How will voice search optimisation aid or limit digital marketing? An End-User Perspective

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Abstract

The most recent advancements in artificial intelligence (AI) and machine learning have had a huge impact on how consumers use their smart gadgets and search the internet in general. Voice assistants (VAs), such as Amazon's Alexa, Google Assistant's Google Assistant, Apple's Siri, and Microsoft's Cortana, are computer programs that aid users by answering queries and carrying out tasks. When compared to text, voice appears to be more natural, faster, and better positioned to take over the internet from within people's personal space. Because it is reasonable to expect that voice assistant users will impact the whole marketing climate, it can be said that the climate will move in their favour. Customers are set to see a huge change in how they interact with companies.

This dissertation explores search engine optimisation as a marketing tool, examines how search engine is moving from traditional search towards voice search, investigates the current usage trends of voice search in Ireland and its impact on digital marketing, and explores limitations of voice-based search. The research methods consisted of the collection and analysis of empirical data. The research was based on a survey of 271 participants using a survey via Google forms.

The findings from this research show that the voice search devices and software are routinely used by the population. The majority of people who use them are utilizing them for personal purposes rather than doing shopping. Only a small percentage of users use them for commerce. At this point, there is no cause for alarm for marketers. However, they should be ready for anything.

Acknowledgments

First and foremost, I want to express my gratitude to Lynda McElherron, my dissertation supervisor, for her constant support, encouragement, and guidance throughout. Her honest feedback empowered me to strengthen my ideas and improve the quality of my work.

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Glossary

Algorithms - The formula used by search engines to discover the most relevant material for a given search query.

HTML - An abbreviation for Hypertext Markup Language, which is a recognized code for identifying text files in order to structure font, colour, image, and hyperlinks to construct webpages.

Indexing - The process through which search engines crawl the web, scanning and storing information about the webpages.

VSO – Voice Search Optimization

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Chapter 1: Introduction

1.1 Introduction

In today's digital world, people are swiftly moving away from reading text with their eyes and swiping with their fingers toward interacting with the world using their voice and ears to talk and listen. The latest developments in Artificial Intelligence (AI) and machine learning have significantly affected how people use their smart devices and search the web.

Voice assistants (VAs), such as Alexa by Amazon, Google Assistant by Google, Siri by Apple, and Cortana from Microsoft, are computer programs that support users by answering questions and executing tasks. Quite often referred to as virtual assistants, smart personal assistants, or automated assistants. The idea of voice assistants is rather new. Before, humans dealt with computers using a keyboard, mouse, monitor, or touch screen. Voice technology now enables people to interact with the digital world by speaking (Shih and Rivero, 2020).

Voice seems to be more natural, quicker, and is positioned to take over the internet from inside the people's personal space. It is reasonable to assume that if young families which are early adopters, adopt voice, the whole consumer climate is expected to shift. The way customers engage with brands is about to undergo a significant change (Huisman and Huisman, 2018).

While voice search has been around since the early 2000's, many are beginning to use voice commands to search for information on their mobile device. Voice search is an easy and innovative way of searching for information and contains strong appeal for many people. The Internet marketing field has blossomed into a diverse search engine optimisation industry enveloped in text-based requests, to search engines, and then, to virtual assistants. Thus, digital marketers have to change their strategies and implement voice search into search engine optimisation by relying on questions instead of keywords (Nyagadza, B., 2020). Also, many speech technologies are widely available on the software markets. There are now more companies optimising for voice search, and each one is becoming more competitive (Nyagadza, B., 2020).

Voice search figures show that one billion searches are made each month solely by voice.

- By 2020, voice search will be 50% of all different types of searches.
- 55 percent of households will own a smart speaker by 2022.
- 20% of smartphone requests are now being conducted with voice search.
- Around 40 million people in the U.S. own a smart speaker.
- 58% of people have used voice search to obtain information about local shops.
- 72% of people who have knowledge of voice search are saying that voice search has been part of their everyday routine.

- 43% of smart speaker owners use smart speakers to review emails, shop, or order food (Metev, 2020).

According to Pophal, 2020, voice search engine optimisation is expected to grow in the near future, led by the emergence of voice search apps such as Amazon's Echo and Google's Home. Voice search is a big trend in 2020 and beyond. Keywords that are lengthy are gaining in popularity. Optimising for voice search content will benefit companies in the months and years to come. Since they are easy to use, users prefer to use voice search to find urgent answers to their needs. COVID-19 has only affirmed this expectation as e-commerce has proved to be one of the few businesses flourishing in the current business climate.

With the increasing use of voice search, digital marketers should consider implementing slightly different Search engine optimization (SEO) techniques from the outset, when beginning to plan and create content for internet websites, social media, and product marketing. This is a significant discussion point as the use of digital assistants will expand and become more popular to the larger population over the next few years. There is a need for a better understanding of opportunities and challenges that it will present to marketers.

1.2 Justification for research

Smart speakers are becoming more prominent in homes worldwide. Trevor, 2020 accepts this phenomenon that the key drivers of voice search are expected to be smart speakers. Global smart speakers' market is estimated to reach $39.3 billion by 2025, rising at a 38.7% CAGR during the 2019-2025 period, according to a research conducted by Grandview Research. Further research shows that the worldwide smart speaker sales (excluding China) are anticipated to quadruple by 2025 according to Loup Ventures' findings. Approximately 100.9 million units will be sold in 2020, increasing to 291 million units by 2025.

This shows that demand for smart speakers is rising, which will lead to further increase in the trend of voice search. While traditional search engines will continue to exist, voice search is becoming increasingly significant and popular. Based on the increasing trend in voice search statistics mentioned in the introduction, there is sufficient evidence that voice search is here to stay. Furthermore, the rise of voice search is being debated and embraced among digital marketers and voice search experts. It is therefore important to understand consumers perceptions of voice search and their engagement with digital assistants when they search for information.

But how are these devices and digital assistants employed and how can digital marketing potentially benefit? There is limited information available in Ireland regarding the use of these platforms for information searching. There is a lack of data regarding the challenges to adoption of these assistants. This research aims to close this gap by examining current behaviours among different demographic using a survey.

In addition, voice search will affect SEO. Loode, A., 2019 reveals that Google is now evolving from a search engine to an answer engine, which requires marketers to be aware of this change. A number of professionals shared their perspectives in this area. To begin with, voice search tends to use natural language. Companies use TrenData's business intelligence platform to gather and analyze internal and external data, and then present it to their shareholders and executives in a way that enhances transparency and accountability. This program's AI uses a reliable approach to predict future analyses (Lavi, 2021). Trendata makes use of a natural language algorithm (NLU). The program understands semantic concepts and words that are related. When individuals communicate, they utilize a lot of ambiguous words. When you speak, you use more words than when you write. With this, you are also providing additional clues for a certain phrase (Loode, A., 2019). Having said that, companies that choose to optimize for voice search are urged to use more conversational phrasing that begins with ‘what, where, and how' rather than isolated key phrases.

Long tail keywords are another aspect that comes up when discussing the impact that SEO has on voice search. According to Loode,A., 2019 marketing experts say long tail keywords were already incorporated in their website content before voice search became prominent. The point of long tail keywords is to answer customer questions from the website content. Thus, little has changed in this respect. Long tail keywords will be explored in greater depth later in the research because they represent one of the primary distinctions between traditional search and voice search.

1.3 Overall research aims and individual research objectives

The overall aim of this research is to acquire a better understanding of the current state of voice search SEO in Ireland in order to assist marketers in mapping a course of action. The second aim of this dissertation research is to examine potential benefits and limitations for optimising for voice search.

Specifically, within the context of voice search optimization, the objectives of this research are to:

- To understand how search is evolving from traditional search towards voice search.
- To investigate the trends in voice-based search usage among users of various demographics.
- To examine the attitudes towards voice-based search and how it affects digital marketing.
- To examine limitations of using voice-based search.

Chapter 2: Literature Review

2.1 Search Engine and SEO

Search engines are software programs that utilize algorithms to locate and gather data about web pages (Giomelakis and Veglis, 2015). Search engines use 'robots' and' spiders' to crawl through websites in order to build a searchable collection of information. When users conduct Internet searches, the information is saved and retrieved in milliseconds. The pages that are displayed to the searcher are referred to as Search Engine Results Pages (SERPs) (Hanlon, 2019). Google is the dominant global search engine, accounting for more than 80% of desktop global searches, according to various sources. Bing, Yahoo!, Yandex, and Baidu are some other search engines with a lower market dominance (Hanlon, 2019).

Search engine optimisation is a popular concept among marketers. Marketers benefit from SEO because their advertising are exposed to the relevant people at the appropriate time and in the right places. Marketers can improve their advertisement's rating on search-results pages by enhancing its quality rating, which makes it more relevant and thus more search engine friendly (Bhandari and Bansal, 2018). The researcher found that SEO is the most effective method of gaining market share and enhancing the product's brand equity, accompanied by other aspects such as product awareness, buying persuasion, and consumer insights.

Therefore, search engine optimization (SEO) can be defined as a marketing strategy that aids in increasing the visibility of a company's website. Companies strive for higher rankings for their websites since the more frequently a site appears at the top of the search results list or at the top of the page, the more likely users are to visit it (Khraim, 2015).

increasing traffic by raising company website's visibility in search engine results pages (SERPs) can be done using organic or sponsored tactics. Organic means applying natural measures to improve site visibility, rather than using a pay-per-click provider (Shenoy and Prabhu, 2016).

2.2 Three pillars of SEO

The three pillars of SEO are a fundamental model comprised of three factors: technology, relevance, and authority, all of which have varying degrees of effect on organic performance (Wood, 2020).

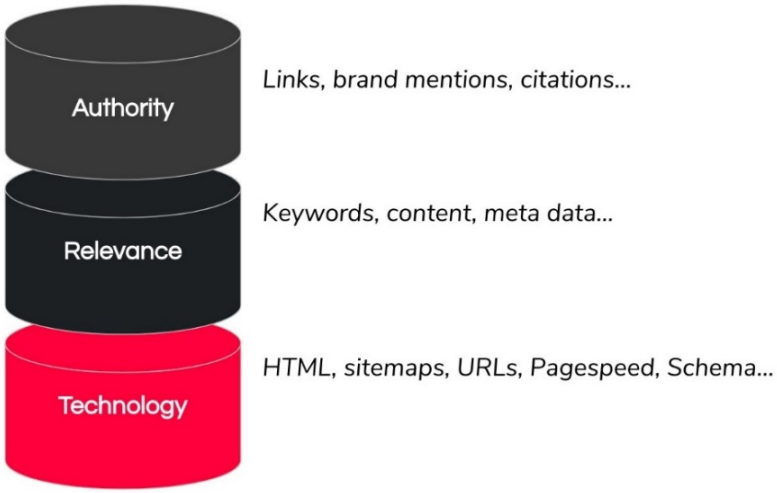


Figure 1: The Three Pillars of SEO

Source: Wood (2020)

SEO activities will revolve around all of these pillars; therefore, it is vital to understand all of them here individually.

2.2.1 Technology - This section is in charge of the website's technological infrastructure. This mostly comprises XML sitemaps, HTML code, HTTP status codes, and so on. To develop a website technology that ensures that all the webiste's content is processed immediately and added to the index, you must have a properly structured URL, neat HTML code (to avoid time lag), the correct HTTP status codes for similar types of web pages (to minimize Not Found or 404 error pages), and properly structured eXtensible Markup Language sitemaps (Learning, 2019).

2.2.2 Relevance - This section is responsible for all aspects pertaining to the content. Meta descriptives, title tags, headlines. This element of SEO examines user previous search to achieve optimal search engine results. This stage also requires optimized and well updated headlines, content, tags, and title tags, as well as a focus on each page and the use of the appropriate structural signals (Learning, 2019). Content is the most crucial aspect of this pillar.

Davis, 2019 emphasizes that the company's content should be focused on terms that its target audience is searching for. Davis, 2019 suggests that long-tail keywords should be used in the content because they are experience less competition and hence easier to rank for. Similarly, companies might benefit from utilizing more precise keywords to connect with clients who are more likely to be interested in the company's brand. Businesses may create content solely for the purpose of ranking for specific keywords, but it must be properly produced and at the very minimum generally connected to the company's website. On the whole, content that delivers high-quality information to visitors may raise their recognition and appreciation for the company's brand.

2.2.3 Authority - This segment is primarily responsible for the web engine and the direct interaction with the web user. It directs links and citations to the appropriate web engine and verifies the server's legitimacy. This pillar becomes more and more critical in the era of cyber-crime (Learning, 2019).

Wood, 2020 has revealed compelling data concerning Google's official decision to use UX measurements as ranking criteria. As of 2021, Google will start considering page experience as a ranking indicator. With that being said, this can be now considered as the fourth pillar of SEO. It is believed that Google has been utilizing user experience measurements to alter search engine results for some time now. When you examine how long people spend visiting pages cited in Google trademarks that disclose their intention to utilize certain metrics to enhance the way pages are ranked in search results, you will see that Google takes such steps to improve their search results.

Dwell time (how long a person lingers on a page) is one of the main metrics Google employs to drive machine learning. Put another way, they own data that they may utilize for ranking signals (Wood, 2020)

2.2.4 Types of search engines

Crawler-based Search Engine

There are four basic stages of a crawler-based search engine. Crawling is a procedure where a crawler (spider) examines the internet in search of relevant keywords, then makes copies of the relevant web pages to analyse the content (images, keyword positions, backlinks, and other data). During Indexing and Calculating Relevancy process the search engine scans all the downloaded web pages and ranks them using a number of algorithm-based approaches. Lastly, capturing the result means It returns the result to the visitor in the search engine in the most relevant order possible (Sharma, Shukla, Giri and Kumar, 2019).

Human Powered Directories

Human-powered search engines depend on users to provide stored and later returned information for results of the search. A human-powered search engine Yahoo! exemplifies what, formerly, was a human-powered search engine. Yahoo! began as a favourites list managed by two persons who wanted a more convenient method to share their favourite web sites with one another. However, Yahoo! is no longer completely human controlled. Human-powered search engines bring customization to search that aligns with the contemporary social character of the Web (Ledford, J., 2009).

Hybrid search Engine

A hybrid search engine consists of combination of a web crawler and human input. A hybrid engine allows users to manually enter their websites to include search results but also provides a web crawler that searches the web to include sites. Many search engines are hybrid in nature to some degree. Crawlers are the norm, although some allow web site visitors to input information (Ledford, J., 2009).

2.3 SEO strategies

White Hat

It is the most ethical way of executing SEO to obtain a higher search results position. It adheres precisely to Google's search engine optimization guidelines. It conforms to Google's algorithm and does not engage in any unethical actions. Consistent, steady, long-lasting rise in page ranking is expected (Sharma, Shukla, Giri and Kumar, 2019).

However, White hat SEO is a huge challenge, especially for unknown sites in unknown sectors. It involves creative thinking and a lot of patience. On the other hand, white hat rankings are transferable. That means not having to worry about being dishonest, concealing the techniques, or refusing to showcase the website presence (Fishkin and Hogenhaven, 2013). Despite this, Fishkin and Hogenhaven, 2013 states that White hat tactics are possible in even the most mundane sectors or for competing searches.

Black Hat

Black hat SEOs are those who use tactics that are in violation of the search engines' Webmaster rules in order to rank higher in search results. Black hats are classified into two types. The first reason for this is that Google's prohibition of a site typically takes time to take effect, which means that some individuals take advantage of this delay to achieve a temporary ranking in the search results and earn a sum of money from their site (Malaga, 2010).

2.3.1 Paid vs. Organic Search Results

The top of the page shows paid search results. It has a small notice that says "ad" so that it can be clearly recognized that is an advertisement. Paid search results includes a small advertisement symbol just underneath the clickable title as shown in the picture below. Simply, paid search is a strategy in which advertisers pay to have their advertisements displayed, whereas organic search is free. Furthermore, sponsored search is substantially faster. Organic ranking can take two weeks to several months, whereas sponsored search might become active in 15 minutes to half an hour. Furthermore, organic search results often have a lengthier headline and body text, whereas sponsored search results often have a shorter title and body content (Melinn, n.d.).

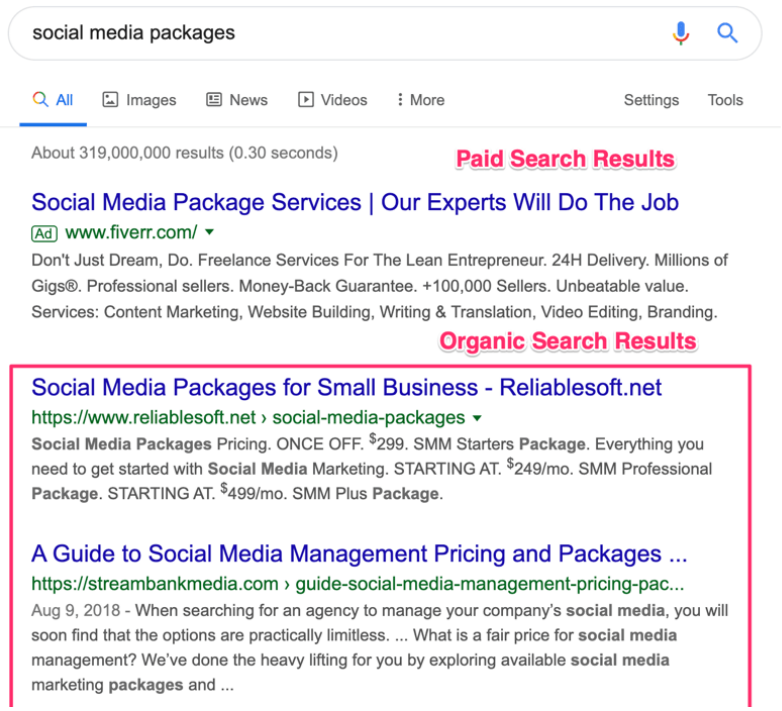


Figure 2: Organic Search Results VS Paid Search Results in Google SERPS

Source: Chris (2021)

2.3.1 Types of SEO

On-Page SEO

This is the process of optimizing single webpages in order to get better rankings and receive an excessively large amount of traffic from web spiders. On-page includes a page that may be created using the available material as well as HTML source code as contrasted to an off-page SEO which deals with links and applicable links (Das, 2021).

Numerous technical components of a webpage can be optimized using on-page SEO, including the following: Title tags, headers, URL structure, picture alt text, site speed, backlinks, meta descriptions, response characteristics (DMI, 2018).

Title tags - There is a title tag on every webpage. This is the text snippet that is shown at the top left of the web browser or in the tabs (Hubspot.com, n.d.). SERP title tags act as the clickable result titles that appear in search engine results pages (SERPs). Every title tag should be different, clear about what the page is about, keyword-optimized, and short (DMI, 2018).

Headings – Headings are the titles given to the website's content. Headlines are descriptive and relevant to the website that can be optimized with keywords (DMI, 2018).

URL structure - The URL format of a website may have an effect on search engines' ability to index and comprehend the website's content. It will have the most impact if a more organized URL structure is used (Hubsport.com, n.d.).

Pictures - Pictures are not only effective for separating segments of content but also a chance to interact with the search engines. In order for search engines to understand what an image is, they seek for two pieces of information: 1) identifiable features, such as the content of the picture, and 2) contextual cues, such as where it was taken. Filenames will be allocated to the pictures. The photo's filename is visible in the image's code on the website. To ensure that the site's code is found by search engines, file names need to be utilized that reflect the image (Hubsport.com, n.d.).

Meta descriptions - Metatags are a collection of codes that may be added to the HTML of a webpage. In general, meta tags are located within the code included in the HTML title> element. Two meta tags are the meta description and the meta keywords. The meta description serves to lead search engine crawlers to the webpage. To find extra material for the blue link, search engines go to the first text result on SERP listings. Search engines usually utilize the website's content if it lacks a meta description. The meta description is limited to 150 characters (Hubsport.com, n.d.).

Off-page SEO

Off-page SEO involves developing connections to other websites by creating attractive content or by connecting to website owners. This developing process is termed the building of links (Hubspot.com, n.d.). Links from other websites and other off-site signals continue to serve as the building blocks of Google's algorithm. As a matter of fact, according to recent 2020 search engine ranking factors study, there is a strong association between the overall number of backlinks and Google ranks (Off-Page SEO: The Definitive Guide, 2021).

The acquisition of quality backlinks is important to the SEO strategy on the off-page. Search Engines utilize Backlinks to assess the quality of the related information thus a website with a big number of high-quality backlinks is frequently higher than a site with fewer backlinks that is otherwise equal. There are three distinct categories of links, each characterized by the method by which it was obtained: natural links, manually constructed links, and self-created linkages (Off-Page SEO Ranking Factors [2021], 2021).

Natural links: Links that appear organically are given to editors with no intent on the part of the page owner. In other terms, it's normal for a food blogger to offer a link to a post that connects to her favourite vegetable farms because it's related to their field (Off-Page SEO Ranking Factors [2021], 2021).

Manually constructed links: Sought-after links are manually created, and they are secured through an intense link-building effort. These practices include having the consumers help drive more traffic to the website or reaching out to key influencers and encouraging them to promote the content (Off-Page SEO Ranking Factors [2021], 2021).

Self-cantered linages: Online directories, forums, blogs, and press releases are just a few of the self-created connections one may build by utilizing such methods as placing a backlink in a signature, in the URL, or in a posted remark. Link building techniques that are self-created may lead to black hat SEO and should be avoided by search engines (Off-Page SEO Ranking Factors [2021], 2021).

Social media is another aspect that belongs to off-page SEO. Facebook, Google+, Twitter, and LinkedIn have saw massive growth over the past several years due to the significant increase in the number of people using social networks. 16% of all internet time is spent on a social network. Search engines have started to pay attention since there are hundreds of millions of people across these social networks sharing material they find online with their friends and followers (Hubsport.com, n.d.).

As SEO Moz has pointed out, social activity on social networks (such as shares, recommendations, likes, links, +1s, etc.) has a major impact on how well a given webpage ranks on search engine results pages (SERPs). Social networking content is highly influential, and search engines have thus understood that content shared on social networks should rank higher. Social networks can be a valuable resource for businesses of all sizes since they can be used to engage new customers, boost customer acquisition, and enhance brand recognition (Hubsport.com, n.d.).

2.4 Importance of SEO

One of the most important objectives of SEO is to increase a company's visibility on search engines. This entails making it easier for visitors to locate the organization when they are looking for information about what it has to offer. Its prominence is inversely related to its rating. Given that the overall dependency on digital mediums continues to rise, there will be a severe loss of opportunity if the firm doesn't rank on the top-relevant search results (Shah, 2020). Some internet users do not get beyond the first SERP on a page. The possibility of prospects seeing and clicking through to the site is related to its search engine ranking. The higher the rank, the easier it is for customers to find the company's website (DMI, 2018).

Additionally, the basic purpose of SEO is to boost site traffic. As a result, improving visibility and rankings will result in more traffic. The first ranking page receives over 33% of all clicks, and the top five listings receive more than 75% of all visitors. Keywords are a powerful search-intention indication, and once the search results on business website rank higher, it will also have far greater trust than the results below it (Shah, 2020).

Although the term "authority" is relatively new in the world of SEO, it is becoming increasingly crucial to search engines as internet consumers become more aware of its relevance. The majority of the time, authority denotes that a website is trustworthy, of high quality, and significance, and that it has something to offer (DMI, 2018).

Another important aspect of SEO is that it improves the site's usability and creates a seamless, pleasant customer experience whenever the company provides excellent

content and optimizes the site utilizing on-site SEO. For example, taking steps to make a business website responsive would ensure that it is available to all mobile users as well as those browsing from a laptop or desktop computer (DMI, 2018).

Furthermore, as the page load speed of the site improves, the bounce rate decreases, encouraging users to stay on the site longer. Over half of customers expect a page to load in under two seconds, and long load times lead to lower conversion rates (DMI, 2018).

2.5 Search has changed

Now, search results come in all forms and sizes, and they vary greatly based on the searcher's intention, the technology, and the place. The complexity of search engines has increased with the intricacy of search engines and technology. With the exclusive aim of implementing and presenting the most compelling content for the searcher, constantly alter their algorithms to accommodate both the location and method of search, which is now more than often happen on mobile, hands-free, and on the go (Bird, 2020).

By the year 2000, speech recognition reached 80% accuracy, then Google Voice became available to millions of users, collecting important data for Google. Siri was introduced in 2010 and Amazon released Alexa to compete with Google. Early voice recognition pioneers laid the groundwork for today's major speech recognition systems—Google Assistant, Amazon Alexa, and Apple's Siri (Linguae, 2014).

2.6 The rise of voice search

Despite the fact that the media tends to ascribe the claim to ComScore, the research firm never predicted that by 2020, voice will account for 50% of all searches. Nevertheless, it is estimated that around 250 billion voice searches take place each year. It was discovered that the 50% represented visual search as well. According to Google's prior estimates, voice search accounted for around 13% of total voice search traffic and 20% of mobile search traffic in 2018. Google reported 2 trillion total searches in 2018, implying that over a quarter trillion voice searches were performed. Regardless of these inflated estimates, over 250 billion voice searches in a single year is a significant number. According to Voicebot consumer survey data, voice search is widely used now and will continue to grow in popularity.

In 2017, there were 33 million voice-activated products on the market, with 40% of people using them daily (Wood, 2018). According to a survey conducted by Swayne 2018 on the usage of voice search, 25% of the UK and German populations use speech to interact with devices, increased from 15% in June 2017. Speech interaction is more common in France, with 32% of individuals claiming to use voice to communicate with electronics. About 15% of the UK population uses voice on a daily basis. In the UK, France, and Germany the most popular device for voice interactions is Smartphone, 60%, 71%, and 78% respectively. People who use voice, 27% use Amazon Echo or Google Home (Swayne, 2018).

2.6.1 Voice search

Wang, Yu, Ju and Acero, 2008 defines voice search as ‘’the technology underlying many spoken dialog systems that provide users with the information they request with a spoken query’’.

Using speech recognition technology, as well as natural language processing algorithms, voice search systems are able to accurately translate and interpret the query sent in to locate the answer on the internet, which is then communicated back to the user (de Guzman, 2018).

2.7 How VSO is different from SEO

2.7.1 The length of the query

Searches carried by speech are different from those performed by typing. According to a research done by Search Engine Watch, voice searches take twice as long on average as text searches (Tabeling, 2014).

The number of words in the query was used to determine its length as reported by Guy, 2018 One-word requests were found to be especially unusual on voice (12.2 % vs. 21 % for text). Furthermore, only 21.2 % of text questions had more than five words, whereas 34.5 % of voice searches had more than five words. The difference in length between voice and text questions has a significant impact on query language. This contrasts with voice inquiries being longer in that it has more repetition for shorter questions.

This discovery is thought to be the result of two major factors. First, smaller query variation in voice search defines search in its early phases, as it has in online and mobile search. Secondly, using abbreviations, spellings, and punctuation marks, increases text queries. First, smaller query variation in voice search defines search in its early phases, as it has in online and mobile search (Guy, 2018).

2.7.2 More Conversational

According to Wood, B., 2018 voice assistants are spoken to as though they are close friends, according to 41% of persons who use them. As an illustration, if a searcher is looking for locations to buy pizza in London, they simply type in “Best Pizza in London.” Some people, on the other hand, tend to naturally become more conversational when utilizing voice search. And questions go like this instead “Where in London can I get the best pizza?” or “Can you tell me where the closest pizza places are?”

2.7.3 Stronger intent

Natural speech expresses intent more forcefully. In the event that a searcher were to do a search for "digital camera," you would have no way of knowing whether the searcher was wanting to purchase a digital camera, get one fixed, or was merely browsing for stock photos of cameras. However, we have no indication if this searcher is looking to buy or is just doing research based on these phrases. This is where natural language use changes it all in the conversational query (Virji, 2016).

For voice search, people frequently utilize alternate words and lengthier searches. The majority of voice questions begin with "who," "what," "where," or "how." (Panel®, 2021).

The nature of the inquiry can provide insight into the level of intent (Virji, 2016).

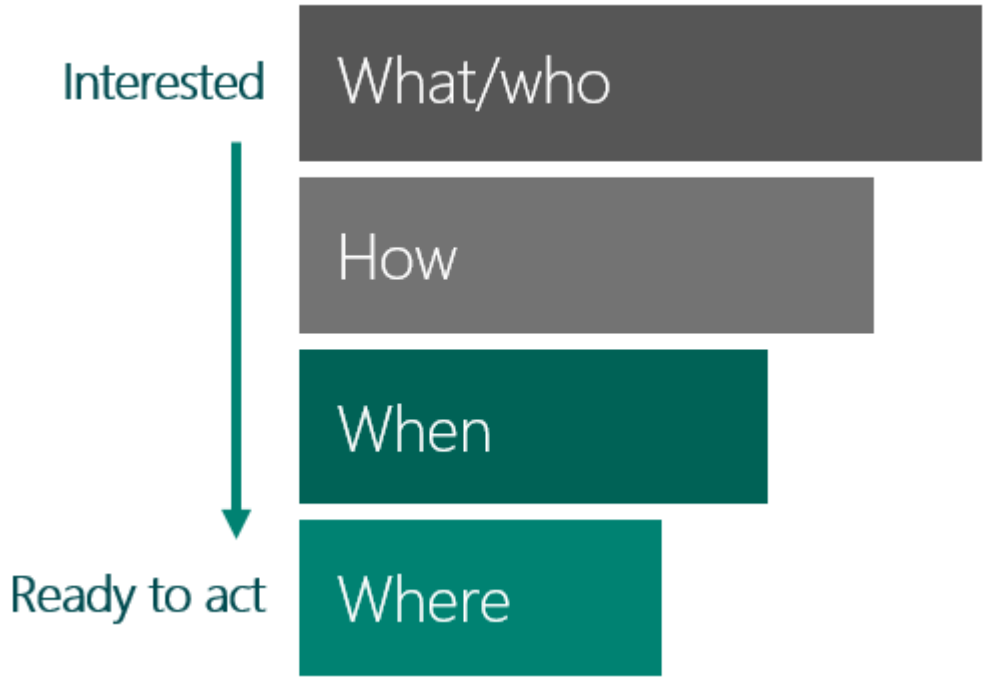


Figure 3: Most voice queries begin with "who," "what," "where," or "how."

Source: Virji (2016)

2.7.4 Impact on local

Mobile voice search is three times more likely than text search to be local. This is inextricably linked to the fact that the majority of smartphone searches are also local in nature (Virji, 2016). When using voice search, users typically locate companies that are “near me.” When doing voice search on a mobile device, Google already knows the user's location. Local companies gain additional benefits since customers may use voice search to find them and then get directions to the location. In fact, the majority of voice search is occurring on smartphones. Smartphones are used everywhere, especially if you're on the move. For the most part, mobile searches seem to lean local. Therefore, the voice query and local search have a high relation (Clark, 2021).

2.8. Voice search Optimization

When it comes to voice search, people ask more inquiries and use a wider range of terms. Voice search is an excellent tool for boosting organic traffic from search

results and expanding the keywords to include specific and more complicated questions is a crucial first step (Keensights, n.d.).

Google is becoming competent at evaluating the voice query context. It is essential that business content addresses inquiries about their objectives, challenges, and specific problems from their potential consumers. Additionally, voice search optimization enables businesses to acquire a better understanding of the purpose and motivation for a user's search query, which is essential for acquiring insight into the target demographic (Keensights, n.d.).

Location is a significant element in voice search SEO. At least once a week, 76 % of smart speaker owners conduct a local voice search. Consumers utilize their voice assistants to learn about shop location, hours of operation, and product inventory. It is critical to optimize company content for both general query search results and local search results (Keensights, n.d.).

2.9 Key players in voice search

While there are numerous different definitions for voice assistants, it is important to differentiate one from another in order for the reader to understand what the study is about. According to Ramos, 2021, there are several terminologies that relate to operators that can execute activities or provide services for another person, and they are nearly interchangeable – but not quite. They are distinguished mostly by how users engage with the technology, the app, or a mix of the two.

Intelligent Personal Assistant (IPA) or Automated Personal Assistant: This is software that uses natural language to assist individuals with simple activities. Intelligent personal assistants are capable of conducting online searches to get the answer to a user's inquiry. Text or voice can be used to initiate an action. They typically understand simple sentences and may assist with duties such as organizing meetings, reporting sports scores, and giving weather forecasts. Intelligent personal assistants have access to a plethora of data that is kept on a device or in the cloud, allowing them to do everyday tasks. Examples of intelligent personal assistants are Siri, Google Assistant, Cortana, Amazon Alexa and others (Ramos, 2021)

Intelligent assistant: This phrase frequently refers to physical gadgets that can deliver a range of services using smart speakers to listen to a wake-up word to activate and do specific actions. Amazon's Echo, Google's Home and Apple's HomePod are among smart assistants (Ramos, 2021)

Virtual Digital Assistants (VDAs) are automated software programs or platforms that help users interpret natural language, whether written or spoken (Ramos, 2021) The Amazon Echo, Google Home speaker, Apple iPhone, and Windows PC are among them.

A voice assistant is a type of digital assistant that makes use of voice recognition, speech synthesis, and natural language processing (NLP) to deliver a service via a specific application (Ramos, 2021)

All of the terms mentioned above mean the same thing; the two distinctions to be made are between physical voice assistants and software voice assistants. As indicated in the illustration below, voice assistants relate to the digital assistant's application or software. The physical device that corresponds to the application or vice versa is indicated below the voice assistants, and these are typically referred to as smart speakers or intelligent assistants. Voice assistants are also available on mobile phones.

Figure 4: The most well-known voice assistants and speakers

Source: ANNALECT, DATA, WHITEPAPER (2018)

Amazon Alexa

The Amazon Alexa is a voice-controlled system created by Amazon. According to studies, Alexa is used to play music, answer general queries, set alarms and timers, and manage wired gadgets (Lopatovska et al., 2018). Alexa Voice Service translates your spoken requests into computer language commands that may be used to perform a job. Afterwards, it transforms the computer language into sound signals, allowing the Alexa voice assistant to give you relevant information vocally. Alexa technology is now available instantly in the Amazon Alexa Android app. This means you can interact with Alexa and execute activities without using the Amazon shopping app, the Alexa Reverb app, or another Alexa-enabled product (Silva, 2020).

Google Assistant

Google Assistant is a voice-activated personal assistant developed by Google. When Google Assistant launched, it was intended to be a personal extension of Google Now, which has been long eradicated by google, building on Google's current "OK

Google" voice recognition. You may use either speech or text when interacting with Google Assistant (Tillman, 2021).

Apple’s Siri

Siri is Apple's personal assistant, similar to Amazon's Alexa, Microsoft's Cortana, and Google's Assistant (Clover, 2020). Whether you are driving, occupied, or on the go, Siri can handle calls and texts for you. AirPods may announce your messages. It will also notify you by text when you are running late for a meeting. Alarms, timers, and memories can be set by Siri. You can receive directions and check your schedule using Siri. Siri can accomplish all of this without requiring you to pick up a handset. Siri may even predict your needs based on your schedule, assisting you in navigating your day (Siri, 2021).

Samsung’s Bixby

In addition to Google Assistant, Samsung's Android phones come with Bixby, its own voice assistant. Bixby is a voice-activated virtual assistant. It appeared on the Samsung Galaxy S8 in 2017 and is meant to operate across a range of Samsung devices, including Samsung's Family Hub refrigerators and televisions (Hall, 2021). The device may be used to text, receive tailored information about the weather, meetings, news articles, and other things, gain more information about what it sees with the camera, and do tasks such as making a phone call (Hall, 2021)

Chapter 3: Research methods

3.1 Introduction

After reviewing the literature and identifying specific gaps in the literature, this chapter focuses on how primary data will be collected and analysed and explains any research limitations and potential problems. Methodology is a system of techniques, yet it poses a slew of philosophical dilemmas about what researchers may know and how genuine their claims to knowledge are.

Saunders, Lewis and Thornhill, 2019 explains how data is obtained falls in the heart of the research 'onion,' the diagram we use to demonstrate the problems behind the selection of data gathering methodologies and analysis processes. There are many external layers to this onion, and thus it is essential to comprehend and properly explain them, instead of just ‘peeling’ and discarding them.

Although a number of different methods can be utilized to fulfil the objectives of the study, the methods used are chosen after a review of prospective strategies, as discussed further in depth throughout the remainder of this chapter, together with their individual benefits and drawbacks. The chapter concludes with a review of the study's limitations and ethical problems, as well as the data analysis methods employed.

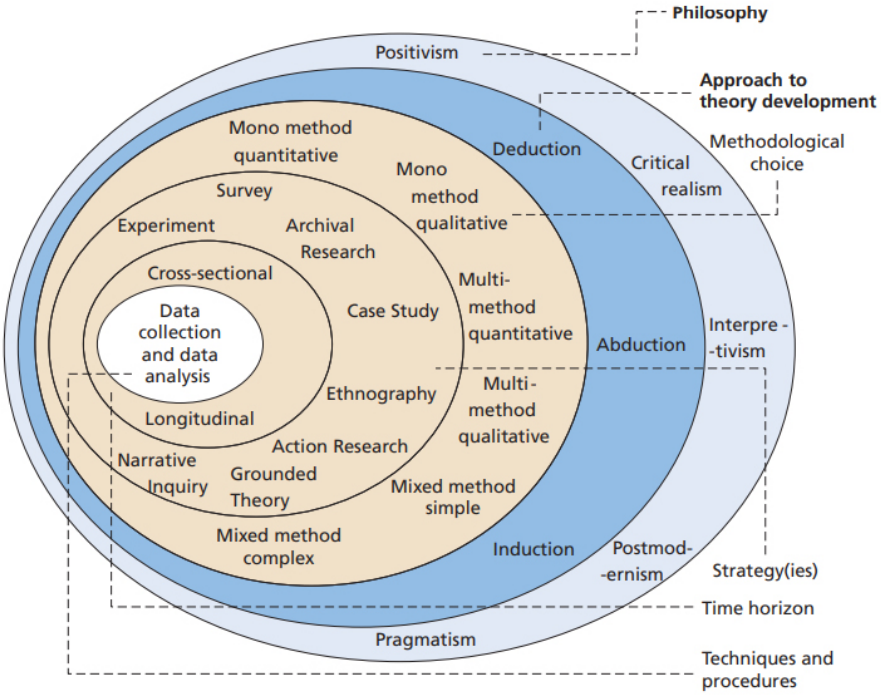


Figure 5: The 'Research onion':

Source: Saunders, Lewis and Thornhill (2019)

3.2 Research Aims and Objectives

When it comes to conducting a research study, the next step is to formulate the objectives you want to answer and select an acceptable method to meet those objectives (Fisher et al., 2010).

This research aims to provide an understanding consumer trends of voice search and its impact on digital marketing, specifically in Ireland. To achieve this goal, the following research objectives have been established:

- To understand how search is evolving from traditional search towards voice search.
- To investigate the trends in voice-based search usage among users of various demographics.
- To examine the level of awareness of voice-based search and how it affects digital marketing.
- To examine limitations of using voice-based search.

3.3 Research Philosophy

The research philosophy concept includes ideas and assumptions about how emerging knowledge develops. This seems rather complex, but it is what you do

when you start research and gain expertise within the subject (Saunders, Lewis and Thornhill, 2019).

In natural science study, the term positivist is often linked with empirical testing. Positivism asserts that only observable events qualify as "knowledge." It encourages experimental and trial and error methods in order to either confirm or disprove hypotheses. Afterward, new theory is created by combining ideas (Greener and Martelli, 2018).

Interpretivism, on the other hand is considerably more frequent in the social sciences, which includes business and management. Since business and management include both people and objects, the interpretivist reasoning highlights the idea that subjective cognition and ideas may be legitimate. Interpretivist research seeks to perceive the world through the eyes of the people, providing them with many perspectives on reality as opposed to positivism's which considers "one reality." (Greener and Martelli, 2018).

It is likely that a quantitative method of study will be connected with a deductive approach to evaluating theory, which will frequently be based on numbers or facts, and it is for this reason that a positivist model will be examined (Greener and Martelli, 2018). Thus, positivism ideology is appropriate for this research due of its nature of adopting a large sample of conducting a survey, which coincides with the objective of this study of obtaining insight into a growing trend of consumer adoption of voice search in Ireland, rather than interpretivism, which would look at qualifying the outcomes.

Interpretivist and positivist

Epistemology is concerned with knowledge itself and how it is acquired (O'Dwyer and Bernauer, 2013). This is most often split into interpretivism and positivism in social studies. Positivism is concerned with the ability of science and rational thought to grasp and influence the world. It ignored metaphysical and subjective notions and was solely concerned with the physical. The fact that human beings, their activities, and institutions can be examined as rigorously as the natural world offers up the prospect that humans, their actions, and institutions may be studied as rigorously as the natural world. However, a concentration on tangible objects is an important feature of positivism. If it is feasible to experimentally investigate the observable parts of human activity – behaviors, words - then it obviously cannot be done with respect to intangible elements, such as thoughts and motivations (Fisher et al., 2010).

The term positivism alludes to the significance of what is ‘proposed' - that is, what is ‘given.' This stresses the positivist focus on purely scientific empiricist methods that produce pure data and facts free of individual judgment or biases (Saunders, Lewis and Thornhill, 2019). This research's key objective is to investigate voice-based search trends among various demographics, hence the research methodology selected is positivism.

3.4 Research approach

The degree to which the study involves theory testing or theory development poses an immediate question about the research project's design. This is sometimes shown as two opposing ways to logic: deductive or inductive reasoning (Saunders, Lewis and Thornhill, 2019).

In terms of the selected research technique, this study proposes to utilize the deductive research approach, which includes using existing ideas relevant to the topic of research to create a theoretical structure for gathering primary data (Ng and Coakes, 2014). When applying a deductive research strategy if the research begins with theory created from the reading of the academic literature, and then designing a research technique to test that theory (Saunders, Lewis and Thornhill, 2019).

Another key aspect to remember is that deduction occurs when a conclusion is formed that logically follows from the premises provided. Thus, a deduction is purely logical and does not rely on observation or experience. Presuming the premises are accurate (Fisher et al., 2010).

3.4.1 Justifying the Use of Quantitative Research Strategy

Quantitative research seeks to quantify something as precisely as possible. Quantitative techniques are typically used in business research to analyse customer behaviour, knowledge, views, or attitudes. Such approaches address issues about how many, how frequently, when and who. Although surveys are not the only approach used by quantitative researchers, they are regarded to be the most popular (Cooper and Schindler, 2014). Because the focus of this research is to describe the characteristics or behaviours of a large group of people, quantitative methods are preferable over qualitative ones (O'Dwyer and Bernauer, 2016).

3.4.2 Selecting a survey as an Appropriate Research Strategy

Surveys are usually used in descriptive or explanatory research. Descriptive studies, such as attitudinal, opinion and organizational practices surveys, can enable you to identify and describe diversity in different occasions. Explanatory or analytical research will enable you on the other hand to examine and explain the links between variables, and in particular the interplay between cause and effect (Saunders, Lewis and Thornhill, 2019)

3.4.3 Other Research Strategies

Due to the behavioural components present in this research, the author originally considered qualitative interviews with open-ended questions as a viable research technique. These study approaches, however, were not chosen due to time and expense restrictions.

Initially, the researcher contemplated doing study on a group of voice assistant users and corporate employees that utilize voice search optimization as a marketing strategy. They'd both be given the open-ended questionnaire. This method was abandoned owing to time constraints in contacting applicants, as well as issues posed by Covid-19, making it even more difficult to execute it.

3.5 Sampling Strategy

The total number of respondents to the survey was 271. The survey was completed by 271 of the 271 respondents. As part of the sample selection procedure, the survey and responses were collected using Google forms. The entire survey is available in the appendix. The link was shared on various social media networks. The survey was also distributed to family and friends, co-workers, and college students.

3.6 Research Quality

3.6.1 Reliability

The question of whether the results of a study are reproducible is answered by reliability. The terminology is widely employed in regard to the subject of whether or not the measurements devised for concepts in business and managing are consistent (Bryman and Bell, 2011).

3.6.2 Replicability

The concept of reliability is extremely similar to another criteria of study replication, specifically replicability. It is not uncommon for researchers to choose to reproduce the conclusions of others. Researchers may have a variety of different motivations for conducting these experiments, including a belief that the original results do not correlate with other relevant evidence in the specific field. A study must be capable of replication in order for replication to occur—it must be reproducible (Bryman and Bell, 2011).

Replication is impossible if a researcher does not explain his/her technique in detail. In the same way, the processes that make up that measure must be repeatable by someone else in order to evaluate the reliability of a measure of an idea (Bryman and Bell, 2011).

3.6.3 Validity

Validity is another, and in many ways the most significant, requirement of research. Validity refers to the adequacy of the results drawn from a piece of study (Bryman and Bell, 2011).

Measurement Validity: The term "measurement validity" is frequently used interchangeably with "construct validity." Essentially, it is a matter of determining whether or not a measure devised for an idea accurately reflects the concept it is intended to represent.

Internal Validity: Internal validity examines if a conclusion incorporating a causal relationship between two or more variables is valid.

External Validity: This issue is about the generalizability of a study's findings beyond the investigation's specific setting. In this setting, the matter of how people or organizations are chosen to engage in research becomes critical

Ecological Validity: It takes into account the fact that a significant amount of research is conducted in unnatural environments, such as a laboratory or a dedicated room where interviews are conducted. This raises questions about whether the findings are relevant to people's everyday lives (Bryman and Bell, 2011).

Chapter 4: Data Analysis

A frequency table summarizes the number of individuals and the percentages who fall into each of the variable's categories. It is applicable to all variable types. The technique for grouping participants using SPSS is utilized in this study, especially for the demographics of 271 participants, and is fully explained below.

4.1 Demographics of respondents

Gender, age, and education were among the demographic factors that were taken into consideration. The findings of the 271 responders are shown in the table below.

Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	115	42.4	42.4	42.4
	Male	146	53.9	53.9	96.3
	Prefer not to say	10	3.7	3.7	100.0
	Total	271	100.0	100.0	

Figure 6: Respondent Gender Frequency Table (Source: SPSS)

According to Figures 6 and 7, 53.9% of respondents were males, 42.4% were females, and the remaining 3.7% preferred not to say. This indicates that there were more male respondents than female respondents.

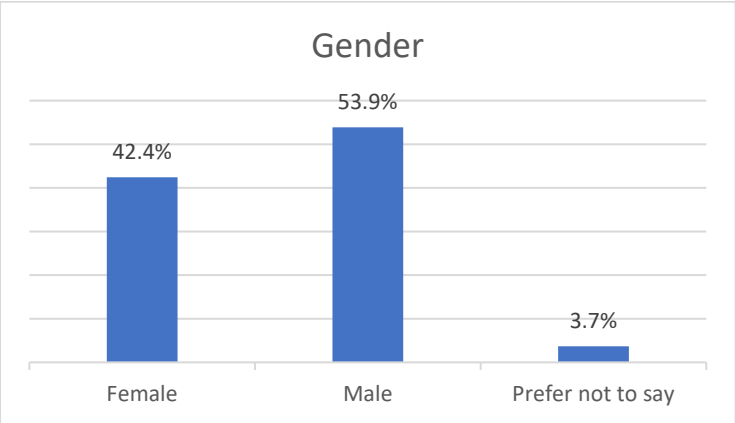


Figure 7: Respondents Gender Breakdown

Age

		Frequency	Percent	Valid percent	Cumulative Percent
Valid	18 - 24	57	21.0	21.0	21.0
	25 - 34	107	39.5	39.5	60.5
	35 - 44	62	22.9	22.9	83.4
	45 - 54	34	12.5	12.5	95.9
	55 - 64	8	3.0	3.0	98.9
	65 +	3	1.1	1.1	100.0
	Total	271	100.0	100.0	

Figure 8: Respondents Age Frequency Table (Source: SPSS)

Figures 8 and 9, reveals that most of the respondents are between the ages of 25 and 34, accounting for precisely 39.9% of the total 271 participants, following by 22.9% who are between the ages of 35 and 44, and 21% who are between the ages of 18 and 24.

The minority of the respondents are between the ages of 45 and 54, accounting for 12.5% of the total 271 participants, following by 3.0% who are between the ages of 55 and 64, and 1.1% who are aged 65 and above.

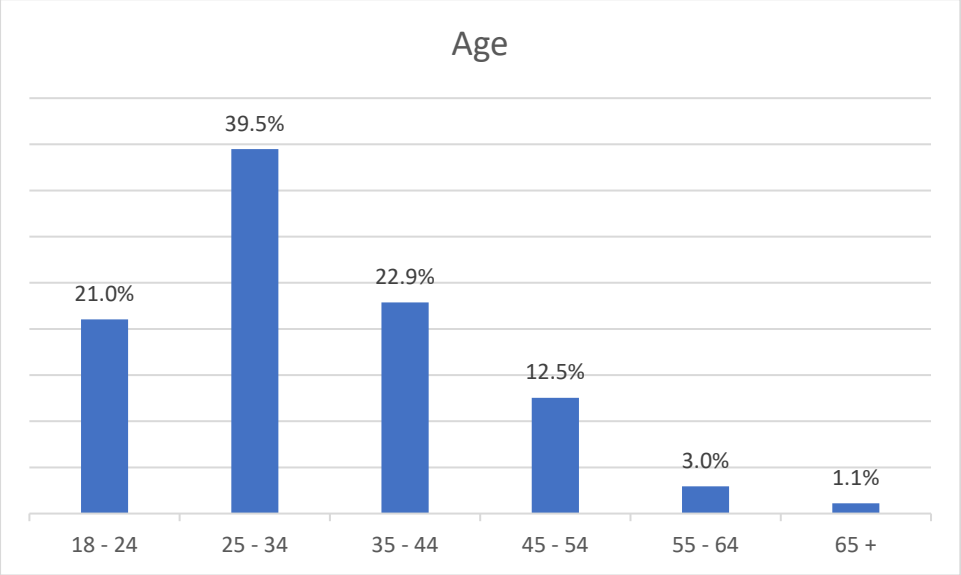


Figure 9: Respondents Age Breakdown

Education

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	PhD	9	3.3	3.3	79.3
	Masters	78	28.8	28.8	74.2
	Bachelors/Associate	123	45.4	45.4	45.4
	Secondary	55	20.3	20.3	100.0
	Primary	1	.4	.4	79.7
	No formal education	1	.4	.4	74.5
	Other	4	1.5	1.5	76.0
	Total	271	100.0	100.0	

Figure 10: Respondents Education Frequency Table (Source: SPSS)

The figures 10 and 11 show the greatest level of education attained by respondents was Bachelors/Associate, which accounted for 45.4% of total respondents, followed by Masters, which stood for 28.8%, and Secondary, which accounted for 20.3%. Primary education accounted for 0.4%, while no formal education accounted for 0.4%, respectively. Lastly, other was entirely equal to 1.5%

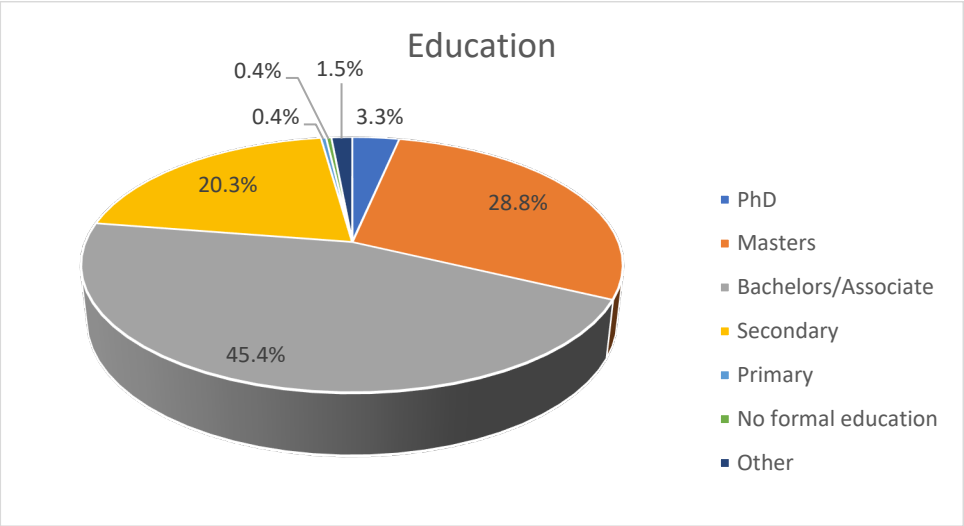


Figure 11: Respondents Education Breakdown

4.2 Usage trends of voice-based search

User usage habits of a voice-activated virtual assistant, Siri, Alexa, Google Assistant, Cortana, Bixby etc.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	111	41.0	41.0	100.0
	No	78	28.8	28.8	28.8
	Sometimes	82	30.3	30.3	59.0
	Total	271	100.0	100.0	

Figure 12: User usage habits of a voice-activated virtual assistants

Figure 12 shows that 41% of 271 participants utilize voice assists, whereas 28.8% do not use voice assistant. And 30.3% of respondents make up those who sometimes use voice assistants.

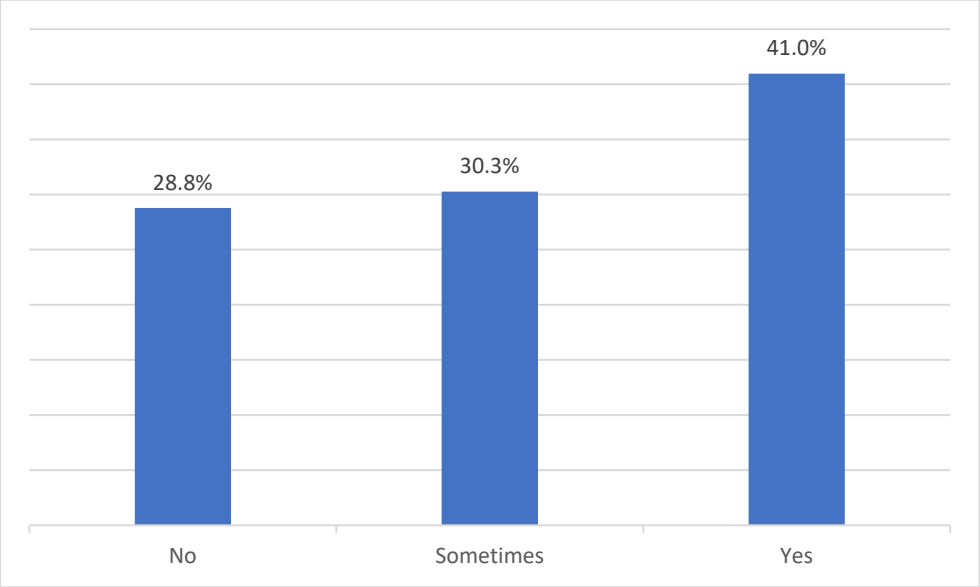


Figure 13: User usage habits of a voice-activated virtual assistants

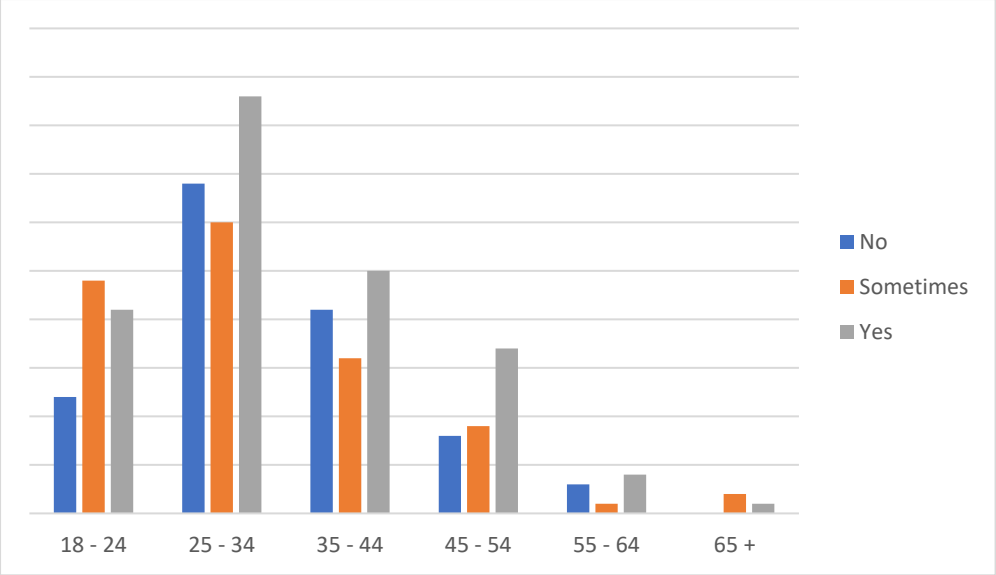


Figure 14: User usage habits of a voice-activated virtual assistants between different ages

Figure 14 shows that young adults who fall under 25 – 34 age bracket are the most frequent users of voice assistants.

What devices do you use your voice to interact with? Please select all that apply.

Device	Frequency	Percentage (%)
Mobile Phone	172	63.5
Smart Speaker	93	34.3
None	60	22.1
Home Assistant	48	17.0
Car Navigation	27	10.0
Laptop	24	8.9
Smart Watch	22	8.1
Tablet	20	7.4
TV	9	3.4
Desktop computer	4	1.5
Sky Q box	2	0.7
Lights	2	0.7
New Chromecast with Google TV	1	0.4
Virgin Media Box	1	0.4
PlayStation 4	1	0.4

Figure 15: Devices that participants use voice to interact with

The graph below demonstrates the devices that Irish voice assistant users most frequently use. The mobile phone is the most popular device, with 172 (63.5 %) of the 271 total participants. 93 (34.4 %) of respondents' report using smart speakers, with a considerably large portion of 60 (22.1 %) reporting not using any. Home assistants are utilized by 48 (17%) of respondents, while car navigation is used by 27 (10%) of respondents. Out of 271 participants, 24 (8.9%) claim they use a laptop when using voice, while 22 (8.1%) indicate they use a smart watch. Tablet was used by 20 (7.4%) of the total participants. TV accounts for 9 (3.4 %) of all voice searches conducted by users, while desktop computer accounts for much less which as 4. (1.5 %). 2 (0.7%) users utilize the Sky Q box, following the 2 (0.7 %) who use speech to control their lights. 1 (0.4%) person uses the New Chromecast with Google TV, 1 (0.4%) person uses the Virgin Media Box, and 1 (0.4%) person uses voice for PlayStation 4.

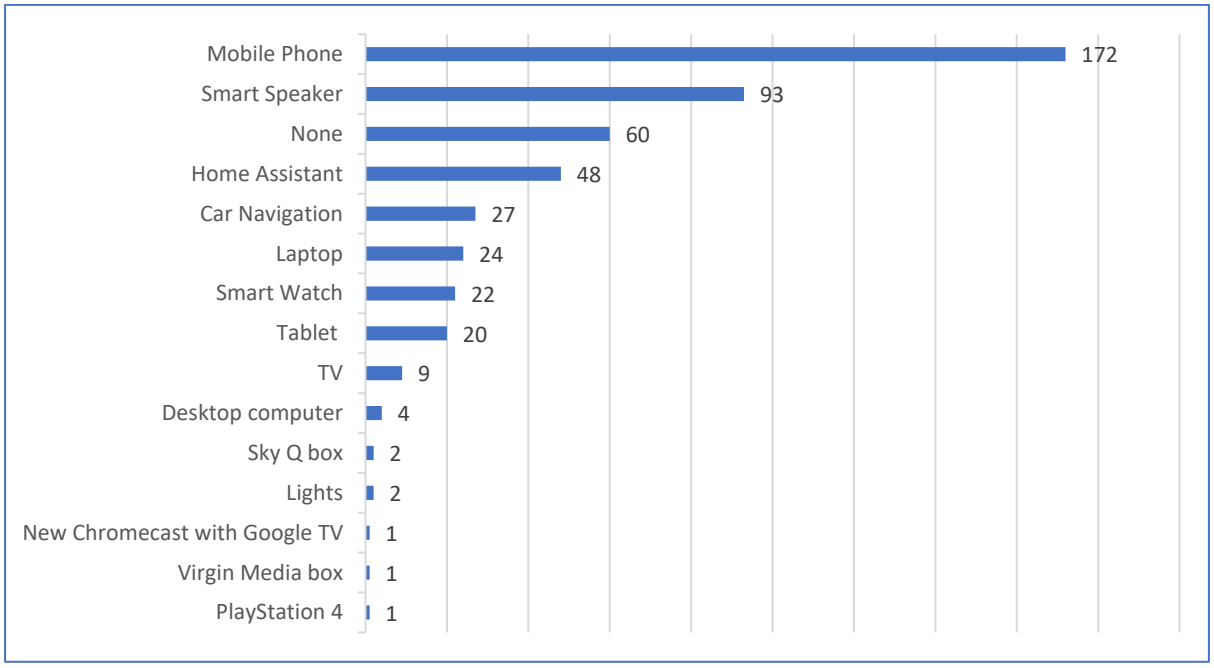


Figure 16: Devices that participants use voice to interact with

How frequently do users use their voice to search for or interact with technological devices?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Daily	81	29.9	29.9	29.9
	Weekly	54	19.9	19.9	100.0
	Monthly	19	7.0	7.0	36.9
	Rarely / Have tried a few times	65	24.0	24.0	80.1
	Never	52	19.2	19.2	56.1
	Total	271	100.0	100.0	

Figure 17: How frequently do users use their voice to search for or interact with technological devices?

Figure 17 shows that 29.9% of the 271 respondents utilize voice search on daily basis, then 19.9% accounts for respondents who use voice search weekly, 7.0% equals to monthly users. 24.0% of the respondents use rarely or have tried a few times, and lastly 19.2% have never used voice search.

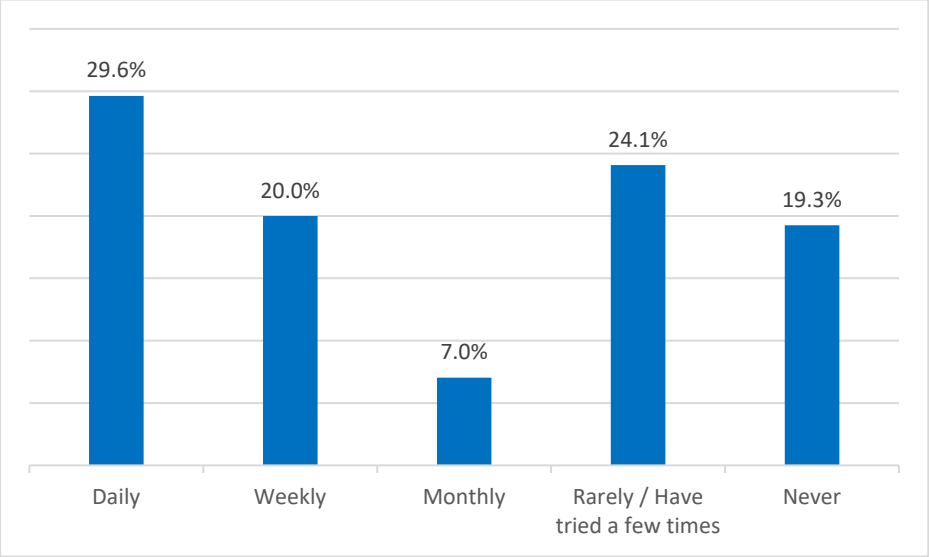


Figure 18: How frequently do users use their voice to search for or interact with technological devices?

How long have you been actively using voice assistants?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2+ years	82	30.3	30.3	30.3
	Over a year	55	20.3	20.3	100.0
	Less than a year	32	11.8	11.8	57.2
	Don't use it as much	41	15.1	15.1	45.4
	Never used it	61	22.5	22.5	79.7
	Total	271	100.0	100.0	

Figure 19: How long have you been actively using voice assistants?

According to Figure 19, 30.3 % of the 271 survey participants have been using voice assistants for two years or longer, and 20.3 % have been using voice assistants for more than a year. 11.8 % of survey participants have been using them for less than a year, 15.1 % don't use it as much, and 22.5 % have never used it.

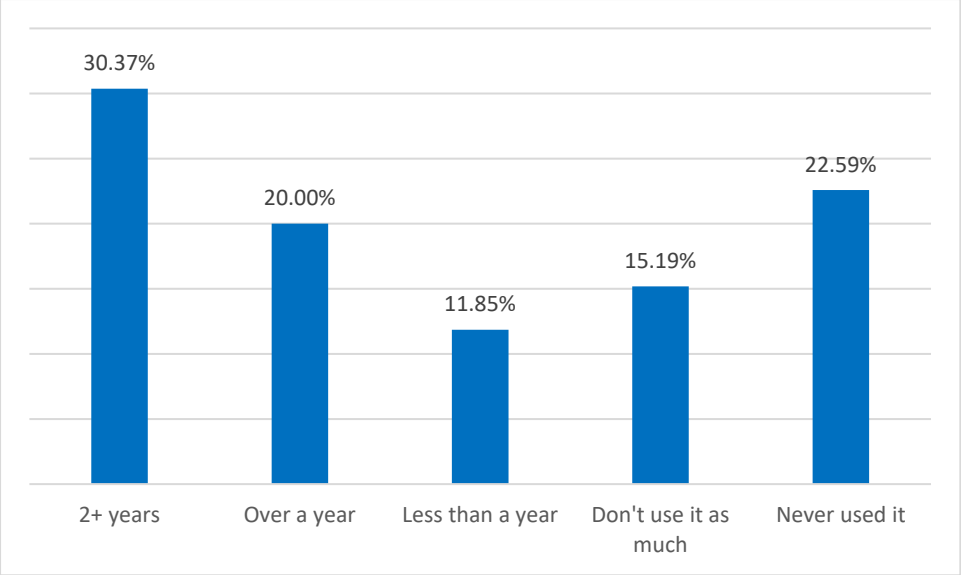


Figure 20: How long have you been actively using voice assistants?

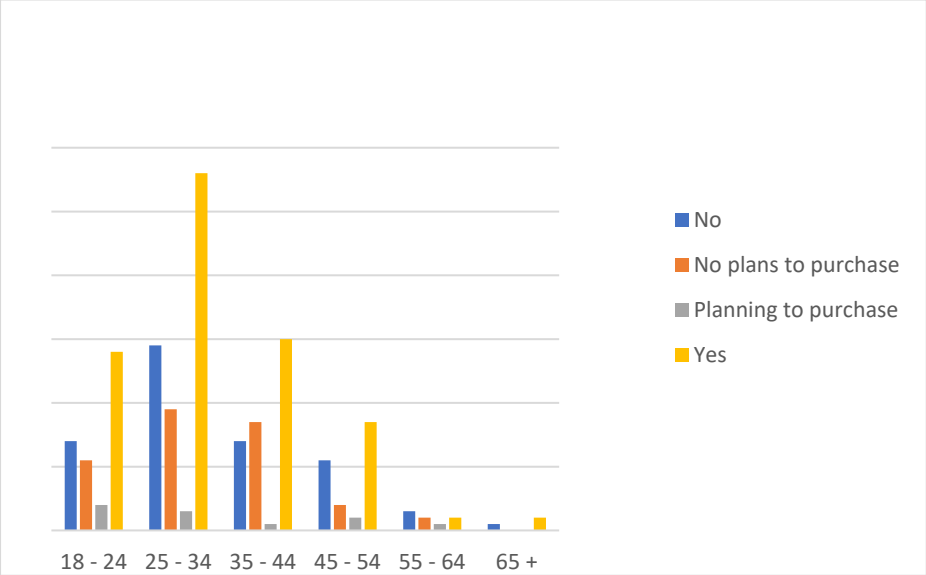


Figure 21: Smart Speaker owners among different ages breakdowns

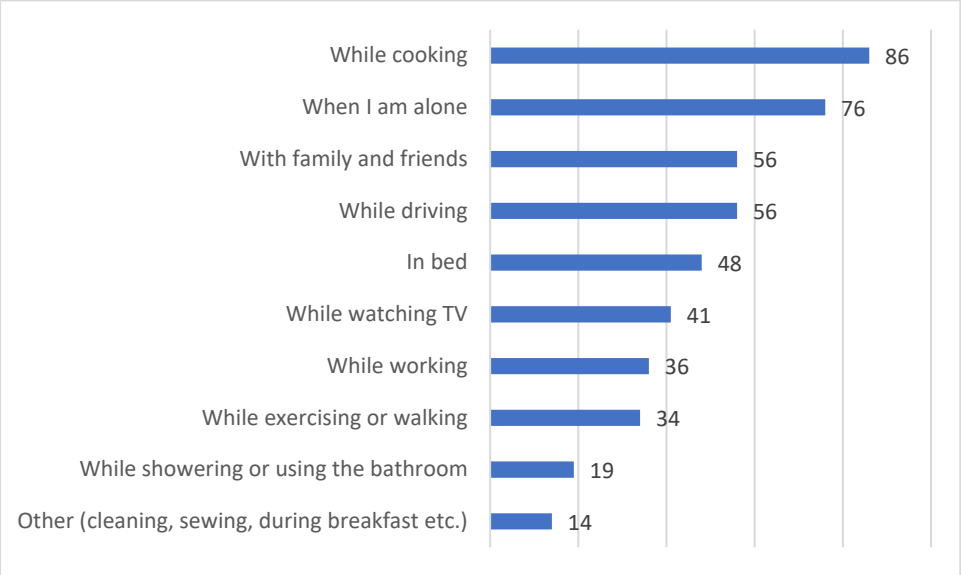
Figure 21 shows that smart speaker owners are young adults falling under 25-34 age bracket.

Activity	Frequency	Percentage (%)
While cooking	86	31.7
When I am alone	76	28.0
With family and friends	56	20.7
While driving	56	20.7
In bed	48	17.7

While watching TV	41	15.1
While working	36	13.3
While exercising or walking	34	12.5
While showering or using the bathroom	19	7.0
Other (cleaning, sewing, during breakfast etc.)	14	5.2

Figure 22: When do you interact the most with voice assistant?

According to the diagram below, 86 (31.7 %) of 271 people use voice when cooking, 76 (28%) when alone, 56 (20.7 %) while interacting with family and friends, 56 (20.7%) while driving, 48 (17.7 %) while in bed, and 41 (15.1%) while watching TV. 36 (13.3%) individuals use voice while working, while 34 (12.5%) individuals use voice when exercising or walking. 19 (%) use voice when showering or using the bathroom. 14 (5.2 %) of the 271 use their voice for other tasks such as cleaning, sewing, and so on.



Search	**Frequency**	**Percentage (%)**
To listen to music	130	48.0
To ask a fact-based question	103	38.0
To check the weather forecast	84	31.0
To ask funny questions	75	27.7

To get directions/maps	65	24.0
To make a call	61	22.7
To check the news	41	15.1
To find the recipes or cooking instructions	31	11.4
To search for ‘’near me’’	27	10.0
To check opening hours	27	10.0
To search information about product/service	23	8.7
To search information about an event or activity	21	7.7
To find the location of a company	18	6.6
To check sports scores	14	5.2
To search information about a company	14	5.2
To order food	6	2.2
To control home devices	5	1.8
To make a purchase	5	1.8
To control TV	3	1.1
Turn on radio/podcast	2	0.7
To search for discounts and promotions	1	0.4
To send a message	1	0.4
To check emails	1	0.4
Add items to the shopping list	1	0.4

Figure 23: What are you searching for when using voice?

The following table clearly shows that the most frequent search was for music, which accounted for 130 (48%) of participants, largely dominated by asking a fact-based inquiry, which accounted for 103 (38%) of the total 271 respondents. According to the data, 84 (31%) of the participants use voice to check the weather forecast, while 75 (27.7 %) of the participants ask funny questions.

Out of 271 participants, 41 (15.1%) of them check the news using voice, whereas 31 (11.4%) of them use voice search to find the recipes or cooking instructions. Following this, 27 (10%) of participants use voice to search for ‘’near me’’ along with checking the opening hours which accounted for 27 (10%) of the participants. 23 (8.7%) participants use voice search to search information about product/service. Then, 21 (7.7%) of participants use to search information about an event or activity.

Further, 18 (6.6%) of the participants use voice search to find the location of a company. 14 (5.2%) of them check sports scores using voice. Also 14 (5.2%) of them use voice search to search information about company. In addition, 6 (2.2%) out of 271 participants said that they use voice search to order food. 5 (1.8%) of them use voice to control home devices, likewise 5 (1.8%) use voice search to make a purchase. 3 (1.1%) participants use voice to control TV. Further, 2 (0.7%) of them use voice to turn on radio/podcast. As revealed by survey 1 (0.4%) person use voice to search for discounts and promotions, similarly 1 (0.4%) person use voice to send a message. Finally, 1 (0.4%) person use voice search to check emails, and 1 (0.4%) person use voice to add items to the shopping list.

Reason	**Frequency**	**Percentage (%)**
Hands - free	149	55.0
Fasten than typing	115	42.4
For fun	70	25.8
Answers are read back to me	61	22.5
It feels more personalised to my needs	19	7.0
Good conversation	16	5.9
It provides better results/deals/offers	7	2.6
More convenient	3	1.1

Figure 24: Why do you use voice search

149 (55%) of the 271 participants use voice search because it is hands-free, whereas 115 (42.4%) use voice search because it is faster than typing. 70 (25.8 %) of the 271 respondents utilize voice for fun. 61 (22.5%) said they use voice search because answers are read back to them, and 19 (7%) stated it seems more personalized to their needs. 16 (5.9 %) participants stated that they use voice because it facilitates good conversation. 7 (2.6%) stated that it provides superior results, discounts, and offers. Finally, 3 (1.1 %) stated that they prefer voice for convenience.

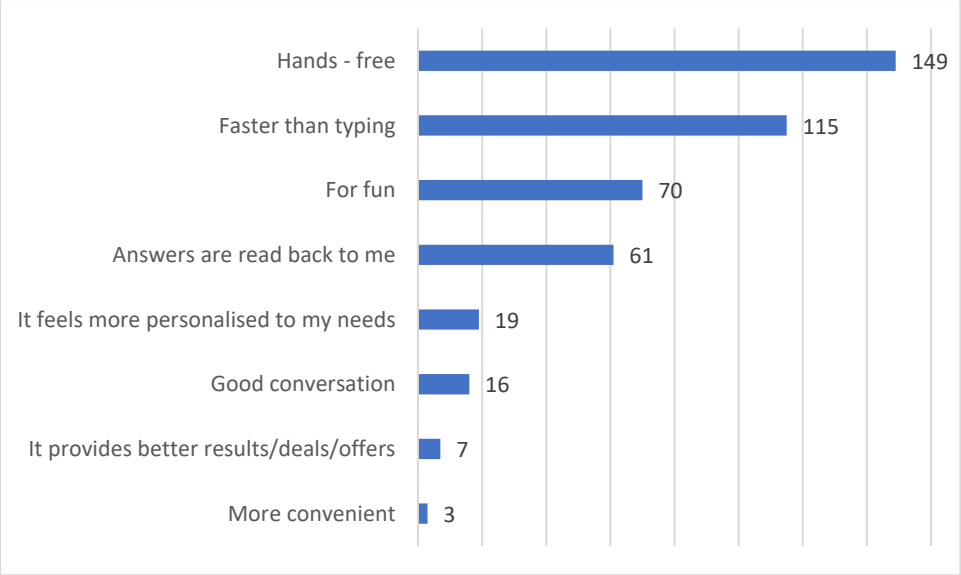


Figure 25: Why do you use voice search

How likely are you to use voice assistant over visiting a physical store?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all likely	132	48.7	48.7	48.7
	Unlikely	63	23.2	23.2	72.0
	Neutral	41	15.1	15.1	87.1
	Likely	23	8.5	8.5	95.6
	Extremely likely	12	4.4	4.4	100.0
	Total	271	100.0	100.0	

Figure 26: How likely are you to use voice assistant over visiting a physical store?

When asked how likely they are to use voice assistance versus visiting a physical sore, 132 (48.7%) replied not at all likely, 63 (23.2%) said unlikely, and 41 (15.1%) were indifferent. In answer to the question, 23 (8.5 %) of 271 participants indicated they are likely to use voice over a physical shop, while 12 (4.4 %) said extremely likely.

How likely are you to use voice assistant over shopping through a mobile app?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all likely	153	56.5	56.5	56.5
	Unlikely	62	22.9	22.9	79.3
	Neutral	41	15.1	15.1	94.5
	Likely	5	1.8	1.8	96.3

	Extremely likely	10	3.7	3.7	100.0
	Total	271	100.0	100.0	

Figure 27: How likely are you to use voice assistant over shopping through a mobile app

When asked how likely they are to use a voice assistant over a mobile phone to shop, 153 (56.5%) replied not at all likely, 62 (22.9%) said unlikely, and 41 (15.1%) stated they were indifferent. Only 5 (1.8%) said likely, while 10 (3.7%) said extremely likely.

Have you ever attempted to make a purchase using voice assistant?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	4	1.5	1.5	100.0
	No	261	96.3	96.3	98.5
	I am planning to	6	2.2	2.2	2.2
	Total	271	100.0	100.0	

Figure 28: Have you ever attempted to make a purchase using voice assistant?

When asked if they had ever tried to make a purchase using voice assistant, 4 (1.5 %) said yes, 261 (96.3 %) said no, and 6 (2.2 %) indicated they are planning to.

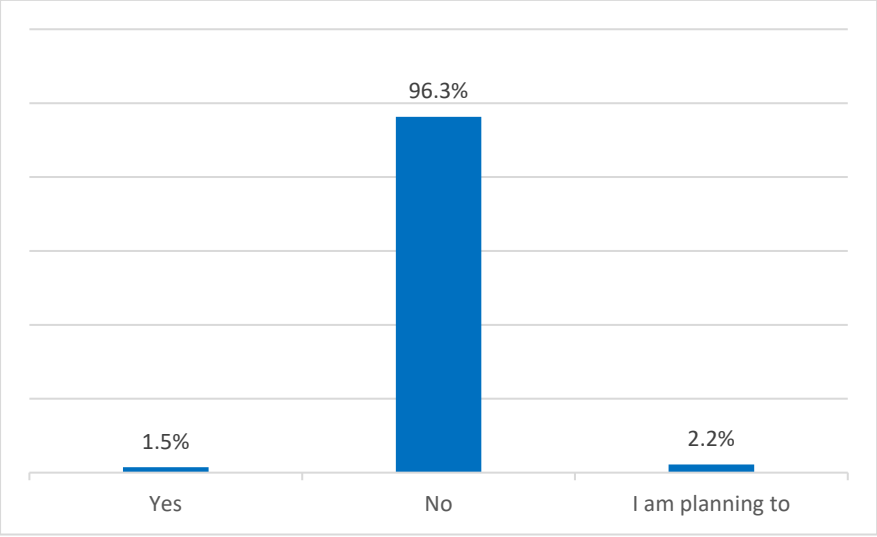


Figure 29: Have you ever attempted to make a purchase using voice assistant?

Four participants who used voice search to make purchases have purchased Siri, Audible & Kindle books, Bitcoin, and bin bags.

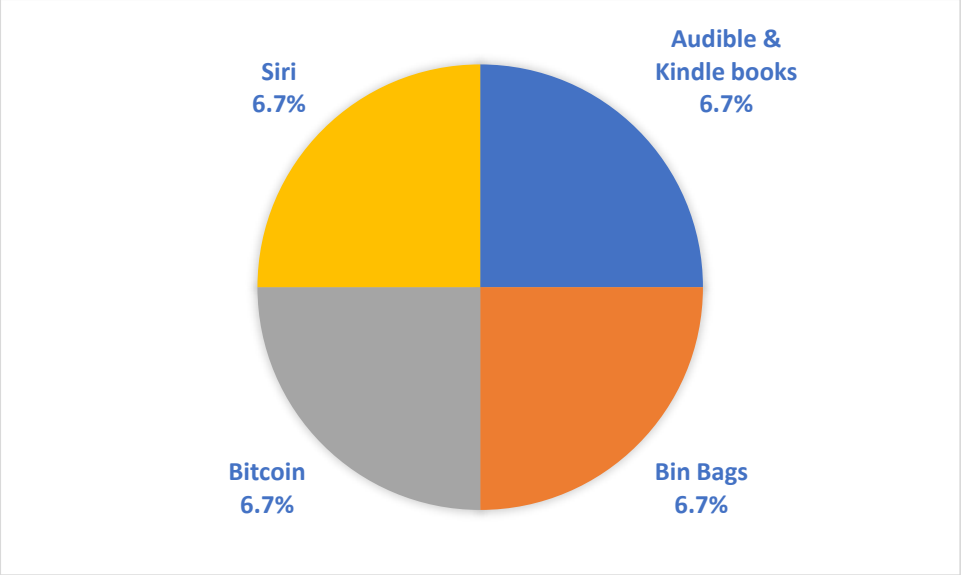


Figure 30: Purchased made by voice assistant users

Purchases	Frequency	Percentage (%)
Ordering meals	107	39.5
Services (booking a taxi, music, healthcare advice etc.)	95	35.1
Wouldn't consider	84	31.0
Groceries, food, and beverages	70	25.8
Electronics	34	12.5
Personal care	24	8.9
Clothing	24	8.9
Banking (sending money to others, paying credit card bills etc.)	24	8.9
Home furnishings and household care	17	6.3

Figure 31: What type of purchase would you be interested or consider making using voice search?

Out of 271 participants, 107 (39.5%) said they would be interested in or consider making purchases related to ordering meals using voice search, while 95 (35.1%) said they would be interested in making purchases related to services (booking a taxi, music, healthcare advice), with 84 (31%) saying they are not interested in making purchases using voice search.

Out of 271 participants, 70 (25.8 %) participants stated that they would be interested in purchasing groceries, food and beverages using their voice. 34 (12.5 %) of those surveyed said that they would consider purchasing electronics. 24 (8.9 %) said they would purchase personal care using voice, 24 (8.9 %) said they would purchase clothing, and 24 (8.9 %) said they would make purchases related to banking

activities. Finally, 71 (6.3 %) indicated they would be interested in using voice to purchase home furnishings and household care.

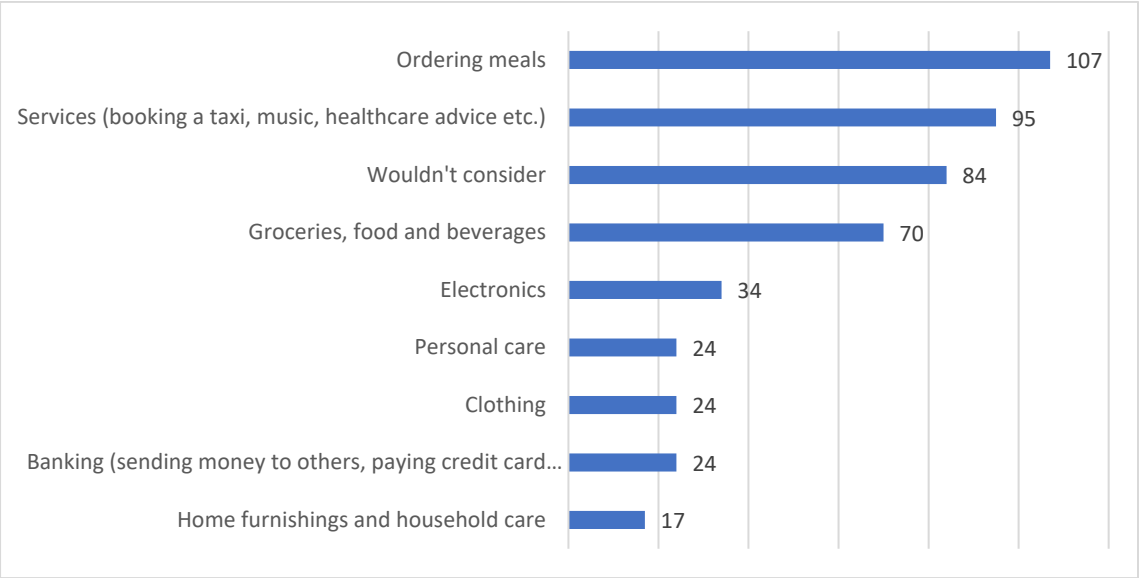


Figure 32: What type of purchase would you be interested or consider making using voice search?

How comfortable do you feel or would you feel completing a purchase using voice search?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very uncomfortable	109	40.2	40.2	40.2
	uncomfortable	71	26.2	26.2	66.4
	Neutral	54	19.9	19.9	86.3
	comfortable	21	7.7	7.7	94.1
	Very comfortable	16	5.9	5.9	100.0
	Total	271	100.0	100.0	

Figure 33: How comfortable do you feel or would you feel completing a purchase using voice search?

When asked how comfortable they are or would be completing a purchase using voice search, 109 (40.2 %) of 271 participants responded very uncomfortable, 71 (26.2 %) said uncomfortable, and 54 (19.9 %) were indifferent. 21 (7.7%) of those surveyed indicated they were comfortable, while 16 (5.9%) said they were very comfortable.

Reasons	**Frequency**	**Percentage (%)**
Safety and security of my personal data reasons	129	46.9
It does not appeal to me	102	37.6
Voice-based assistants don't allow me to visualize information/choices	94	34.7

I don't feel the need to interact with any voice assistant	92	33.9
It does not understand me or my reactions	72	26.6
I feel uncomfortable talking to a machine	23	8.5
Poor voice recognition	5	1.8
Privacy reasons	2	0.7
Too slow	2	0.7

Figure 34: What hinders you from adopting voice assistants?

People who are not using voice search, 129 (46.9%) out of the 271 participants said they are not using for safety and security of their personal data reasons. Furthermore, 102 (37.6%) of participants said voice search does not appeal to them. 94 (34.7%) answered that voice-based assistants don't allow them to visualize information/choices. 92 (33.9%) out of 271 participants said they are not using voice search because they don't feel the need to interact with any voice assistant. 72 (26.6%) said voice assistants don't understand them or their reactions and that prevents them from using them. 23 (8.5%) participants said they don't feel comfortable talking to a machine. 5 (1.8%) of the participants said poor voice recognition stops them from using voice assistants. 2 (0.7%) persons said they are not using voice search for privacy reasons, followed by 2 (0.7) persons who claimed voice assistants were too slow.

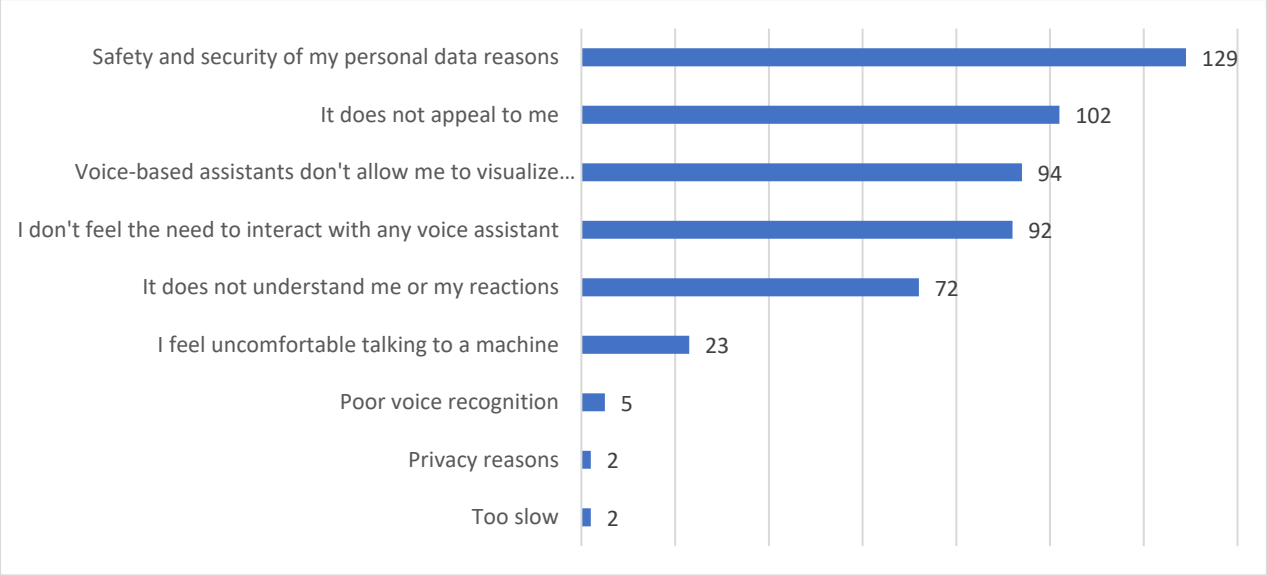


Figure 35: What hinders you from adopting voice assistants?

Thematic Analysis

The survey included one open-ended question. Participants were invited to give their thoughts in response to the question of what would encourage them to use voice

assistants more often. Therefore, qualitative data was analysed using thematic analysis.

Thematic Analysis entails a researcher categorizing her or his qualitative data to discover themes or patterns for subsequent analysis linked to his or her research problem. In a realism research, thematic analysis aims to elucidate the variables that characterize human attitudes and behaviours. Additionally, Thematic Analysis may be used in an interpretivist research to investigate alternative meanings of a situation (Saunders, Lewis and Thornhill, 2019).

Thematic analysis facilitates with comprehending usually enormous and diverse quantities of qualitative data; effectively establish themes or patterns in a data collection for upcoming investigation (Saunders, Lewis and Thornhill, 2019).

There are four aspects to the process of thematic analysis:

- Familiarising yourself with your data.
- Codification of your data.
- Identify links and identify themes
- Tweaking of themes and validation of propositions

As shown below, themes and sub-themes were identified using thematic analysis. Thoughts were given by participants and are included under comments section. A variety of arguments have surfaced as to why people may consider utilizing voice assistants more extensively. The most prevalent topics were data security, voice recognition, visualization, improved software, accuracy, user friendliness, intrusiveness, and localized searches.

Theme	**Sub-theme**	**Comments**
Data privacy	• More privacy/privacy options • Biometric data safe • Assured privacy of personal data • Data transparency • Trust and confidence in personal data	• Better AI, Greater assurances of privacy including legal protections, better connectivity with other smart devices. • Encryption and anonymisation to the point of zero data headed towards or mined by the assistant's creator or any sponsors of it.
Voice recognition	• Recognising different accents • Better voice recognition system • Language recognition/options	• More accurate results, a lot of the time my voice command is not interpreted properly and I do not have a heavy accent.

		• Only allowing a certain recognized voice to make purchases. I don't have kids, but I could imagine It would be a hassle if my kids, or my friends were making unwanted purchases via an assistant. Only allowing a certain person and their voice to make transactions, would ease the stress. • Voice assistants consistently mishear and misunderstand and are entirely unreliable when it comes to context and other issues like partial information and slang. They are unreliable and can cause more of a delay in your query rather than speeding it up
Visualisation		• More visuals involved on screen while using voice commands so choices can be made. • Visual aid or element.
Better software		• Better developed systems for ordering. • More advanced Ai • A lot more functionality for basic things.
Accuracy		• Accuracy improvements. • If the results were more accurate. • If it was better - half the time I find it doesn't give me the answer I am looking for, I don't think it is quite 'there yet' but I would use it in the future if it was better. I use exclusively Siri & sometime I find the answers frustrating.
User friendly		• If they were more user friendly • Maybe if there were better instructions on exactly what you can ask/what kind of answers you can expect

Too intrusive/invasive		• If they were more secure or I felt like they weren't listening all of the time • if they were presented less invasively. I use a thing when I want to, I don't like being spammed by any app, feature, product or service
Localized searches		• More localised services • Country focused results for commands and queries

Figure 36: Thematic analysis

4.3 Discussion

The aim of this quantitative study was to uncover voice assistant user trends related to voice search. This chapter discusses key findings as they pertain to the literature on voice search optimization. This will be followed by an examination of the remaining variables and aspects of the survey under the headings of (i) trends in voice-based search usage among users of various demographics, (ii) the level of attitudes towards voice-based search and how it affects digital marketing, and (iii) the limitations of using voice-based search. The chapter five closes with a discussion of the study's limitations, recommendations for future research, and conclusion.

Voice assistants are becoming more and more prevalent in people's daily routines. As outlined by (Metev, 2020) and (Trevor, 2020) that voice searches of all kinds are on the rise. Smart speakers are growing increasingly popular, and most families will possess one in the coming years. A growing percentage of smartphone queries are now being carried out using voice search. This is strongly evidenced in the survey which determined that 41% of people use voice assistant, and 30.3% use them sometimes, and 29.9% of people use them on the daily basis. Further, 49% of surveyed people own a smart speaker, with 4.1% interested in purchasing one. 63.5% of people use voice assistants on their mobile phones, following 34.3% who use smart speakers. According to survey young adults aged 25 to 34 are the most frequent smart speaker owners as well as voice assistant users. The claim that the vast majority of people do voice searches on mobile devices is definitely correct, with more than half of users using their smartphone to execute searches or commands.

Voice assistants aid with tasks such as meeting planning, sports score reporting, and weather prediction. Alexa can play music, respond to common questions, set alarms and timers, and control wired devices - a phenomena absorbed by (Ramos, 2021) and (Lopatovska et al., 2018) The findings show that majority of users tend to use a voice search for music, an alarm, and the weather, and for factual questions. Thus, the study's findings clearly support the literature in that there is a significant positive relationship between the use of voice assistants and the usage trends among users who use voice search

Around 39.5% of voice assistant users say they are interested in using voice assistants for ordering meals. It makes logical sense for the restaurant sector to capitalize on this opportunity. Further findings show that 35.1% of voice assistants users are interested using voice assistants for services like booking a taxi, healthcare advice. 25.8% of users interested in using voice for groceries, food, and beverages.

It is apparent that voice assistant users enjoy their conveniences. The main reason why participants liked voice search was that it was hands-free. In the subsection on how voice search was executed, 86 (31.7 %) of participants with voice search experiences reported using voice search while cooking, whereas 56 (20.7%) used voice search while driving.

According to a survey, a small number of consumers are already using voice assistants, to check opening hours (10%), to search for "near me" (10%), to find the location of a company (6.6%), to search information about product/service (8.5%) However, Irish voice assistant users are not yet fully engaged in using voice assistant to make purchases. 96.3 % of those surveyed claim they have never used voice assistant to make a purchase. Likewise, according to survey consumers are more likely to visit physical stores than shop through voice assistants. Similarly, consumers prefer shopping using a mobile app over using voice commands. Although the figures are small, they show that voice search is an important part of the customer journey. It could imply optimizing for voice search for small businesses.

Consumers are wary about attempting to utilize voice assistant's more advanced features, like shopping using voice. In terms of their personal data, the main issue is a lack of assurance in the security of their data. Furthermore, current voice search technologies have several flaws. Voice search was disliked by 46.9% of participants due to data privacy concerns, further 37.6% of participants said that voice assistants simply do not appeal to them ; additionally, voice recognition was another issue with voice assistants; participants stated that voice assistants do not understand them and that better voice recognition would encourage them to use voice assistants more; however, other participants stated that they would use voice assistants if they had a built-in screen for visualisation purposes. This could suggest that individuals are hesitant to adopt voice assistants for more complex tasks such as shopping or buying online.

We can certainly state that the assumptions were correct: people use voice search devices and software on a daily basis, and it's a growing market. However, the vast majority of those surveyed are not really using them solely in such a way that businesses should be concerned about falling behind. Actually, most people's "searches" are weather, questions, music, and reminders.

Chapter 5: Conclusion

5.1 Conclusion

Voice assistants have been increasingly used throughout the world in recent years. More businesses are incorporating voice assistants. As a result, interactions between users and voice assistants are rising. Analysing consumer behaviour revealed whether firms should prioritise voice search optimisation and how those already optimised for voice are affected.

The majority of respondents do seem to use voice search to check the weather, listen to music, and look up random information, followed by getting directions. This would imply that retailers, followed by entertainment businesses benefit the most from immediately optimizing their websites for voice search. However, when compared to individuals who use their voice search device for personal reasons, these figures are far lower.

Due to the limitations present in these voice assistants, people are hesitant to employ them for shopping purposes. This would impose constraints on businesses who have optimized for voice search or are planning to optimize.

5.2 Recommendations for Future Research

Future research in the near future may focus on doing a comparative study to find out whether voice assistants have grown in prominence and shopping using voice has also risen in relevance. These findings might be useful in confirming certain future predictions that researchers can only make based on their current knowledge.

Furthermore, researchers may be interested in a follow-up study that focuses more on the qualitative aspects of the matter. The research may include focus groups and interviews with actual voice assistants to investigate why, how, and when voice assistants are used.

5.3 Limitations of the Research

The survey was the primary source of empirical data and the basis for addressing the research questions. It was considered as the most timely and statistically precise method of gathering data and answering questions regarding customers' use and perception of voice assistants and their features.

Despite providing numerous quantitative insights, it lacked qualitative context and information on how voice assistants are used. The researchers may have included more open-ended questions to compensate for the survey's lack of rationalities and perspective. Further, the survey should have included questions as to which brand

(Amazon Echo, Google Home etc), of smart speaker they use or have, as well as which voice assistant (Alexa, Siri etc) they have, if any so.

Chapter 6: References

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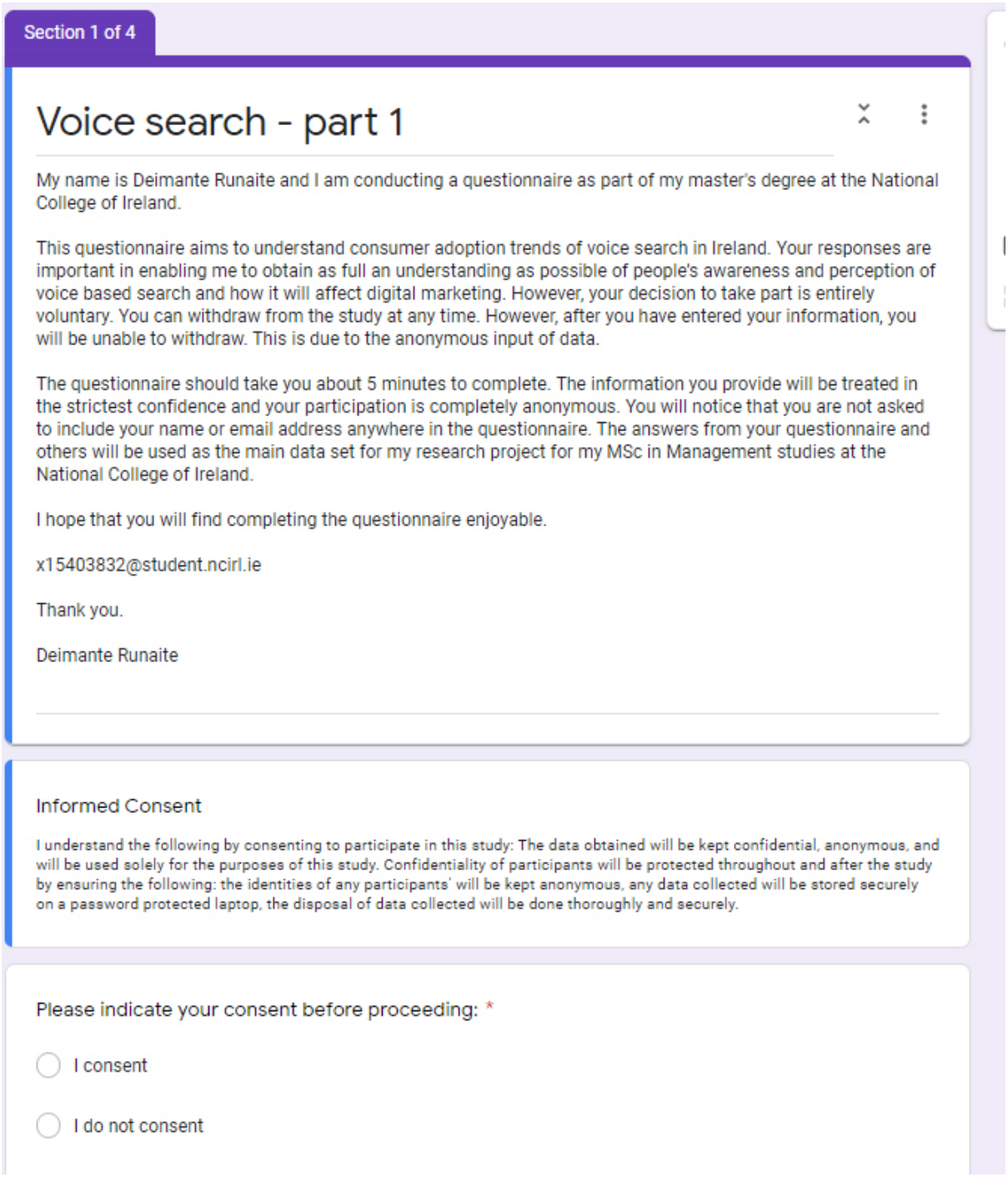
6.2 Appendix

6.2.1 Survey and ethics form



Section 1 of 4

Voice search - part 1

My name is Deimante Runaite and I am conducting a questionnaire as part of my master's degree at the National College of Ireland.

This questionnaire aims to understand consumer adoption trends of voice search in Ireland. Your responses are important in enabling me to obtain as full an understanding as possible of people's awareness and perception of voice based search and how it will affect digital marketing. However, your decision to take part is entirely voluntary. You can withdraw from the study at any time. However, after you have entered your information, you will be unable to withdraw. This is due to the anonymous input of data.

The questionnaire should take you about 5 minutes to complete. The information you provide will be treated in the strictest confidence and your participation is completely anonymous. You will notice that you are not asked to include your name or email address anywhere in the questionnaire. The answers from your questionnaire and others will be used as the main data set for my research project for my MSc in Management studies at the National College of Ireland.

I hope that you will find completing the questionnaire enjoyable.

x15403832@student.ncirl.ie

Thank you.

Deimante Runaite

Informed Consent

I understand the following by consenting to participate in this study: The data obtained will be kept confidential, anonymous, and will be used solely for the purposes of this study. Confidentiality of participants will be protected throughout and after the study by ensuring the following: the identities of any participants' will be kept anonymous, any data collected will be stored securely on a password protected laptop, the disposal of data collected will be done thoroughly and securely.

Please indicate your consent before proceeding: *

I consent

I do not consent

Voice search - part 2

Description (optional)

1. Do you use a voice-activated virtual assistant, like Siri, Alexa, Google Assistant, Cortana, Bixby etc? *

- ( ) Yes
- ( ) No
- ( ) Sometimes

2. What devices do you use your voice to interact with? Please select all that apply. *

- [ ] Mobile phone
- [ ] Desktop computer
- [ ] Laptop
- [ ] Smart Speaker
- [ ] Home Assistant
- [ ] Smart Watch
- [ ] Tablet
- [ ] Car Navigation
- [ ] None
- [ ] Other...

3. How often do you use your voice to search or interact with your electronic device? *

- ( ) Daily
- ( ) Weekly
- ( ) Monthly
- ( ) Rarely / Have tried a few times
- ( ) Never

4. Do you own a Smart Speaker (e.g Amazon Alexa, Apple HomePod etc.) *

- ○ Yes
- ○ No
- ○ Planning to purchase
- ○ No plans to purchase

5. How long have you been actively using voice assistants? *

- ○ Less than a year
- ○ Over a year
- ○ 2+ years
- ○ Don't use it as much
- ○ Never used it

6. When do you interact the most with voice assistant? Please select all that apply. *

- ☐ While driving
- ☐ While working
- ☐ While cooking
- ☐ While watching TV
- ☐ While exercising or walking
- ☐ While showering or using the bathroom
- ☐ In bed
- ☐ With family and friends
- ☐ When I am alone
- ☐ Other...

7. What are you searching for when using voice? Please select all that apply. *

- [ ] To ask a fact-based question
- [ ] To get directions/maps
- [ ] To make a call
- [ ] To check the weather forecast
- [ ] To set an alarm
- [ ] To search information about a company
- [ ] To make a purchase
- [ ] To check opening hours
- [ ] To searching for "near me"
- [ ] To order food
- [ ] To find the location of a company
- [ ] To ask funny questions
- [ ] To search information about product/service
- [ ] To search information about an event or activity
- [ ] To find recipes or cooking instructions
- [ ] To check sports scores
- [ ] To search for discounts and promotions
- [ ] To listen to music
- [ ] To check the news
- [ ] Other...

8. Why do you use voice search? Please select all that apply. *

- [ ] Faster than typing
- [ ] Hands-free
- [ ] It provides better results/deals/offers
- [ ] Answers are read back to me
- [ ] Good conversation

- [ ] For fun
- [ ] It feels more personalised to my needs
- [ ] Other...

9. Have you ever attempted to make a purchase using voice assistant? *

- ( ) Yes
- ( ) No
- ( ) I am planning to

10. If answered yes to the above question, what have you purchased using voice?

Short-answer text

11. What type of purchase would you be interested or consider making using voice search? * Please select all that apply.

- [ ] Electronics
- [ ] Groceries, food and beverages
- [ ] Clothing
- [ ] Personal care
- [ ] Home furnishings and household care
- [ ] Ordering meals
- [ ] Services (booking a taxi, music, healthcare advice etc.)
- [ ] Banking (sending money to others, paying credit card bills etc.)
- [ ] Other...

12. How likely are you to use voice assistant over visiting a physical store? *

	1	2	3	4	5	
NOT AT ALL LIKELY	( )	( )	( )	( )	( )	EXTREMELY LIKELY

13. How likely are you to use voice assistant over shopping through a mobile app? *

	1	2	3	4	5	
NOT AT ALL LIKELY	○	○	○	○	○	EXTREMELY LIKELY

14. How comfortable do you feel or would you feel completing a purchase using voice search? *

	1	2	3	4	5	
VERY UNCOMFORTABLE	○	○	○	○	○	VERY COMFORTABLE

15. What hinders you from adopting voice assistants? *

- [ ] Safety and security of my personal data reasons
- [ ] I don't feel the need to interact with any voice assistant
- [ ] It does not appeal to me
- [ ] I feel uncomfortable talking to a machine
- [ ] Voice-based assistants don't allow me to visualize information/choices
- [ ] It does not understand me or my reactions
- [ ] Other...

16. What would encourage you to use voice assistants more? *

Long-answer text

After section 2 Continue to next section

Section 3 of 4

About you - part 3

Description (optional)

17. What age are you? *

- 18 - 24
- 25 - 34
- 35 - 44
- 45 - 54
- 55 - 64
- 65 +

18. Highest Level of Education attained *

- PhD
- Masters
- Bachelors/Associate
- Secondary
- Primary
- No formal education
- Other...

19. Gender *

- Male
- Female
- Prefer not to say

After section 3 Submit form

Section 4 of 4

Participation declined

You've elected not to participate, you can click the submit or simply close your browser