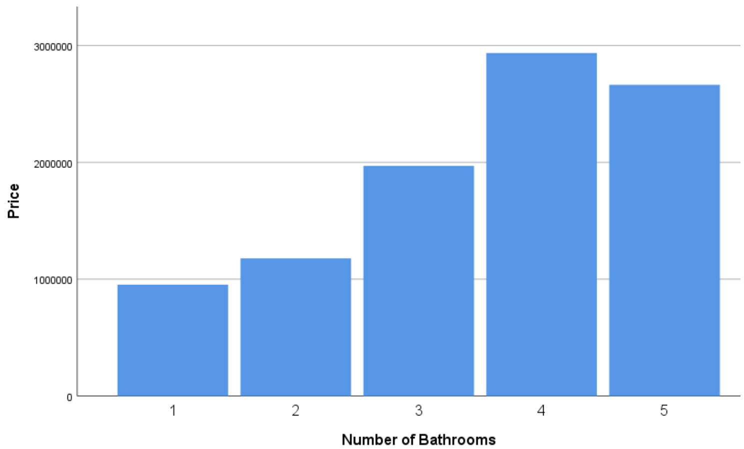

Figure 6. Relationship between number of bathrooms and house price

Figure 6 shows the relationship between number of bathrooms and house price. As can be seen from the figure, with the increase in the number of bathrooms, the price of houses increases accordingly. This happens when the number of bathrooms is between one and four, but when the number of bathrooms is more than four, the price of the house decreases.

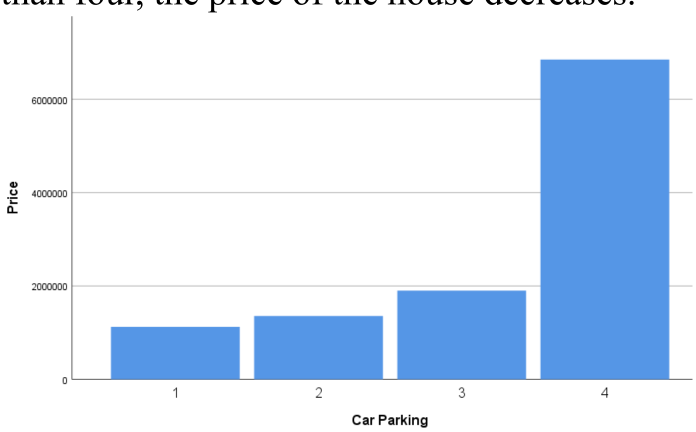

Figure 7. Relationship between car parking and house price

According to Figure 7, this graph shows the relationship between parking space and house value. Increase in the amount of parking space brings slowly rising house prices, while if the number of parking lots is less than four, the price of houses increases with an increase in the number of parking spaces. At the same time, while the number of parking spaces to achieve four, house prices have very significant growth, house prices rose by more than three times.

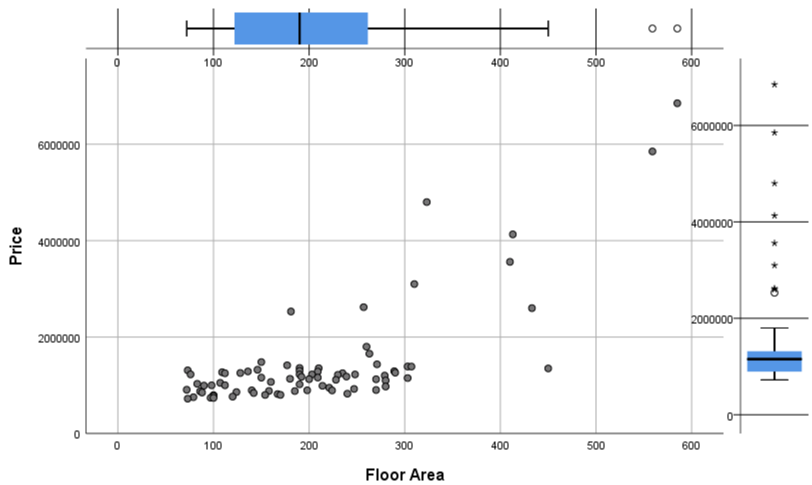

Figure 8. Relationship between floor area and house price

As can be seen from Figure 8, an increase in floor area will result in moving up in the housing price. At the same time, for houses with a floor area of one hundred square metres and three hundred square metres, the increase of price is not obvious with the increase of floor area.

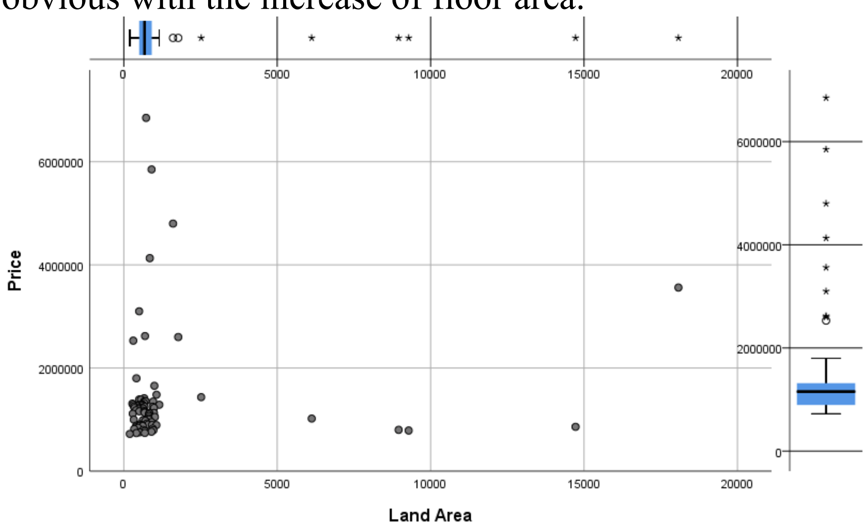

Figure 9. Relationship between land area and house price

Figure 9 shows the relationship between land area and housing price. According to the data, the land area of most houses is within 1000 square meters. However, interestingly, with the increase of land area, the housing price actually declines.

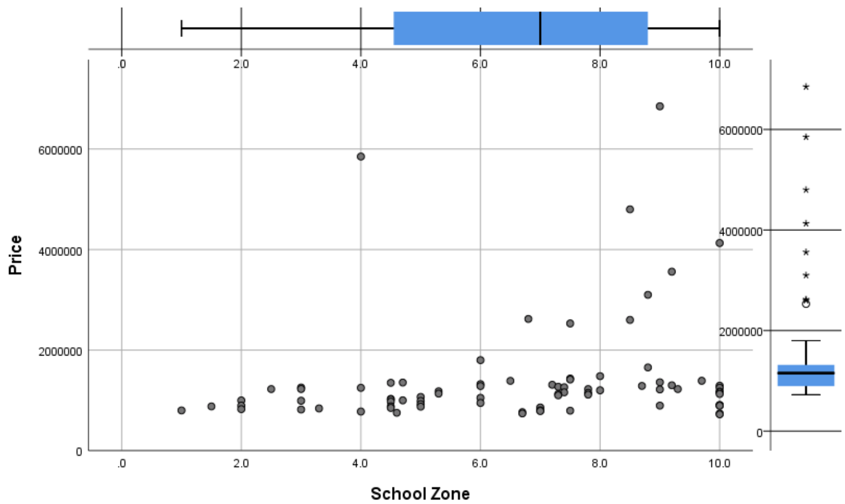

Figure 10. Relationship between school zone and house price

Figure 10 shows the relationship between school zone scores and housing prices. As can be seen from the figure, there is an obvious positive correlation between housing prices and school zone scores. That is, when school zone scores increase, housing prices increase correspondingly.

Assessment of Hypotheses

The correlation coefficient is used to evaluate the hypotheses proposed. In this study, Pearson Correlation is used to evaluate the proposed hypotheses.
Using correlation assessment, we are including home distance from the city centre, decade built, number of bedrooms, age of houses (the assumption and the housing construction time are mirror effects), the number of bathrooms, the land area, the number of parking spaces, floor area, school zone ratings and the crime rate to evaluate correlation between several assumptions.

Based on transaction data for 80 houses, we can clearly see that the relationship between the factors that affect house prices in Auckland, are as follows:

- The correlation value between the location and house price is “-0.321” which shows there is a weak negative relationship between distance from city and house price.
- The correlation value between the age of the house and price is “-0.062” which means there is no relationship between the age of the house and house price.
- The correlation value between number of bedrooms and price is “0.311” which means there is a weak positive relationship between the number of bedrooms and house price.

- The correlation value between the number of bathrooms and price is "0.524" which means there is a moderate positive relationship between the number of bathrooms and house price.
- The correlation value between the number of car parks and house price is "0.388" which means there is a moderate positive relationship between the number of car parks and house price.
- The correlation value between the floor area and house price is "0.739" which means there is a strong positive relationship between the size of floor and area house price.
- The correlation value between the land area and house price is "0.095" which means there is no relationship between the land area and house price.
- The correlation value between school zone and house price is "0.211" which means there is a weak positive relationship between the school zone and house price.
- The correlation value between crime rate and house price is "0.068" which means there is no relationship between the crime rate and house price.

Table 3 shows the assessment of the proposed hypotheses; whether each should be accepted or rejected.

Table 3. Assessment of Hypotheses

#	**Hypotheses**	**Accept/Reject (Sig. < 0.05)**
H_1:	The location (Distance from City/kilometres) has an effect on the house price	**Accept**
H_0:	The decade built (age) has no effect on the house price	**Accept**
H_1:	The number of bedrooms has an effect on the house price	**Accept**
H_1:	The number of bathrooms has an effect on the house price	**Accept**
H_0:	The car parking has no effect on the house price	**Accept**
H_0:	The floor area has an effect on the house price	**Accept**
H_1:	The land area has no effect on the house price	**Accept**
H_1:	The school zone has no effect on the house price	**Accept**

H_1:	The crime rate has no effect on the house price	**Accept**

Regression Analysis

Regression analysis is a set of statistical processes used to develop a mathematical model that can be used for estimating the relationships among variables. In this study, regression analysis was used to predict the house price (i.e., dependent variable) based on the factors that affect the house prices (i.e., independent variables). An SPSS tool is used to generate the relationship between the factors, see Table 4 and
Table 5.

Table 4. Regression Statistics Summary

Model Summary									
				Std. Error of the Estimate	Change Statistics				
Model	R	R Square	Adjusted R Square		R Square Change	F Change	df1	df2	Sig. F Change
1	.858[a]	.737	.703	584713.667	.737	21.778	9	70	.000
a. Predictors: (Constant), Crime, School Zone, Car Parking, Land Area, Number of Bedrooms, Age, Number of Bathrooms, Location (Distance from City/kilometres), Floor Area									

In Table 4-3, the R-Square value (0.737) measures how close the data are to the fitted regression line. A high R-squared value indicates that the prediction model will generate a highly accurate result. The value of "significant F-change" supports that the added variables significantly improved the prediction.

Table 5. Coefficient Values for the variables

Coefficients					
	Unstandardized Coefficients		Standardized Coefficients		
Model	B	Std. Error	Beta	t	Sig.

1	(Constant)	16530460.12	5530058.33		-.139	.003
	Location (Distance from City/kilometres)	-30769.883	9191.260	-.334	-3.348	.001
	Age	8227.454	2900.688	.227	2.836	.006
	Number of Bedrooms	-143878.599	82298.404	-.145	-1.748	.085
	Number of Bathrooms	130220.728	96212.542	.128	1.353	.180
	Car Parking	127146.674	140741.394	.071	.903	.369
	Floor Area	7384.720	1043.180	.728	7.079	.000
	Land Area	91.633	32.851	.244	2.789	.007
	School Zone	3686.575	29802.592	.009	.124	.902
	Crime	200881.535	304355.788	.046	.660	.511
a. Dependent Variable: Price						

Based on

Table 5, a mathematical formula was generated that can be used to estimate a house price in Auckland. However, some variables have a significant impact on house price (location, age, floor area, and land area). The rest of the factors have an impact on house price but are not significant.

The prediction formula is as follows:

$$
\begin{aligned}
\mathit{House\ Price} &= (-30769.8 * \mathit{Location}) + (-8227.5 * \mathit{Decade\ Built}) \\
&+ (-143878.6 * \mathit{Number\ of\ Bedrooms}) \\
&+ (130220.7 * \mathit{Number\ of\ Bathrooms}) \\
&+ (127146.7 * \mathit{Car\ Parking}) + (7384.7 * \mathit{Floor\ Area}) \\
&+ (91.6 * \mathit{Land\ Area}) + (3686.6 * \mathit{School\ Zone}) \\
&+ (200881.5 * \mathit{Crime}) + 16530460.12
\end{aligned}
$$

To predict a house price, we need to replace the variables with their values (house specifications) and calculate the price.

Evaluating the prediction outcome

In order to test and evaluate the prediction formula, Microsoft Excel was used to calculate a house price based on some specifications; see Table 6. Once the house details are entered, the estimated price will be calculated. In the example provided in Table 6, we can see that the predicted price was very close to the real price of the house. The difference was NZD $ 137,178.65 which is not that significant.

Table 6. House price prediction tool for Auckland city

House Price Prediction tool			
Factors	Coefficient value	Entered parameters	Calculation
Location	-30769.88288	20	-615397.6576
Decade Built	-8227.454483	1991	-16380861.88
Number of Bedrooms	-143878.5987	4	-575514.3948
Number of Bathrooms	130220.7278	2	260441.4556
Car Parking	127146.6742	2	254293.3484
Floor Area	7384.720277	190	1403096.853
Land Area	91.6325819	573	52505.46943
School Zone	3686.575436	9.2	33916.49401
Crime	200881.5354	1	200881.5354
Intercept (constant)	16530460.12	0	16530460.12
	Estimated Price	Real Price	Difference
	$ 1,163,821.35	$ 1,301,000.00	$ 137,178.65

According to result presented in Table 6, this prediction model can be used to provide a close estimation of real house prices in Auckland. Therefore, this model can be used by investors who plan to buy houses in Auckland. House owners who plan to sell their houses can also use this model to estimate the asking price for their houses.

Discussion

The study demonstrates a correlation between internal factors of real estate and house prices in Auckland. Through the analysis of multiple linear regression of OneRoof house transaction data, the floor area of the house was found to have the biggest influence on the price of a house in Auckland, followed by the number of bathrooms and car parking, the number of bedrooms and school zone are the two factors having a weak positive relationship to house price. The distance to the city had a weak negative relationship to house price, while the crime rate, age of the house, and land area had almost no correlation with the property price. This result was reasonable, but also somewhat surprising.

The Pearson Correlation analysis indicated that the number of bathrooms and car parks have a moderate positive relationship with house price in my study. The number of bathrooms and parking spaces had a certain impact on housing prices, mainly because in the Auckland region, many homeowners sublet their houses, so that more bathrooms and parking spaces can bring more rental income for the owners.

According to the data analysis in the previous chapter, we found that the distance between houses and the city centre had little influence on the prediction of housing prices, which has a strong relationship with the urban layout of Auckland. Auckland's residential units are regional, each area has corresponding supporting public facilities, such as schools, shopping malls, leisure and entertainment places, clinics, community service centres and so on. These good facilities enable residents to enjoy a convenient life wherever they live. So, the distance to the city centre is not the dominant factor in housing prices. Research on house value by Topcu and Kubat (2009) showed that the distances from the sea, central business district, university and health facilities were factors influencing land change. However, for Auckland, proximity to the city centre did not significantly affect housing prices.

The age of the house, the land area, and the crime rate show no relationship with house prices. These results are unexpected. Investors focused on the size of the house and whether there were sufficient bathrooms and parking spaces for rent. The ownership type of house transaction data selected for this research is freehold, these houses are independent, so the land size is not the main factor that affects the housing price. This conclusion is different from the results of Ylmazel et al. (2018), who believed that the size of the land, the number of rooms, the total number of floors, heating, bathrooms, elevators, parking, and kitchens are all factors that influence the housing price. It is also interesting that the crime rate has no impact on the house price - Auckland is a very safe city with a low crime rate. Residents feel very safe living there which can also be seen from the data we collected. Among the 80 sets of data collected, only two sets of data show that the crime rate in the area where the house is located is level 2, and the rest are all level 1, which means very safe. This is the reason that neither local buyers nor investors think about crime rates as having a major impact on house price.

Conclusions

In this study, by collecting the housing transaction data for 80 Auckland areas and conducting multiple linear analyses on the data, a mathematical model was developed to predict the housing price in Auckland. Floor area is identified as the main factor influencing the housing price.

This study not only provides academic references and makes a theoretical contribution for research in related fields, but also has a practical contribution. Many scholars have studied the real estate market in New Zealand and the factors that affect the price of real estate in New Zealand. This study obtains the latest data from an online platform directly, which not only provides a new data collection method, but also provides a strong reference value for the selection of influencing factors based on the characteristics of real estate in Auckland. This study also makes a significant practical contribution: we have designed a simple housing forecast model; By using the model, buyers and investors even without an IT background can predict the houses which they would like to purchase. The model can also help investors to make good decisions when they want to buy real estate.

Future Works

Although the research offers an important reference for Auckland homebuyers, there are gaps in what could be included in this study. The research scope of this study was selected as Auckland, and data collection and analysis of other areas were not carried out. Similar studies could be conducted in other New Zealand cities such as Wellington, Christchurch, and Hamilton.

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The Impact of Instagram's Business Advertisements on Customers' Attitudes and Purchasing Behaviours

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Abstract

This paper aims to investigate the impact of Instagram ads on users' purchasing behaviour and attitudes. It helps to know whether the Instagram platform and social influencers may affect people's perspectives on products or services. The study examines advertising effectiveness in these Instagram advertisements in terms of ad attitude and ad intrusiveness. A face-to-face survey was conducted with 123 participants. It investigated differences in gender attitudes toward Instagram advertising and purchase decisions based on gender. The outcomes indicated that influencers on social media can also influence consumers' positive attitudes and behaviour towards products. Moreover, social influencers' ads enhance consumer attitudes toward, behaviour.

Key Words: Instagram, eWOM, Social Influencer, Influencer Marketing, Customer Attitude, Buying behaviour

Introduction

As the second-generation social media vehicles have emerged and become famous, such platforms as Facebook, Twitter, YouTube, and Instagram have attracted plenty of attention. Many people who use the Internet have embraced the use of social media apps and the number is projected to continue on an upward trend as smartphones are popularized (Woods, 2016). Worldwide, active social media users' number 2.307 billion, with the most active group being 'millennials': 90% of the U.S. population aged 18 to 29 use social media platforms (Statista, 2017). From these numbers it is obvious that transparency performs a critical role in determining whether a company can be commercially successful nowadays. Nevertheless, the above-mentioned social media platforms have substantially affected the level of control an organization has over brand information in the communication environment that the organization must face and influence.

The increasing popularity of social networking services (SNS) and their large number of users also have a massive effect on the buying desires of customers. At present, customers are more reliant on the advice offered by others than ever before (Lu et al., 2014). Electronic word of mouth (eWOM), opinion exchanges, and online users' perceptions and viewpoints on social networking services are accepted as trustworthy sources of intelligence. From the customer's point of view, 74% of customers are dependent on social media apps to aid them with decision making when buying products or services (Bennet, 2014). Doh and Hwang (2009) show that customers are more trusting of eWOM than of company news, which means that traditional advertising and marketing have become less effective. These developments are forcing advertising firms to change and to reconsider conventional promotional tactics to engage consumers effectively. Among those adjustments, as well as modern tactics, is influencer-led advertising. Dominant marketers use influential figures to produce, spread, and disseminate advertisements to customers. Influential advertising has existed for some time and has conventionally been targeted at offline opinion leaders. Currently, the focal point of influencer-led advertising has switched to Internet-based influential figures, people with proactive engagement on social apps. Due to the large number of users and consumers trusting eWOM, the companies are now working with influential figures to spread advertisements among more potential customers. Some influential figures may obtain the products offered by the company for free, hoping that they may like them and upload product pictures and recommendations. Other influential people may get paid by the company to advertise the product and even be employed as a merchandiser or spokesperson in promotional events.

The advertising industry is very interested in influencer marketing. As revealed by Conner (2016), a vast majority of advertising and communications practitioners globally intend to hold one or more significant events over the following year. The budgets deployed to influencer-led events are on the increase, and researchers discovered that 61% of U.S. advertisers plan to spend more on their influencer-led advertising (Conner, 2016). Modern internet-based social influencers may be bloggers, a YouTuber who uploads video blogs that record their lives, or an Instagram user who shares their lives utilizing images. In some cases, influential figures pay attention to a particular SNS. However, different apps are frequently used in combination to expand their coverage. Among the many platforms for influencer-led advertising, Instagram occupies a significant position. The platform features eye-catching visual effects and has a considerable number of proactive customers, making it an essential vehicle for influencer-led advertising. There has been pilot research of influencer-led advertising. As revealed by a survey of 13 advertising firms, Instagram was among the top-choice of SNS sites that people can think of when mentioning this subject (Woods, 2016). The way influential figures communicate advertisements and the messages they include provide essential elements that influence customer response. As influencer-led advertising emerges, relevant studies are being conducted on, for instance, the number and range of fans, as well as the relationship between influential figures or the disclosure of promotional messages on consumer attitudes towards them (Marijke & Liselot, 2017). However, despite the need for scientific knowledge, only preliminary research has been conducted on influencer marketing. This paper is purposed to meet this demand while widening the scope of the current study. The information carried by influencer-led advertising on social media apps shows a similarity to marketing information because pictures and imagery titles are contained. In this paper, the impact of the factors mentioned above on customer response and the correlation between them is examined. Particularly in advertising influencer marketing, the findings regarding information bias and product descriptions raise interesting questions.

The bias of information is associated with the way and how the information is conveyed. By intentionally choosing to stress or ignore some details, customers' reactions to advertising messages may be affected. One sort of information bias is the bidirectional persuasive message, where an adverse message related to a brand, product, or service is voluntarily included in the information.

Regarding the impact of a visible message in an advertisement, the present research is based on the study of merchandise descriptions as well as a psychological image to discover in what way varied merchandise performance in advertisement information transmitted by influential figures can promote the psychological image and impact customer response. Advertising messages on

Instagram are designed to impact purchase intentions so that a visible description of the merchandise plays an essential role. Therefore, advertising messages on Instagram are considered to be a variety of internet-based advertising. Instagram is a highly successful social media app designed to share photos and clips in private or in public. It was established nearly a decade ago and it has a massive number of users globally. Among its accounts across the globe, more than half-a-billion users are proactive online daily (“Business Instagram”, n.d.). Instagram is ranked among the five most-used social media apps, and its prevalence shows an increase on a continuing basis (“Business Instagram”, n.d.).

Due to its increasing prevalence, Instagram has become a new and relevant subject of social media research. Particularly in advertising, Instagram has been creating novel ways on a continuing basis to sell advertising resources. The campaign began in November 2013 when sponsored advertisements were launched in the U.S. These are image ads which emerge between users’ news feeds. These ads were used globally in 2015 and are available to all advertisers. New features are added continuously to create more space for ads. For example, Instagram Stories ads were only launched in January 2017. At present, companies can purchase various marketing resources on Instagram: picture advertisements, clip advertisements, one post ads, and multiple photos/videos in story ads (“Business Instagram”, n.d.). Another fundamental and less obvious way to advertise on Instagram is influencer-led advertising. This sort of advertising requires companies to hire influential people to promote their products on Instagram. For example, this could be in the form of an influential figure publicizing a photo on Instagram while using a particular product or service.

Moreover, one of the latest varieties of digitized advertising is to employ social influencers (SI), also known as celebrities, primarily through Instagram. It combines eWOM and product positioning. This is an integrated method of advertising, which is why it looks great. Companies that expect to sell their commodities on social media don’t need to rely only on their own profile or pages. They simply post pictures through SIs to recommend products. In doing so, companies can access more extensive networks in some specific areas. However, some ‘fans’ still view this as purely advertising, which uses SIs to recommend products.

To understand the effectiveness of Instagram advertising it is necessary to understand the impact of various sorts of advertisements on customers. The way ads are experienced is an essential deciding factor for their future (Djafarova & Rushworth, 2017). This is usually reliant on the consumer's brand attitude and willingness to buy. However, advertising is also frequently bothersome and distracting (Verlegh, Fransen, & Kirmani, 2015). This can be counterproductive if there is an attempt to persuade customers (Burgoon, Alvara, Grandpre & Voulodakis, 2002). Research shows that an increasing number of people who feel they are being persuaded are more likely to resist such persuasive attempts (Burgoon et al., 2002; Verlegh et al., 2015). Therefore, it is essential to make a distinction between various sorts of advertisements because of their different effects on customers. In this study we look at how people react to various advertisements on Instagram and determine if the marketing tactics differ in terms of brand awareness, ad invasion, brand attitude, and impact on buying desire.

Problem Description

As revealed in a previous study, the pattern of customer interaction with brands has been transformed. People are accustomed to finding highly visualized messages from people who are defined as influential figures (Liu et al., 2010). Consequently, companies continue their attempts to explore the influence of influential figures on marketing. As indicated by Liu et al. (2010), selecting influencers is crucial for companies, as using the social media platform to advertise messages spreads their influence faster and more effectively, and ensures a wide following to their recommendations. Therefore, marketers must decide whether to use the social media platforms and influential people for advertising events, which have the potential to attract a more significant number of customers while boosting their return. As indicated by the prior study, the image of influencers positively impacts the brand to multiple people, and their brand recognition impacts positively on the company's economic strength. Marketing tools can assist managerial personnel to make the announcement of new products or to re-position existing ones (Constantin, 2009). According to Patil (2014), if consumers consider that influential people are more likely to make particular purchases, this will affect their own purchase intentions. Allowing for that, social media essentially makes consumers doubt company advertising in social media (Kim & Kim,2015). The real experience is simple because of experienced consumers. If managers and marketers know how Instagram users' perceptions of an influencer's reputation may have an impact on netizens, and the influence of these people on a buying desire, they can adjust their tactics, and use Instagram, as well as influencers, to be relevant conduits for purchases and to stimulate purchase growth. Therefore, Instagram has become a platform that attracts more consumers to participate, and influencers have released a convenient marketing tool, a crucial reference resource for consumers when making buying decisions (Marijke & Liselot, 2017).

Research Objectives

The object of this investigation is to recognize some gaps in the searched information, which sets the primary goals for quantitative research. Through the present study, there is a necessity to explore the general customer's purchasing behaviour in terms of people's lifestyle products. There is a necessity to understand customers' Instagram usage, opinions, and attitudes towards celebrities. To be specific, this study aims to validate whether Social Influencers have an impact on purchase behaviour. Another goal of this research paper is to get a broader understanding of people's online shopping options. The aim of decisive research is to indicate quantitative research hypotheses at the final stage of the paper.

Research Questions

The following are the research questions related to the research aims:

RQ1. How does an advertisement on Instagram influence customers' attitudes and purchasing behaviour?

RQ2. Do celebrities or Social Influencers (SIs) have an influence on customers' purchasing behaviour?

RQ3. What technologies do customers expect to be improved on Instagram?

The Significance of this Study

At present, major social media software companies have developed close social relationships with social media platforms like Instagram (Wilcox & Stephen, 2013). With the surge in social media usage, social media users, and their increasing reliance on the Internet tend to increase social relationships (Shin, 2016). Internet influencers have been accepted as a practical and cost-effective advertising model for the close communicative relationship they possess with their followers, prompting the latter to purchase what the former endorses (Trzcińska & Nożewski, 2016). As argued by Lim and Kim (2011), followers have internally developed close relationships with digital celebrities, and the latter's advertisements and endorsements have contributed to their influence on Social Networking Services.

From an academic perspective, only limited studies have focused on the impact of influential figures. Nevertheless, these researches concentrate on other prevalent socializing vehicles, for instance, microblogs, without significant study conducted directly associated with Instagram. Besides, limited studies have considered credibility factors for interaction with influential figures via blogs (Ohanian, 1990). Regarding social media as a vehicle to acquire brand-related information, they expect to gain a deeper understanding of brands. Consequently, the message sourced from the author may have an impact on people's positive feelings about the brand (Chu & Kim, 2011). This article may help an understanding as to the credibility of these influential figures among Instagram users premised on different studies. The primary objective of the paper is investigating socializing apps' subjective reliability of an influential figure for comprehending the effect on buying desire.

The research results are believed to provide a reference to the extensive research and its attempt to identify new elements in relation to digitalized customer acts, by exploring socializing apps' need to adapt in the future.

Methodology

Research Approach

This research followed the descriptive research approach. The researcher used a survey questionnaire to understand the participants' attitudes towards advertising on Instagram and whether these attitudes had an effect on their buying behaviour.

Research Design

A quantitative research design was used in this study. A survey questionnaire was used to collect information about Instagram users and how Social Influencers influence their purchasing behaviour. The survey questionnaire was designed with mostly a five-points Likert Scale to measure buying attitudes, Social Influencers' credibility, and Instagram purchasing experiences where the participants need to choose.

Population and Sampling Size

A convenience sampling technique has been used in this research project. Convenience sampling refers to participants volunteering to participate in the questionnaire survey, and they are easily available. The population of this study was ICL Graduate Business School, a Private Training Establishment (PTE) in Auckland, New Zealand. In this research, the population includes people between the ages of 20 and 50 who have accounts on Instagram, only consider those active users of Instagram accounts, and follow at least one social influencer on this platform.

The participants were the business students of level 6 to level 9. They included Level 6 students majoring in Early Childhood Education and Care, and the Business programme. The Level 7 students were majoring in Hospitality Management and International Tourism Management. The Level 8 students' major was business, and Level 9 were students of Master of Business Informatics (MBI).

There were 123 participants in this study out of 350 students. Regarding gender issues, 49.2% were female, 50% were male, and 0.8% chose confidentiality. At level 6, 25 students were surveyed. There were 39 participants at level 7. Fifteen Level 8 students participated in the survey, and 44 students from Level 9 participated (Figure 1). The largest age group was the Level 9 students, the second largest was Level 7.

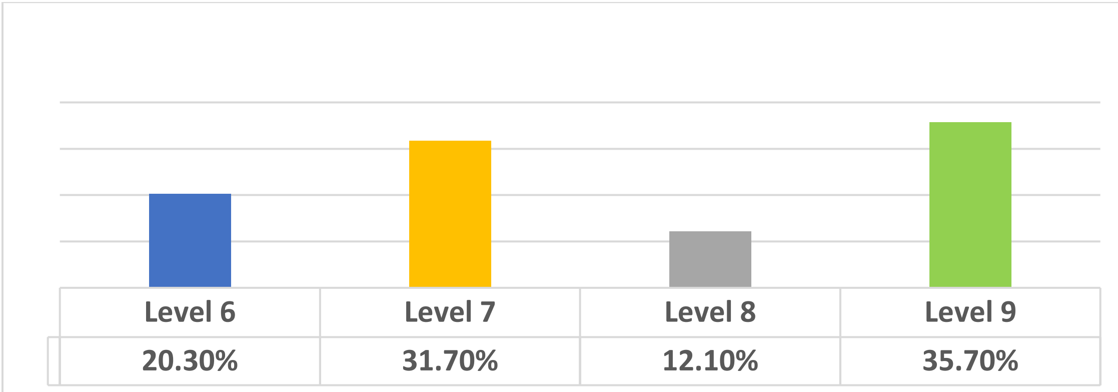

Figure 1: The distribution of participants by different levels

Data Collection Tool and Procedure

A survey questionnaire was used to collect information from the participants. In the survey questionnaire (19 Questions), the Likert scale was mainly used. Most of the questions (Q6-Q17) were answered on a 5-point Likert scale, where 1 meant "strongly disagree" and 5 "strongly agree". In questions 1-5, the participants were asked to provide their demographic information such as gender, age and basic information regarding Instagram such as Instagram advertisements and spending time on Instagram per week.

The questionnaires were collected face-to-face from the ICL Graduate Business School. Only completed questionnaires were used for the purpose of analysis.

Data Analysis

All questionnaires were numbered (1- 123) after collecting from the participants. A descriptive analysis technique used Statistical Programme for Social Science (SPSS) software to analyse the data such as participants' demographic background, credibility of Social Influencers (SIs), attitudes towards advertisements on Instagram and expectations for further improvement of Instagram.

Results

Background of the Respondents

The study had a total of 123 participants. Regarding gender issues, women accounted for 49.2% of participants, 50% were men. The largest age group was 21-30 years old, accounting for 70.7%, followed by 31-40-year old accounting for 26.8%. Results are shown in Figure *2*.

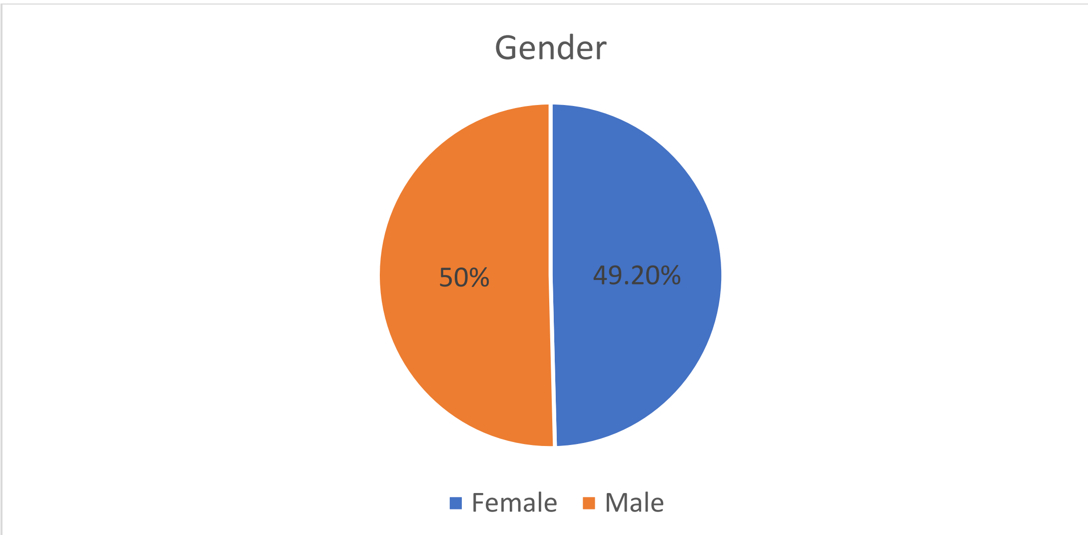

Figure 2: Number of participants by gender

Regarding age-related issues, *Figure 3* shows that the age distribution was distributed among people of all ages. Among the participants' age ratio, the highest ratio of 21 to 30 years was 70.7%. The second highest age group was 31 to 40 years, accounting for 26.8%.

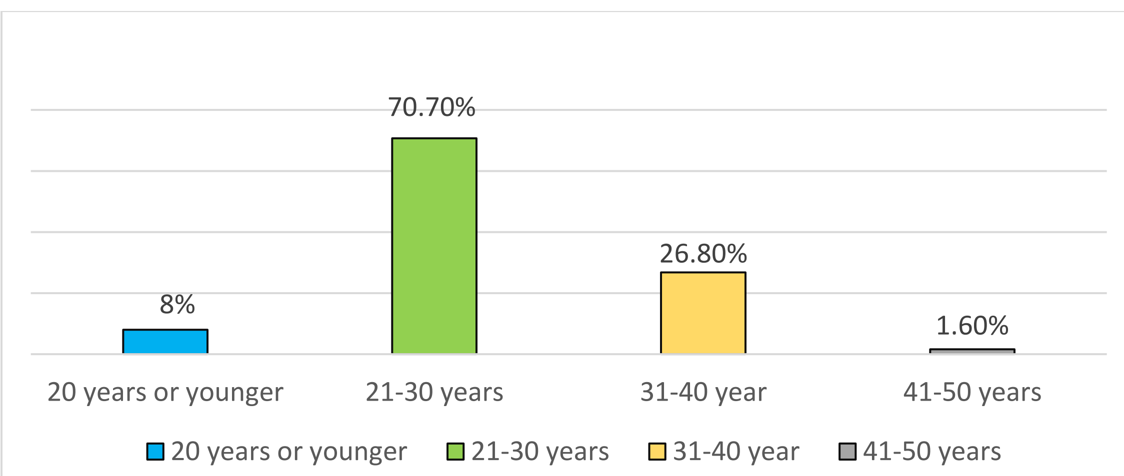

Figure 3: Age distribution of the participants

Time Spent on Instagram

The participants were asked "Do you follow Instagram?" and "Have you ever seen ads on Instagram?".

Participants were asked, “How many hours a week do you spend on Instagram”. *Figure 4* shows that the highest distribution of participants was in the 6-10 hours of use category. The second place is respondents who spent 11-15 hours per week.

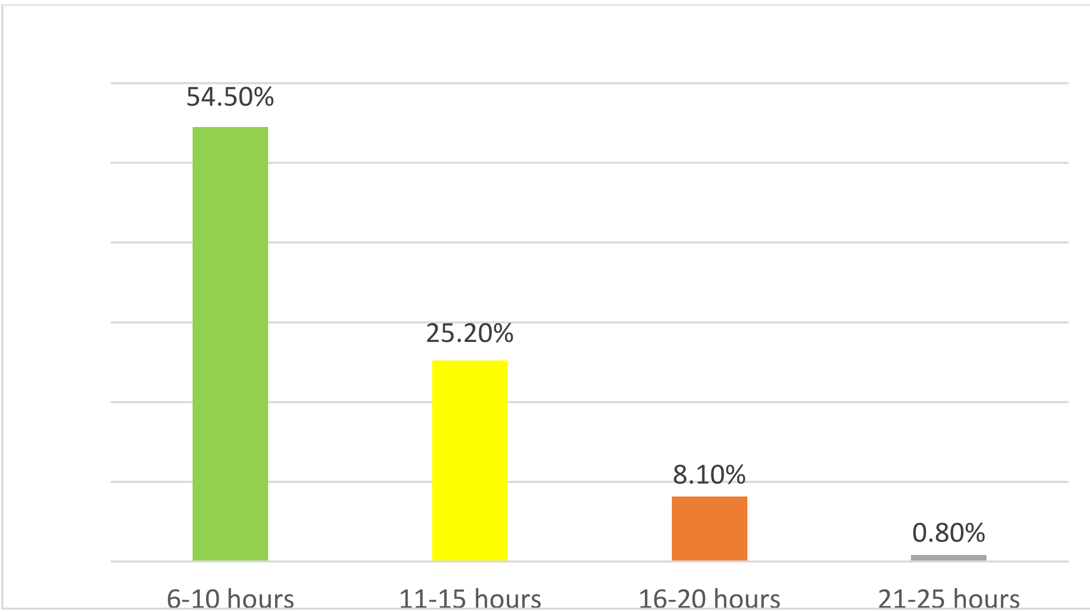

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Figure 4: Time spent per week on Instagram by participants

Instagram Celebrities' Credibility

The researcher asked the participants whether celebrities’ ads are convincing. Twenty-two percent of participants considered that celebrities’ ads on Instagram looked convincing, 51.2% were neutral on this issue, and the remaining 21.1% of customers disagreed (Figure 5).

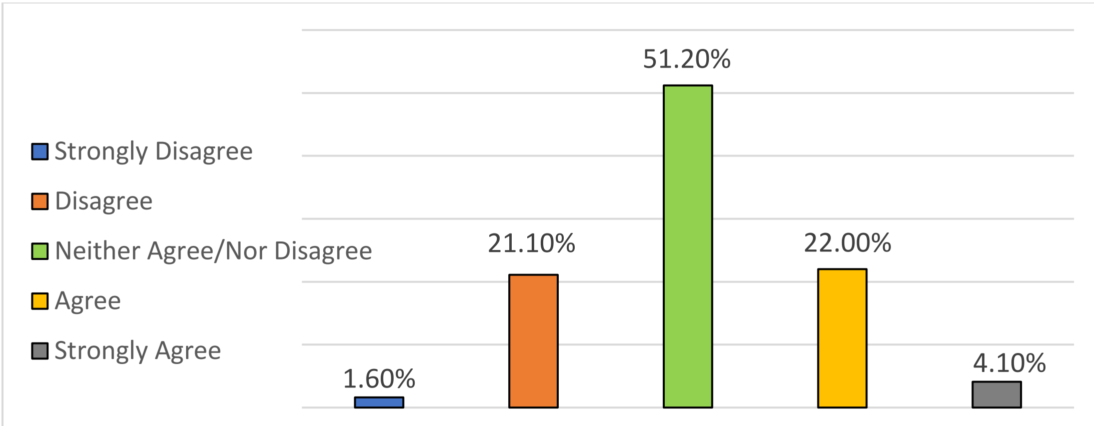


Figure 5: Whether celebrities' ads are convincing

From *Figure 6*, it could be interpreted that the majority of participants believe that Instagram's advertising is reliable, 25.2% believe that the celebrities' ads on Instagram are reliable, 48.8% are neutral about it, and 22.0% disagree. This analysis indicates that participants believe the advertisements on Instagram.

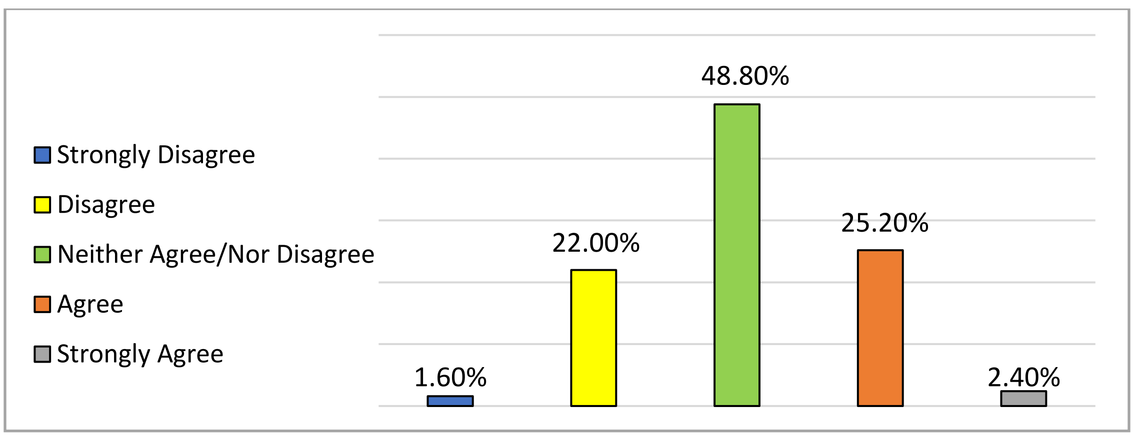


Figure 6: Instagram's advertising reliability

The researcher asked the participants if they agreed that celebrity ads on Instagram were interesting. In this regard, most of the participants pointed out that it was interesting to watch the platform's advertisements with and without objection (47.2%). 29.3% of participants agreed with this, while 19.5% disagreed. Moreover, the proportion of people who strongly agree and disagree is very small, only 0.8% and 3.3% (Figure 7). This shows that the ads placed on Instagram by an organization are attractive in content.

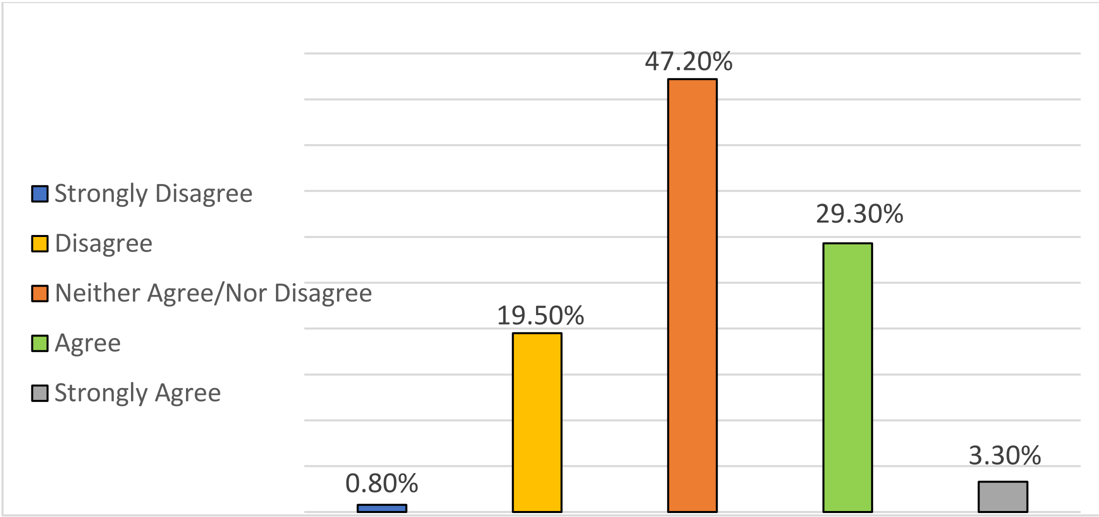


Figure 7: Whether Instagram ads are entertaining

Participants were asked whether celebrities' advertisements on Instagram were a valuable source of information about products and services. In this regard, 26.8% of respondents did not consider celebrity ads on Instagram to be a valuable source of knowledge about a product or service, and 42.3% were neutral (Figure 8). This shows that companies that advertise on Instagram need to strengthen their advertising and ensure the reliability of the source so that the targeted customers are attracted to their products and services.

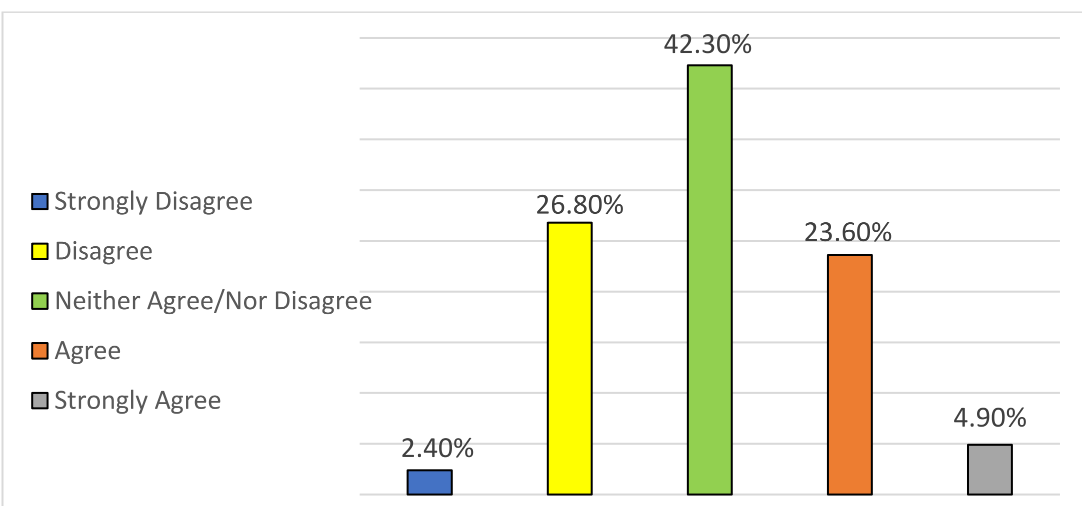


Figure 8: Whether Instagram ads are useful

The researcher required participants to state if they agreed whether the social influencers' ads on Instagram informed students about new products or services on the market (Figure 9). In this regard, the proportions of people who maintained neutrality and who agreed were almost the same, with 39.80% being neutral and 38.20% agreeing. In comparison, the number of those who disagreed accounted for 17.10%. In addition, the proportion of people who strongly agreed and disagreed was really small, 1.60% and 3.30%, respectively.

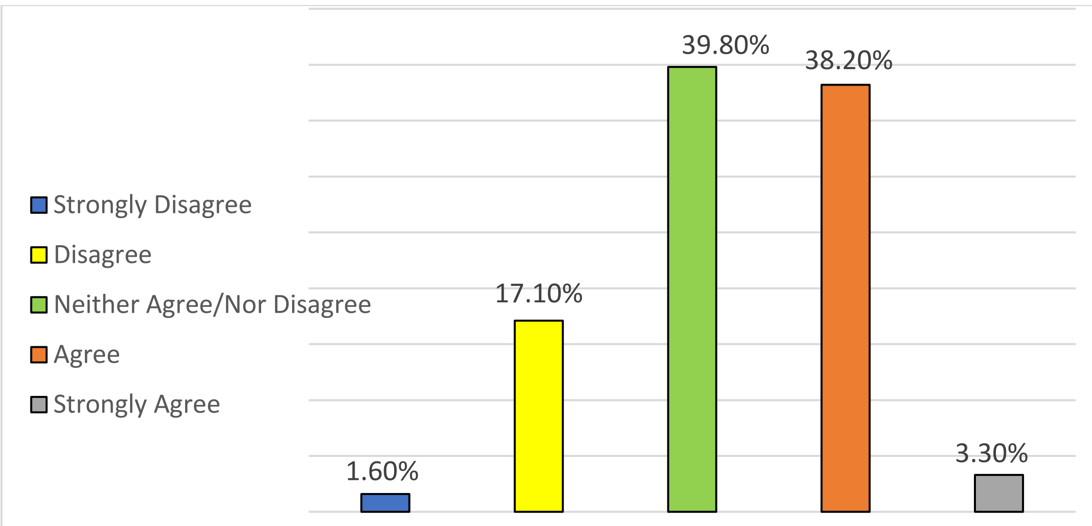


Figure 9: Whether from Instagram ads participants can receive the latest product information

From *Figure 10*, it can be interpreted that the majority of respondents believed that celebrity ads on Instagram can promote the company's image, 37.40% had a neutral opinion on this, and only 17% disagreed with the fact that celebrities' ads are able to enhance the organization’s image. This shows that Instagram as a channel that has the potential to lay down information to provide opportunities to enhance companies’ reputations.

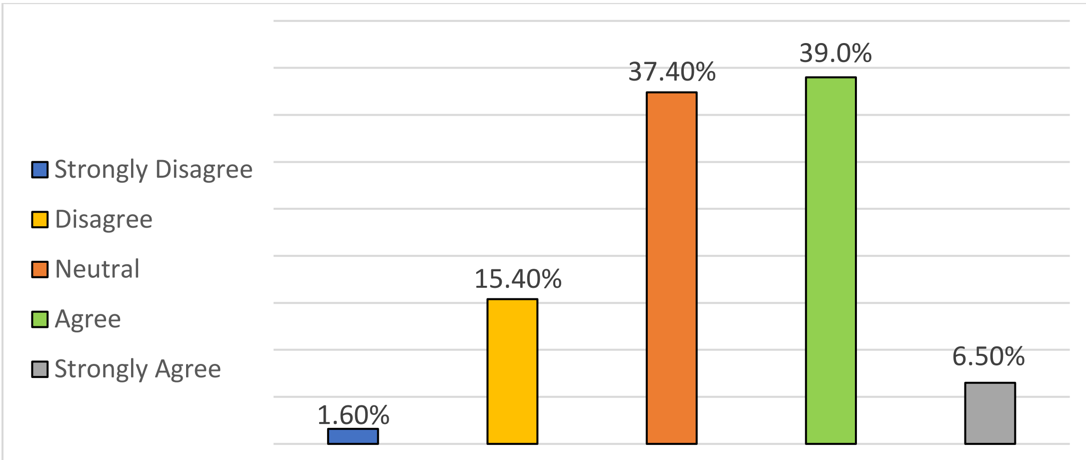


Figure 10: Whether celebrity ads on Instagram can promote the company's image

As shown in *Figure 11*, 34.1% of respondents said that they buy a brand's product because of celebrities' ads on Instagram, and 38.2% were neutral about it, and 18.7% of respondents were less affected by Instagram ads. This shows that the organizations advertising their products on Instagram have positive marketing facts and help the business in influencing the behaviour of the consumer.

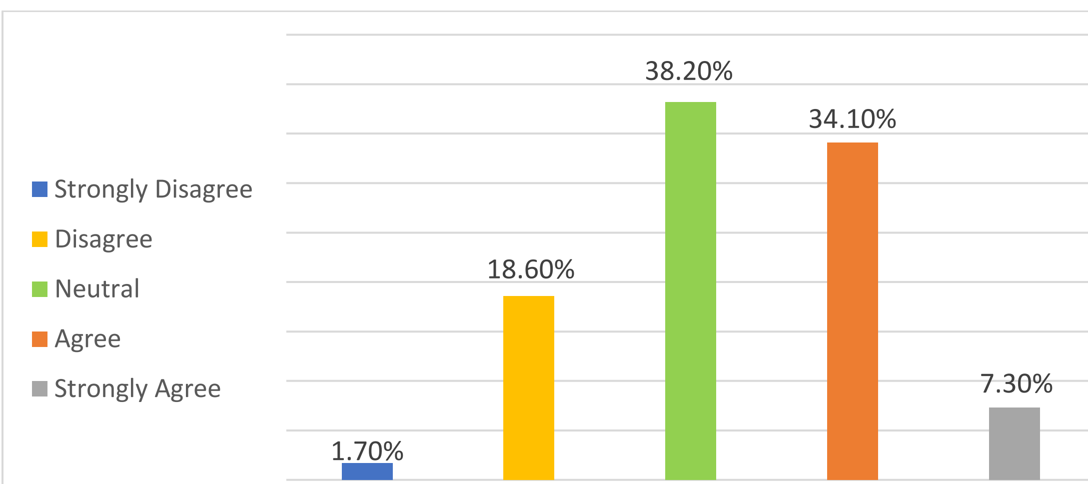


Figure 11: Purchase branded products because participants see celebrity ads on Instagram

Attitudes to Instagram Advertisements

The question about the attitude of participants to Instagram ads asks whether they agree that "Instagram ads are useful for promoting the latest products". In this regard, the majority of respondents (55.30%) believed that launching products on this platform was effective, and 29.30% of students replied that they were neutral. 8.90% disagreed with this view, while 6.50% of participants strongly agreed. In this question, no students' answers showed strong disagreement to this question.

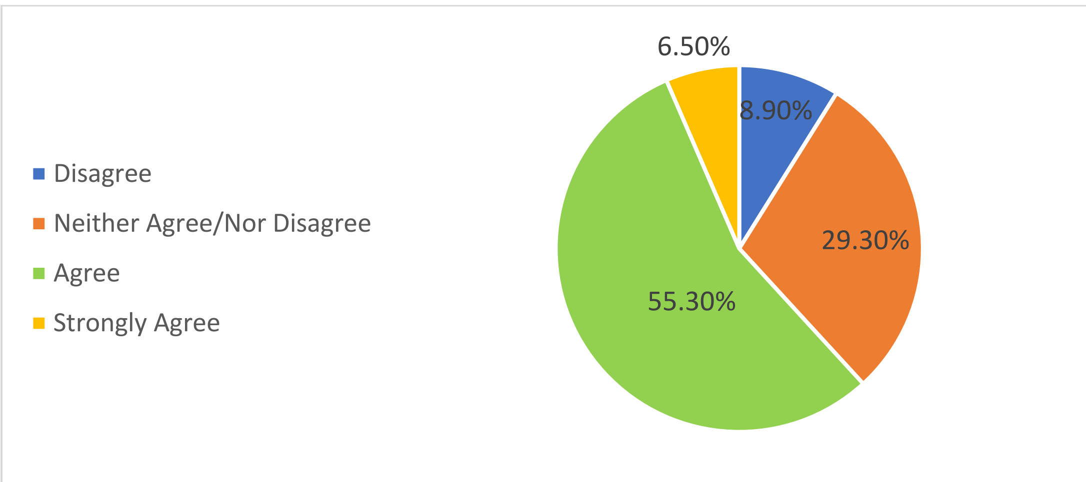


Figure 12: Whether Instagram is helpful for promoting the latest products

As can be seen from the pie chart below, most participants agreed that through advertising on Instagram, they can learn more about innovative products. (56.90%). At the same time, 26.80% of the students replied that they neither agreed nor disagreed, with a different attitude shown by 11.40% who disagreed, and only 4.9% who strongly agreed. No one chose to strongly disagree to this question. The analysis shows that participants get inspiration products through these social media channels so that they can obtain related products and services.

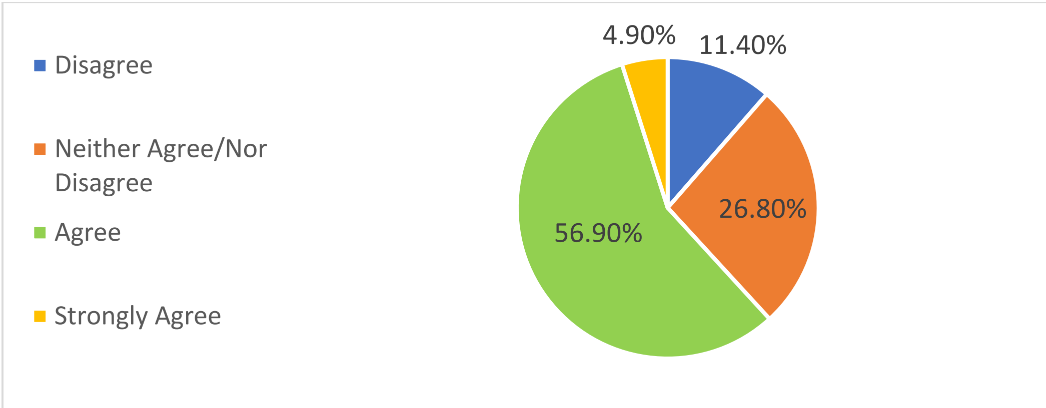


Figure 13: Whether participants get innovative information from Instagram ads

The researcher asked if they agreed to support celebrity ads on Instagram because this is where creativity is greatly valued. The media website seeks advice on products and services. In this regard, the majority of respondents (48.0%) agreed that they believe social media supports appropriate creativity for products and services. At the same time, 35.80% of the participants were neutral. Only 9.8% of participants expressed disagreement with this creative idea, while 6.50% of students strongly agreed. This shows that organizations must record appropriate information about their products and services on social media in order to influence consumer behaviour regarding the products they provide.

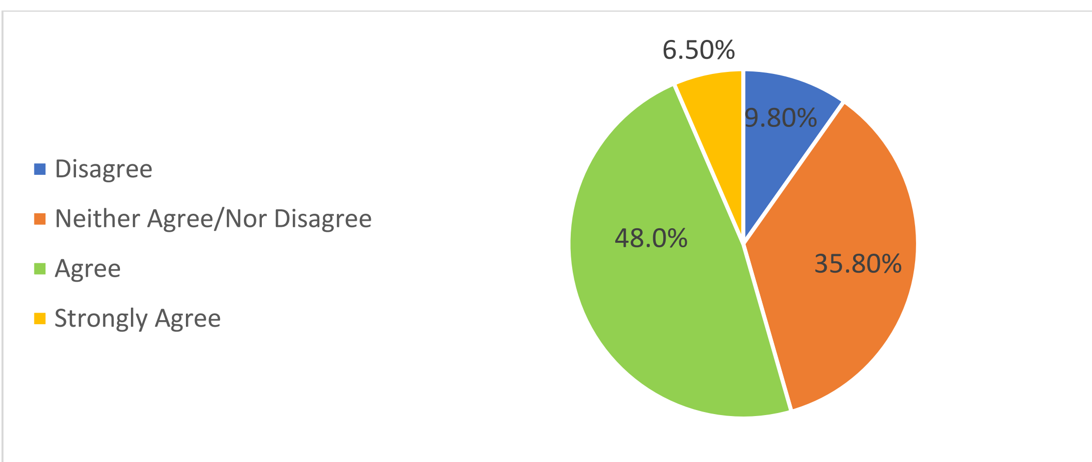


Figure 14: Appreciation of Instagram ads by participants

Customers' Expectations of Instagram platform

The researcher investigated whether customers want companies to work with celebrities to promote their brand on Instagram. In this regard 58.50% hoped that the company cooperates with celebrities, 31.7% of the participants expressed strong support for this view, 2.40% of the proportion said they did not support it, and 7.30% of the participants expressed a neutral view. This result shows that modern social media is more effective than traditional advertising.

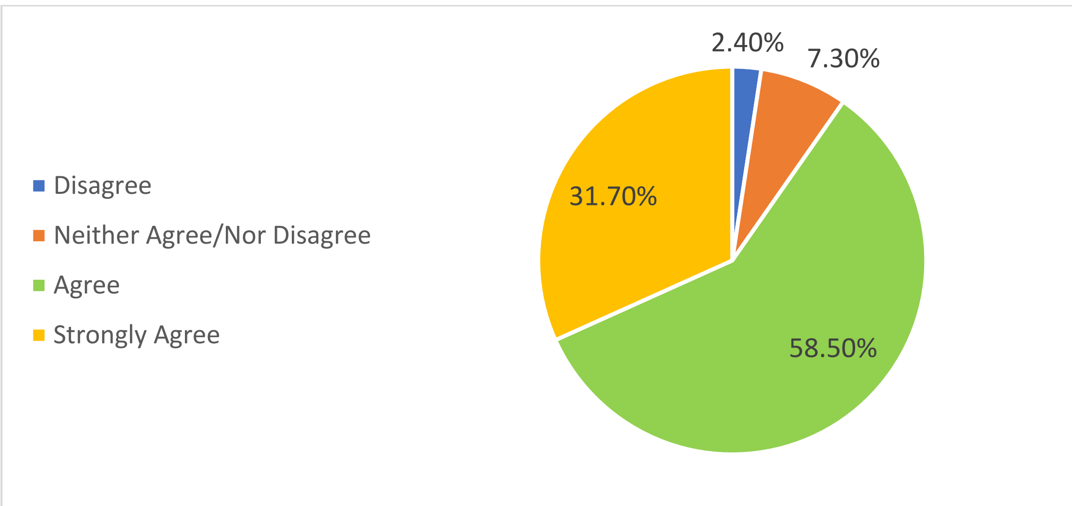


Figure 15: Whether company can cooperate with social influencers

As can be seen from the *Figure 16* below, most participants indicated that they agree (55.3%) with the fact that users require celebrities also to be responsible for the quality of Instagram products they promote. This shows that celebrity endorsement of products needs to have a sense of responsibility. At the same time, the Instagram platform also needs to enhance the authenticity of the product and be accountable to customers.

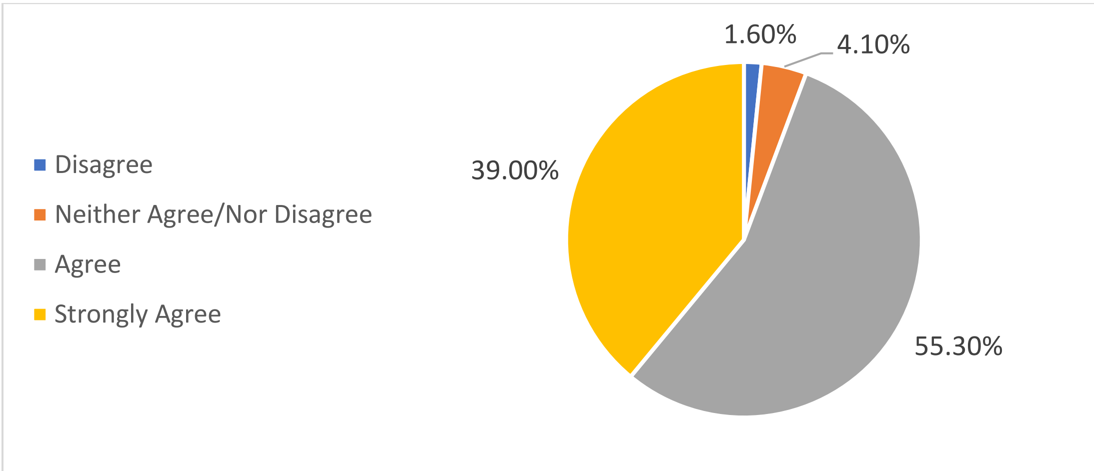
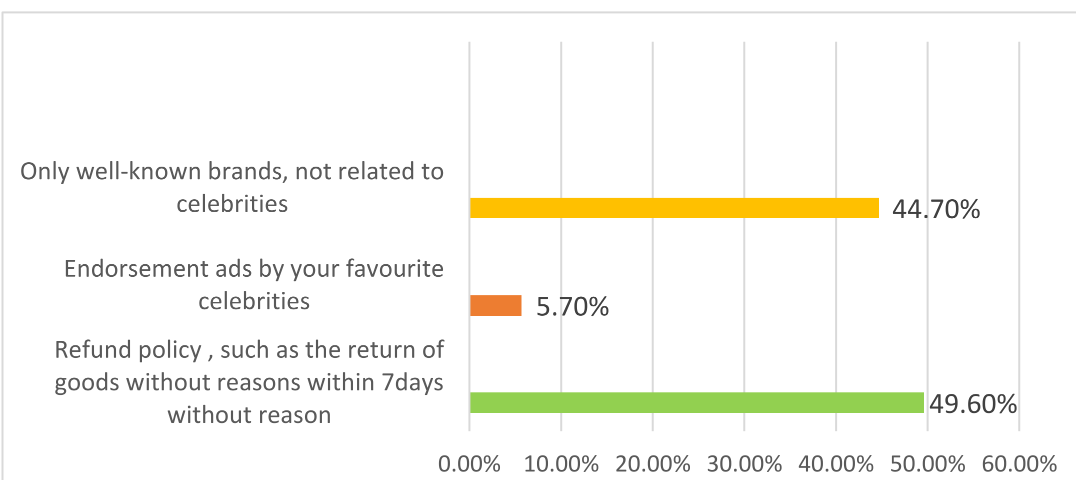


Figure 16: Whether celebrities need to be responsible for Instagram products

The researcher asked participants what makes Instagram ads worthy of trust. In this regard, it was found that most customers feel that they trust products with seven-day return-without-reason (49.6%), but there are still some participants who feel that as long as it is a large company's brand, it is trustworthy and without celebrity endorsements (44.7%) (Figure 17). Therefore, what users pay most attention to on Instagram ads is that the value of the product itself has nothing to do with social influencer endorsements.

Figure 17: Whether Instagram ads worthy of trust



Another question the researchers asked participants was which technologies they wanted Instagram to improve on. Multiple selection methods had been set up as potential answers. Almost 90% of participants chose to increase their privacy protection (32.1%), and the remaining five options did not exceed 20% (Figure 18). It seems that customers are asking for privacy on social media.

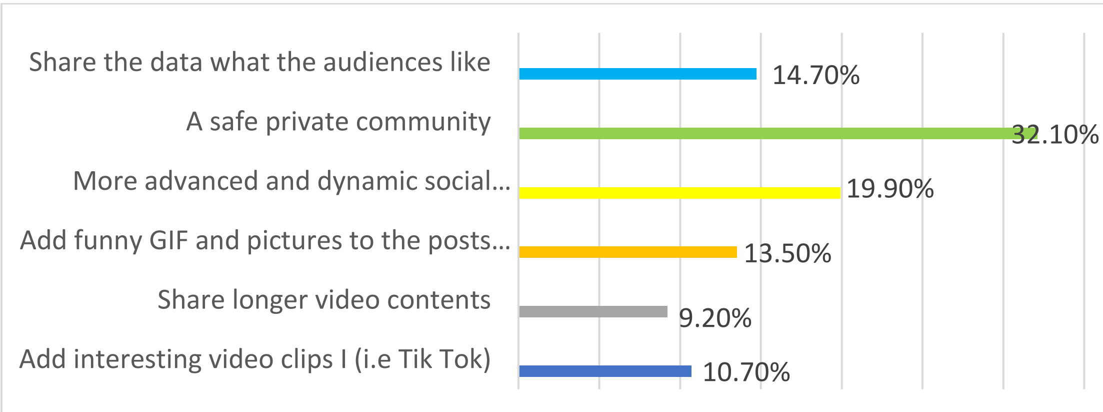


Figure 18: Expected technologies by participants

Descriptive Analysis by Gender

In this study, descriptive gender differences were analyzed based on gender to verify the three research questions used in this study.

RSQ_A. How does an advertisement on Instagram influence customers' attitudes and purchasing behaviour?

Table 1 shows that 41.9% of men and 68.8% of female participants agree with the fact that through the advertisements posted on Instagram, they can get the latest product information and think it is useful. 35.4% of women and 22.9% of men maintained a neutral attitude. The proportion of men and women who disagreed with this view was 12.9% and 4.9%, respectively. Social media is a marketing information channel. It can be observed that male customers have a similar view that they can obtain the highest level of information from these online websites.

Table 1: Instagram ads are extremely beneficial for promoting the most advanced goods

		Disagree	Neither Agree/Nor Disagree	Agree	Strongly Agree
Gender	Male	12.9%	35.4%	41.9%	9.6%
	Female	4.9%	22.9%	68.8%	3.2%

As can be seen from the table 2, 68.8% of female and 45.1% of male participants agree that they can seek advice and innovative information by accessing Instagram platform advertisements. On the other hand, 35.4% of male participants agree that they visit Instagram ads to find out the facts, 18% of female participants maintained a neutral attitude to the freshness and innovation of products and services. 19.3% of men disagreed with this view and 0% of men strongly agreed with this view, only 3.2% of women disagreed and 9.8% of women strongly agreed with this view.

Table 2: Through advertising on Instagram, one can get more innovative ideas

		Disagree	Neither Agree/Nor Disagree	Agree	Strongly Agree
Gender	Male	19.3%	35.4%	45.1%	0%
	Female	3.2%	18%	68.8%	9.8%

It can be seen from Table 3 that 46.7% of men maintained a neutral attitude, but 60. 6% of female participants and 35.4% of men agree with this view. They explain the support for celebrity advertising and their appreciation of advertising is consistent. 9.8% of female and 3.2% of male participants expressed strong agreement with this view but 14.5% of men and 4.9% of women expressed disagreement.

Table 3: Support celebrity advertising on Instagram

		Disagree	Neither Agree/Nor Disagree	Agree	Strongly Agree
Gender	Male	14.5%	46.7%	35.4%	3.2%
	Female	4.9%	24.5%	60.6%	9.8%

RSQ_B: Do celebrities or Social Influencers (SIs) have an influence on customers' purchasing behaviour?

From table 4, it can be understood that 60.6% of female participants and 41.9% of male participants said they neither agreed nor opposed celebrity advertising. 30.6% of males and 11.4% of females expressed disagreement, while 19.3% of males and 24.5% of females agreed. The proportion of males and females who expressed strong disagreement was the same, 6%. The study also found that in the credibility of participants' social celebrity advertisements, females agree with this opinion more than males, but the gap between them is not large, indicating that customers accept their advertisements.

Table 4: Whether celebrities' ads look convincing

		Strongly Disagree	Disagree	Neither Agree/Nor Disagree	Agree	Strongly Agree
Gender	Male	1.6%	30.6%	41.9%	19.3%	6.4%
	Female	1.6%	11.4%	60.6%	24.5%	1.6%

In addition, in terms of the reputation of social celebrity advertising, 54.0% of females and 43.5% of males maintained a neutral attitude, while 33.8% of females and 16.3% of males disagreed (Table 5). It can be seen that male customers disagreed with the fact that they are still not used to buying various products and services recommended by celebrities. In addition, 27.8% of females and 16.1% of males agreed. 3.2% of males disagreed strongly with this view, compared with 0% for females. It seems that most women hold a positive attitude toward this view.

Table 5: Whether SI ads on Instagram are trustworthy

		Strongly Disagree	Disagree	Neither Agree/Nor Disagree	Agree	Strongly Agree
Gender	Male	3.2%	33.8%	43.5%	16.1%	3.2%
	Female	0%	16.3%	54.0%	27.8%	1.6%

On the other hand, in the question of whether they pay attention to social celebrity advertising, males account for 35.4% and females account for 59.0%. At the same time, the number of participants agreeing that the advertisement is interesting is higher than to the above two questions. In agreement with this point of view, males accounted for 27.4% and females for 31.1%. But the males who expressed disagreement were 30.6% higher than those who agreed. Females accounted for 8.1% of different opinions. Females who strongly disagree remain at 0% and males at 1.6%. It can be seen whether customers refuse to watch advertisements posted by social celebrities.

Table 6: Whether SI ads are interesting

		Strongly Disagree	Disagree	Neither Agree/Nor Disagree	Agree	Strongly Agree
Gender	Male	1.6%	30.6%	35.4%	27.4%	4.8%
	Female	0%	8.1%	59.0%	31.1%	1.6%

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From Table 7 it could be understood that 35.4% of males and 49.1% of females expressed a neutral attitude towards celebrity advertisements on Instagram that they are valuable and can be understood. 20.9% of male and 26.2% of females both agreed on the fact that social influence marketing obtains valuable product information in advertising. 37% of male participants disagreed as did 16.3% of female participants. 3.2% of males strongly disagree and 1.6% of females.

Table 7: Whether Social Influencers' ads are valuable

		Strongly Disagree	Disagree	Neither Agree/Nor Disagree	Agree	Strongly Agree
Gender	Male	3.2%	37%	35.4%	20.9%	3.2%
	Female	1.6%	16.3%	49.1%	26.2%	6.5%

From Table 8, it can be defined that participants who have been following celebrity advertisements on Instagram can get the latest products or services on the market. 42.6% of females and 37% of males agreed with each these statements, 33.8% of male strongly agreed with the opinions, but only 6.5% of females agreed with this opinion. However, females who did not hold a neutral view account for 42.6% and male 25.8%. The percentages who disagreed with this view are 3.2% for males and 8.1% for females. Those who strongly disagreed are 0%. Therefore, SI marketing obtains the latest product information from advertisements.

Table 8: Where SI ads can inform participants about the latest products

		Disagree	Neither Agree/Nor Disagree	Agree	Strongly Agree
Gender	Male	3.2%	25.8%	37%	33.8%
	Female	8.1%	42.6%	42.6%	6.5%

Table 9 below illustrated that participants who believe in social influence can raise the company's image if they can cooperate. The majority of males and females agreed with this view but zero percent of females strongly disagreed. This confirmed that people do not resent the endorsement of products by social celebrities.

Table 9: Whether Social Influencers' ads can enhance the company's image

		Strongly Disagree	Disagree	Neither Agree/Nor Disagree	Agree	Strongly Agree
Gender	Male	3.2%	20.9%	38.7%	37%	0%
	Female	0%	9.8%	36%	40.9%	13.1%

Table 10 indicated that through social influence advertising, customers will buy the company's products because of their advertisements. Most males and females agreed with this view, accounting for 25.8% and 42.6%, respectively. Neutral men are 41.9% and women are 34.4%. 20.9% of males disagreed and 16.3% of females. Male consumers who strongly disagreed account for 3.2% but females, zero percent. 6.5% of females and 8% of men strongly agreed. This confirms the effectiveness of advertising using social celebrities.

Table 10: Whether accepting branded goods because viewed SI ads

		Strongly Disagree	Disagree	Neither Agree/Nor Disagree	Agree	Strongly Agree
Gender	Male	3.2%	20.9%	41.9%	25.8%	8%
	Female	0	16.3%	34.4%	42.6%	6.5%

RSQ_C- What technologies do customers expect to improve on Instagram?

From Table 11 below, it could be interpreted that 62.9% of males and 54% of females agreed with the fact that they always expect social influencers to work with companies to promote products. On the other hand, 37.7% of females strongly agreed with this, and males accounted for 25.8%. Disagreeing males accounted for 4.8% and females 0%. Neutral males accounted for 6.4% and females for 8.1%. They hope that the company will cooperate with social celebrities to promote products because no females object to this view.

Table 11: Whether participants are expecting the company to cooperate with celebrities on Instagram

		Disagree	Neither Agree/Nor Disagree	Agree	Strongly Agree
Gender	Male	4.8%	6.4%	62.9%	25.8%
	Female	0%	8.1%	54%	37.7%

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Table 12 indicated that participants expect social influencers to be responsible for their promotional products. In other words, 58% of males agreed and 52.4% of females agreed. 30.6% of males strongly agreed and 47.5% of females. Most users want companies and influencers to promote their products on Instagram, but customers support influencers who have a responsibility for product quality. The proportion of females who disagreed and had a neutral attitude is 0%, and that of males was 3.2% and 8%, respectively.

Table 12: Whether celebrities are responsible for the quality of the recommended products

		Disagree	Neither Agree/Nor Disagree	Agree	Strongly Agree
Gender	Male	3.2%	8.0%	58%	30.6%
	Female	0%	0%	52.4%	47.5%

Table 13 shows the trustworthiness of advertisements on Instagram. 64.5% of male participants believed that among the reasons for trusting Instagram ads, the most selected answer is the 7-day-refund-without-reason policy. The proportion of females is 34.4%. For female customers, the most popular answer is to purchase because it is a well-known brand, and it is not related to celebrity endorsements. The proportion is 57.3% for males, and 32.2% for females choosing this option. At the same time, males and females chose the least answer, that their favorite celebrities approve the product, the ratio being 3.2% and 8.1%, respectively.

Table 13: The trustworthiness of ads on Instagram

		Refund policy such as the return of goods without reason within 7 days without reason	Endorsement ads by your favourite celebrities	Only well-known brands, not related to celebrities
Gender	Male	64.5%	3.2%	32.2%
	Female	34.4%	8.1%	57.3%

In the analysis of the multiple-choice Table 14 below, among the first three options, 83.8% of males and 86.8% of females chose that Instagram could improve its personal privacy protection technology. The second-highest proportion is 50% of technical men who want more vivid advertising with females at 55.7%. The third option is to share Instagram information, such as the topics people like (hot lists), males accounting for 41.9% and females 36%. The trend of choice among males and females in multiple choices is the same, and they both hope that Instagram can strengthen their privacy protection technology and improve their own technology. 30.6% of males and 26.2% of females hoped Instagram could have more interesting photography skills. 22.5% of the male participants and 26.2% of the female participants hoped to increase the amount of time they posted. 33.8% of male and 37.7% of female participants hope to have more interesting GIF animations and photos.

Table 14: Further improvement of Instagram platform

		Add interesting video clips (i.e, Tik Tok)	Share longer video contents	Add funny GIF and pictures to the posts (photo or video)	More advanced and dynamic social advertising	A safe private community	Share the data what the audiences like
Gender	Male	30.6%	22.5%	33.8%	50%	83.8%	41.9%
	Female	26.2%	26.2%	37.7%	55.7%	86.8%	36%

Discussion and Conclusions

Instagram Advertising Marketing and Customer' Buying Behaviours

This research surveyed consumers' buying behaviours and attitudes on Instagram. From the research, it can be found that a large number of consumers are already using products published by Instagram that meet personal or professional needs and products recommended by celebrities. Research shows that effective marketing may have an impact on consumers' behaviour. Therefore, it is essential for organizations to develop their Instagram advertising and celebrity advertising effects under such circumstances. The study showed exactly this phenomenon, and it is reported that 50% of Instagram participants spend more than six hours per week posting on Instagram. It is therefore important to understand the main opinions of Instagram followers on the credibility and influence of Instagram's interaction with influencers. These influencers are promoting the purchasing of products. Thereafter, it is also important to understand whether there are differences between the way male and female users respond to Instagram advertising.

Most companies use the Instagram platform to advertise in the following ways to obtain potential targets that affect consumer behaviour. The degree of satisfaction that has been determined is considered high by consumers in terms of advertising, but it can still be seen that there are certain groups of people who disagree with this aspect. Research shows that consumers use the Instagram platform to watch advertisements while watching advertisements from social celebrities. Therefore, for companies, enhancing performance is critical to using social networking sites and establishing appropriate blogs for social media marketing, which may have an impact on consumer behaviour.

Further research indicates that consumers have obtained the latest product information through social celebrity advertisements and expressed recognition for the value of Instagram advertisements, which helps to attract a large number of consumers. It was also found that consumers who look forward to advertising on Instagram find it interesting and convincing. Research even shows that consumers are always looking for social media channels where they can get the best opinions related to products and services. In addition, research showed that when an organization supports the promotion of products by social celebrities who represent their products and services on Instagram, consumers show a preference for the products they offer on the market.

There are also determinations about whether companies need to influence consumer behaviour in today's era with their products and services, and if they can then invite celebrities to expand their image and advertising. Consumers have shown that Instagram is attractive. It was also found that this platform has the potential to provide consumers with more product and service information than any other advertising model. Research shows that organizations need to display a sense of responsibility for products that are released so that they can respect their own views of the product, which in turn helps companies influence consumer behaviour. It was also found that consumers who visit Instagram every day may already view online ads because most people think they are interesting.

Said (2013) noticed that, with respect to most shopping processes (such as the mentioned internet platforms), the target audience is changing from old media such as TV, radio and magazines to social media, influential people and eWOM marketing. Organizations are accepting this unconventional regular usage to promote on Instagram to increase brand awareness. The conclusion shows that for both males and females the utilization rate of Instagram is statistically high, which is related to the number of influencers who pay attention to social media or purchase behaviour.

The survey results show that according to the analysis of variance, inviting celebrities to advertise has no huge benefit for the company's image and sales. Over 45% of participants think that celebrity advertising on Instagram can enhance the company's image, or they express a neutral opinion; 37.4% of participants agree and only 17% disagree. In addition, 41.4% said they used branded products because they saw celebrity ads on Instagram, and 38.2% were neutral, which means that more than 70% of participants were more or less affected by the impact of Instagram advertising. As a result of this, more than 40% of participants have demonstrated purchasing behaviour. Nearly 62% of participants believe that if a brand advertises on Instagram, they can learn more innovative ideas. Less than 10% of respondents do not support celebrity ads on Instagram. In addition, 61.8% of participants agree they use Instagram to research the latest products, and only 8.9% of participants disagree with this method. Therefore, it can be seen that the advertisements posted by Instagram social influencers have a positive impact on users' attitudes and purchasing behaviour.

From these results, it is their responsibility and credibility that affects most Instagram influencers' main reputation, so that users purchase intentions for the advertised products will increase. Therefore, discovering the relationship between influential people and purchase intentions and a person's reputation can lead to a better understanding of these constructs and will help advertisers meet the needs and interests of Instagram users, and therefore achieve higher purchase intention, which is the main goal. In short, advertisers, marketers and marketing managers can benefit from it.

For consumers, they use the ads they see on the platform to help them make purchase decisions. The results show that most participants may not decide to purchase advertising products or services collected through the platform. A small number of participants replied that they did not use this information to make purchase decisions. Regarding the trustworthiness of advertisements, most of them are either neutral or positive about accepting advertisement information. Siekpe (2003) confirmed that if the ads become compelling or controversial, this may stimulate consumers. The author believes that people now need to be more cautious on Instagram when it comes to influencer marketing, because if every social influencer supports the same product, it may deny reliability. There is no obvious gender difference in the purchase attitudes and behaviours of participants, and it is almost unaffected when they see influencers promoting products or services on Instagram. There is also no obvious difference between the age groups and the results of the same problem. The author believes that even if there may be significant differences between genders, ads on Instagram usually do not significantly affect their buying behaviour. The results of the investigation persisted and showed that the ads on the platform received the latest product information. Students think they may often use the data collected from advertisements. These advertising incentives are supported by the majority of participants. Anitsal (2005) noted that the market has been trying to make consumers unsatisfied with their needs and desires. The gulf between the true self and the passionate self is growing larger and more useful by constantly reminding everyone what they are doing. In other words, it gives consumers a positive attitude and purchasing power for product purchases, and consumers get the most cutting-edge product information through influential online marketing. These exquisite visual effects increase the attractiveness of the product.

Social Influencer Credibility

In terms of the results, most participants would follow the influencers, and it is a choice. The more frequently consumers follow them, the more likely that they are to be influenced by their ads. Kim et al. (2012) further confirmed that relevant organizations must choose appropriate influential products or services so as to adapt to the target audience and target market. Judging from the results, most participants think that advertising on social media or the cooperation with sponsored advertisements may affect the reliability of products or services, and therefore it is advisable to choose appropriate influencers carefully. According to the statistical results of the questionnaire, half of the participants are neutral on this issue. In terms of the reliability of Instagram ads, most participants have a neutral view of the reliability of celebrity ads on Instagram. According to the survey results, participants think that celebrity ads on Instagram are interesting, and some of them hold a neutral opinion, accounting for almost half of the consumption. Everyone thinks that advertising on Instagram is not boring. From the results of the questionnaire survey, it can be seen that most consumers not only know about commercials on Instagram, but they also believe that celebrity ads on Instagram are compelling, reliable, and interesting. This also supports the premise that 41.5% of participants believe that celebrity ads on Instagram inform users about the latest products/services on the market.

Consumers usually act after careful consideration before purchasing a product. Internet celebrities post commercials on Instagram, which can increase consumers' awareness of the product, thereby changing consumers' purchasing psychology and promoting the occurrence of purchasing behaviour. The specific impact process is that consumers use Instagram to promote the Internet and click as needed to obtain corresponding effective information. Through this different advertising content model, corresponding consumption information is obtained. It is more popular and occupies a particularly important position in people's daily lives. Many consumers tend to consume these products from a trust or demand perspective. Some are promotional activities that affect demand through price changes, others increase consumer appetite by allowing consumers to try products for free (Rob, 2020). Most ads on Instagram are soft ads embedded in the tweets of Internet influencers. This method is easier to accept and attain than traditional methods (Rob, 2020).

As far as research is concerned, most participants believe that the cooperation between social influencers and companies may increase the company's visibility and trust. Influential people are marketing their characters with specific characters or tags to attract followers and organizations to work with them. The results show that most participants believe that sponsorship or participation in sponsorship may not significantly change the loyalty to goods or services. In addition, in terms of gender and loyalty, women are more likely than men to test the trustworthiness of advertisements.

According to Crawford and Jackson (2019), social influencers can earn $1 million for every Instagram posted by their sponsors, which ensures Instagram influencers are highly paid. SI promotes his or her products. It is often seen as showing off, such as the latest makeup kit, using or demonstrating the products of a certain brand. Influenced by such promotion, consumers usually have the willingness to learn about new products, as well as purchasing and trying. On Instagram, influencers are actually available in different fields, and they would convey various kinds of information to their followers. Due to this, 28.5% of consumers would refer to the ads of celebrities on Instagram as a valuable source of knowledge about a product or service, and 42.3% of consumers hold a neutral attitude towards it. In the meanwhile, 41.5% of participants would obtain relevant information about the latest products or services on the market from the ads of celebrities on Instagram, and only 18.7% would not adopt it. In other words, more than 60% of people hold the view that commercials published on Instagram have no negative impact on them, which is of great significance to both businesses and consumers. It is then shown by the result that Instagram ads allow consumers to have the willingness to learn information about new products and services, thereby resulting in the possibility of consumption.

Instagram Advertisements Improvements

The results of the third research question noted that most respondents want Instagram to improve the protection of users' personal privacy. Instagram advertising platforms need to be improved in terms of advertising content, spokesperson responsibility and quality of purchased products, which provides users with better credibility to help explain the purchasing intentions of influential people.

This research suggests which aspects of Instagram advertising need improvement and analyzes this issue in detail. For example, Instagram needs to improve the quality of the product itself or improve the product's censorship system. Social celebrities must enhance their sense of responsibility for product promotion. Finally, Instagram needs to strengthen its censorship system to prevent users from buying inferior products. Burgoon et al. (2002) believe that in the investigation, at least several aspects of the Instagram platform, Instagram social celebrities, and Instagram products should be reviewed. In the first aspect, if users found that advertisements that display these products are false advertisements, users must immediately report this to Instagram. This means that influencers may also be liable. On the other hand, users need Instagram's own platform to protect users' funds and avoid fraud. Finally, users called on the platform to protect their privacy and to strengthen technology (Burgoon et al., 2002).

The participants also expressed their expectation about the way of commercial advertising on Instagram, whereby Instagram content can be easily digested in the form of images or short videos, can encourage more peer-to-peer sharing to help the brand expand its target audience. Posts sponsored on Instagram mainly contain photos. Considering that online celebrities have more social participation than advertising brand accounts, online celebrities on Instagram may have a significant impact on brand promotion.

Future Research Recommendations

The main shortcoming of this research lies in the fact that the surveys and feedback only target the young people in one school, and therefore this example cannot be considered as being of significance to the general public. However, it is possible to have a broader range and more samples, which may mean that the results are more convincing. Besides, since this research is mainly based on quantitative research, a qualitative method could be used to improve their viability in focus group discussions. Use of Instagram and its influence by interviewing marketers or brand managers actually serves as a bridge which can involve consumers in their brands. Thus, a better understanding of the subject would be feasible. However, Instagram users hold the belief that the credibility of influencers, which can be further divided into perceived attractiveness, trustworthiness, and expertise known as the dimensional studies used in this manual, can be employed to measure the impact on consumers' purchasing intention. Therefore, it would be ideal if future researchers were to study what motivations also result in Instagram users' interacting with influencers on Instagram and then adapt this research to other popular social media platforms, Facebook or Twitter, for instance. The exploration of this knowledge dimension would be an excellent choice which can contribute greatly to the marketers.

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