THE HAGUE
UNIVERSITY OF
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Improving Effectiveness of McDonalds' Self-Service Kiosk

Picture by Felix Meller on Food Retail, Automat 2.0

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Executive Summary

Currently, in a fast-growing electronic age, digital presence is becoming a necessity in order to maintain pace with the current technological evolution. In addition, increasing labor costs due to governmental regulations is challenging McDonalds' scheme of providing low priced meals. Resorting to technology is becoming increasingly popular among the restaurant industry. Although, despite the advantages of technology deployment, McDonalds' self-service kiosks are becoming the pivotal representative of the brand image. For instance, Dominos' utilization of Geographic Positioning Systems (GPS) for tracking customers' orders, increased the global digital image of the brand (Ritzer, 2018). In the case of McDonalds, self-service kiosks are modifying customers' perception of the brand due to the shift from traditional to digital approach. In particular, the replacement of human labor in the ordering process increases the ability of McDonalds to gain control over its customer service through software optimizations. Thus, development of a consistent customer relation will be dependent on the fluidity of the self-service kiosks' interaction experience.

Under those circumstances, customers' satisfaction rate of the experience will be mirrored through the effectiveness of the self-service kiosk. In accordance to the Dual Mediation Hypothesis (1989), improving effectiveness of the self-service platform impacts users' perception toward the brand, henceforth, intensifying their return intention rate. Furthermore, for this research to recommend pragmatic improvements to McDonalds' self-service kiosks, both business and customer perspectives were taken into consideration. With this intention, dismantling effectiveness into functionality, usability and aesthetics has posed as the fundamental criteria for approaching improvements while constructing the theoretical framework. Consequently, data collected through carrying out questionnaires were formed sustaining the main concept of the defining criteria. Prior theories on interface design granted this research measuring guidelines to assess possible improvements.

The research revealed major issues with the current operating self-service kiosk, inconsistency and asymmetry in the scrolling capability have caused difficulties among 79% of users to identify patterns, thus, resulting in a failure of product range recognition. As well as, anxiety build up in 38% of participants subsequent to the ordering process which required the use of short-term memory. In addition, in order to improve the current user interface experience, this report recommends optimizations in order to increase responsiveness rate to meet current and future expectations of customers. Finally, this report has identified possible improvements and opportunities which

require further research such as, integration of online and offline channels, as well as, the use of immersive human centered visualization design (emojis) in the dialogue sequence to boost positive stimuli for customers with a higher tendency for human interaction.

Postscript: (it will be apparent while reading the paper that "McDonald's" will be referred as "McDonalds". As well as, the use of " McDonalds' " possessive form instead of McDonald's' to avoid confusion and for a better reading experience.)

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Preface:

Before you reclines the final project "Improving Effectiveness of McDonalds' Self-Service Kiosk", the future of modern communications and relations between businesses and customers. The search for a topic has begun and influenced by encouragement provided by the project supervisor of exploring my field of interests. In order to fulfill the requirements of graduation, I have decided to further study improvements on McDonalds' self-service kiosk based on my prior knowledge of computer sciences and fueled by the personal instability of human communication. The ability to interact with machines with no prior judgment on the person you are to perform a daily task, has posed as a viable option in my area of interest.

In person, morning behavior of cash register employees while ordering breakfast has an impact on the mental state for the day. An early morning smile can leave a positive influence during the day, whereas, an early morning rude behavior would most likely alter my attitude negatively. Interacting with computers for ordering a breakfast empowers uncertainty avoidance for leaving a neutral mark. However, interacting with poor systems and interfaces can be frustrating, therefore, ensuring consistency of daily satisfying performance is the future key element of customer service.

I would like to dedicate this section to acknowledge the people who left and continue to leave a positive mark on the near and forthcoming future. First, I would like to thank Mr. Ernst Van Weperen on supervising this project, his continuous faith in my abilities, and his patience that lasted longer than the expected.

I also wish to thank the Schrooyen family for their direct and indirect support which exceeded dictionaries' definition of generosity. To Michael Page and all true friends who helped shape the personal school of thought, to all the participants who willingly took the time to answer the questionnaire, I would like to thank you all from the depth of my heart.

Finally, a particular gratitude towards my parents who deserve a special note of thanks: your never-ending torrent of contribution to the fountain of wisdom, your everlasting belief in my ability to make it through life, have blossomed into the person I am today. Thank you!

I hope you enjoy your reading.

Jan Sael

1.Introduction

Awareness, observations and understanding the surrounding nature, granted mankind survival whilst solely the fittest remained. Currently, after the agricultural and the industrial revolution, the invention of transistors and the rise of technology have influenced human perception and interaction with objects. Technology is a tool which has been designed to execute precise operations. Its main elements are hardware, the physical form of machineries, and software, the intangible architecture of electrical frequencies. At the present time, the existing technological infrastructure endorses software engineers to explore unfamiliar applications. (Englander, 2014)

Automation is the definition of advanced systems and robotics replacing human labor in manufacturing plants. The transition to automation is irreversible, on the contrary, it is accelerating on constant basis. Nowadays, Artificial Intelligence (AI) is on the verge of replacing exclusive human intensive tasks within the service industry. According to Uber (Advanced Technologies Group, n.d.) "At Uber, we believe the future of mobility is increasingly shared, sustainable, and automated."

1.1 Evolution of McDonalds

The hospitality industry is a business specialized in the service sector. The general business model of the restaurant industry is generating revenue through serving meals and beverages. However, the diversification of the customer target groups within the food market, divides the segments to be explicitly targeted. The most prominent difference in restaurants' business plans is whether quality or quantity will be the general theme of generating revenue. Some restaurants rely on providing high-quality experience, whilst, fast-food chains such as McDonalds rely on systemized production and cheap labor in order to provide low prices and keep generating a healthy profit. (Peterson, 2016)

The empire of McDonalds started in California 1937, the brothers, Richard and Maurice McDonald have introduced their fast service approach featuring 15 cent hamburgers. High quality food was not the aim of the scheme, on the contrary, the key success was found to be in the principle of high speed, large quantity and low-priced meals achieved by utilizing assembly lines. The accomplishment of such concept relied on four dimensions: efficiency, calculability, predictability, and control. The phenomenal prosperity of such systemized

operation led the brothers to franchise their concept allowing Raymond Albert Kroc's vision of expanding the business to become a reality. (Ritzer, 2018)

Currently, McDonalds is the largest global fast food chain with a total of 37855 operating branches around the world, including 249 restaurants specifically in the Netherlands. Their menu consists primarily of hamburger, French fries, soft drinks and chicken products. They are served utilizing the primary concept of assembly lines maintaining the original low-priced fast-service approach. (Lock, 2019)

1.2 Challenges

Generally, the entire fast-food industry is facing modern challenges to retain McDonalds' concept of providing low-priced labor-intensive services in order to remain competitive in the market. Continuous global legislative adjustments of minimum wage and overtime rates are causing artificial inflation of costs, thus, threatening the entire scheme of the industry. In order to maintain the flow of process and to protect the main scheme of McDonalds, adaption through innovation provides an answer to the challenging circumstances. Commonly, automation has been the most distinctive solution for businesses in coping with escalating wages of human resources. (Peterson, 2016)

1.3 Necessity to exist digitally

Nowadays, along the expansion of the cybernetwork, fast-food restaurants are diversifying and redesigning their shops to operate digitally. Digital presence is becoming a necessity due to competitors' digitalized platforms' success. For instance, Dominos' Global Positioning System (GPS) utilization for tracking customers' orders has increased their high-tech presence. According to George Ritzer (2018) in his book *The McDonaldization of Society*, "the really big change at Domino's has been the effort to maximize digital ordering and tracking of orders through various Internet sites. As a result, Domino's has increasing credibility as a high-tech business. Domino's share price has increased sixty-fold since 2008 and the company has grown exponentially". The fast-food giant's ability of running an enormously sized global operation was not achievable without resorting to advanced technology. Dating back to the use of assembly lines, McDonalds has led the emergence of machineries into direct food production for customers. For McDonalds to reduce its labor cost, it has implemented technology in order to eliminate such expenses in the ordering process. The ordinary flow of orders taken in McDonalds, involves a third-party employee to channel information between customers and internal kitchen assembly lines. However,

current familiarity of the global society with the use of technology, has offered an opportunity for McDonalds to deploy interactive machines in their restaurants for cutting costs. As a solution, Self Service Point-of-Sale (POS) systems were introduced. A giant touch screen fused with user-friendly interface facilitating an accelerant channel of information bypassing cash register employees. The essential emphasis of standardization in McDonalds will ensure a global rollout of their interface "NewPOS" worldwide. (Mohapatra & Singh, 2012)

1.4 Evolution of Point of Sale Systems

Point of Sale (POS) common attribution used to refer to the physical cash register. Comparatively, the technological advancement has redefined the traditional approach transforming POS into a powerful hub for businesses. First thing to mention is the introduction of barcodes in the 1970s which granted computers input recognition of physical products. A decade later, Graphical User Interface (GUI) empowered POS systems simplifying its usage leading to mass adoption by businesses. In the 21st century, the online infrastructure and the access of customers to digital banking, accelerated the development rate of POS systems to reach its current state. In the present time, POS refers to the traditional cash register, online web shops (e-commerce), and self-service kiosks. The adoption of Near Field Communication (NFC) technology by banks has simplified the payment process to the point of "touch to pay" resulting in a seamless financial transaction. Therefore, modern self-service kiosks offer customers the ability to order, personalize, and purchase their products without any human interaction. On the other hand, POS systems empower businesses to offer loyalty programs, collect data, understand trends and minimize inventory costs. In brief, the self-service POS system is an e-commerce platform that can increase the rate of orders improving its efficiency and calculability. (Oracle, 2016)

NewPOS software was initially developed by Torex PLC, a European based Tech provider of systems and software in the United Kingdom. In 2008, McDonalds corporation has signed a licensing arrangement authorizing the company to tailor the system in order to meet their business requirements (Computer Business Review, 2008). The Chief Technology Officer (CTO) of McDonalds, Tom Gergets referred to McDonalds as a modern and progressive burger company on stage at *Re:Invent (2016)*. During the event, the CTO has stated the company's plan in partnering with Amazon Web Services to implement cloud-enabled digital transformation. Thus, unifying their user-friendly point-of-sale system optimizing it to run on every cash register, mobile device and self-service Kiosk. (Gergets, 2016)

1.5 Targeted groups for the study

In accordance to McDonalds' Frequently Asked Questions (FAQ) about the corporate's target audience "McDonald's aims to offer a friendly, fun environment for everyone, and we mean everyone, to enjoy. This means appealing to families who love our iconic Happy Meal, to workers grabbing breakfast on-the-go or eating in to enjoy our freshly ground coffee and free WiFi" (McDonald's, n.d.). However, to truly understand the demographic change among the developing population in a changing technological environment, it is important to understand their habits and reflections on digital interfaces. Professor Reinhold Sackmann (2013) elaborates on the subject of interface knowledge formation by stating his research findings: "Technology generations born before 1960 are assumed to have stored declarative and procedural knowledge in their long-term memory that was shaped in young adulthood by either mechanical or electro-mechanical equipment. The study showed that these technology generations have difficulty with interface characteristics of the "software generation" born after 1960. Persons of the mechanical (born before 1930) and electro-mechanical generations (born 1930-1960) have greater difficulty coping with multi-layered interfaces, they take more steps and they make more mistakes". The study of professor Sackmann (2013) clarifies the difficulties of pre generation X with the use of digital interfaces and present contraptions. Thus, specifying but not limiting the users' demographic segment of people born after 1960 for McDonalds to consider while implementing UCD in their NewPOS interface.

Specifically, The Netherlands is the European leader in internet access, scoring 98 percent of household access to the internet, whilst the average in the rest of Europe is 87 percent (Center for Big Data Statistics CBS, 2018). In The Netherlands, knowledge of internet and smart devices utilization is very high, thus, allowing the Dutch Market to be the right place for nurturing early adoption. McDonalds' competitive advantage in their low-pricing strategy remain in their capacity and ability of implementing economy of scale through serving large quantities to consumers. Deficiency of customers will result in a failing strategy, therefore, McDonalds' priority in strategic positioning results in a densely concentrated presence such as "Randstad" the west of The Netherlands.

1.6 Aims of the study

The aim of this document is to study improvement possibilities of McDonalds' self-service kiosk effectiveness among post Generation X in the Hague, The Netherlands. The projected findings might vary depending on future collected data through conducted surveys and analysis.

1.6.1 Research Objectives

- To identify effectiveness under a certain criterion
- To investigate the requirements and effects of the chosen criteria in effectiveness of the Self-Service Kiosk.
- To analyze room of improving effectiveness.
- To recommend possible improvements to the Self-Service Kiosk.

2.Theoretical Framework

The customer-business relation development in modern marketing resembles the increased value of interaction between corporates and clients. Improved customer relation management (CRM) maximize profit through increasing customer retention rate. For instance, Gronroos (1990) states: "Marketing is to establish, maintain, and enhance relationships with customers and other partners, at a profit, so that the objectives of the parties involved are met. This is achieved by a mutual exchange and fulfillment of promises" (P.138). Taking the Dual Mediation Hypothesis (DMH) model into consideration, MacKenzie, and Lutz (1989) reperformed the tests of the hypothesis remeasuring the DMH model in advertising effectiveness. The findings of the tests presented that, the actual characteristics of an advertisement stimulus together with individual's attitude towards the advertiser and the advertisement, interact directly with brand perception and attitude towards the brand as shown in *figure 2.1*

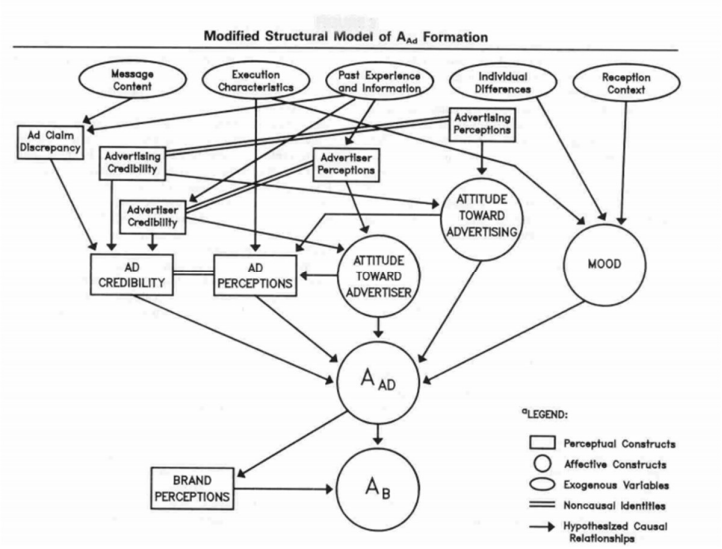
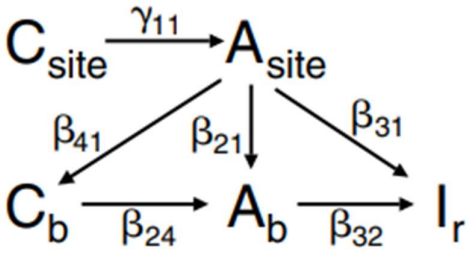


Figure 2.1 Dual Mediation Hypothesis: MacKenzie, and Lutz (1989)

As an extension of the previous study of the DMH model, Karson and Fisher (2005) utilized the same concept of the mediation hypothesis but instead, they replaced advertisement cognition by website cognition. Their research report provides credible and measurable data concluding: site induced stimuli (cognition) collectively with attitude towards the website are linked directly with brand cognition and customers' attitude towards the brand, resulting in an increased intention to return to the website. *(see figure 2.2)*



Where:

C_{site} = site cognitions

C_b = brand cognitions

A_{site} = attitude toward the site

A_b = attitude toward the brand

I_r = intention to return to the Web site

Figure 2.2 Dual Mediation Hypothesis: Karson and Fisher (2005)

For this specific study of McDonalds' implementation of automation in the business to customer experience, the self-order system became the key role of communication between the brand and the customer. NewPOS system utilizes the same design and build characteristics of e-commerce websites, the mere difference is the operating network. While e-commerce operates on an online infrastructure, McDonalds' NewPOS processes orders on an offline local network. Bearing the Extended Dual Mediation hypothesis by Karson and Fisher (2005) in mind, the digital interface of NewPOS transforms the computerized version of cashiers into the pivotal representative of the brand, thus, impacting customers' attitude towards the brand and their return intention rate. *(Figure 2.3)*

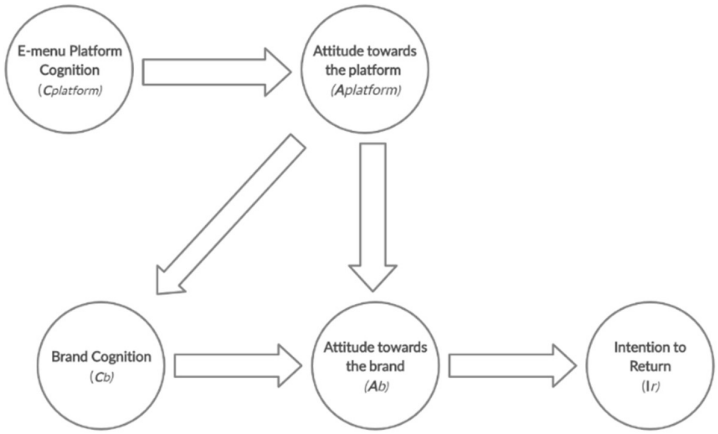


Figure 2.3 Dual Mediation Hypothesis: McDonalds instead of Ecommerce

2.1 Defining the effectiveness criteria of digital ordering interfaces.

The variation in digital interfaces designs, depends on its purpose, developer, and the targeted user. The main function of McDonalds' harmonized platform is to provide effectiveness, consistency and convenience for its customers. Therefore, User Centered Design (UCD) implications in such interface, meets the corporate intentions. Measuring how effective McDonalds' self-service interface is highly dependent on the defining criteria of effectiveness. According to Lary E.Wood (1998) in referral to Don Norman's book (1988) *The Design of Everyday Things*, "Norman makes a strong case for the need to emphasize usability in addition to functionality and aesthetics through the design of artifacts that we frequently encounter in our everyday lives". Therefore, implementation of UCD in NewPOS requires understanding of the targeted users in order to effectively tailor the platform to customers' needs, thus effectiveness can be calculated through measuring functionality, usability, and aesthetics.

2.2 Business perspective

As mentioned above, digital presence of fast-food businesses has become a necessity to compete in current modern times. Escalating labor wages led businesses for adoption of automated devices in the ordering process. However, the implementation of self-service kiosks, requires deeper understanding as it becomes the main representative of the brand as discussed before in the extended DMH model by Karson and Fisher (2009). Defining the measures of effectiveness of such implementation, needs to match the business perspective in order to become fully effective. To grasp the measurements of effectiveness in business perspective, functionality, usability and aesthetics must be applied and understood.

2.2.1 Functionality:

In business perspective, Speed of service was one of the main approaches by the McDonalds brothers for customer satisfaction which successfully globalized the brand allowing it to become the market share leader worldwide. Regarding McDonalds' own point of sale system, speed of service increases over customers' retention and repeated uses. The more familiar customers are to the system, the faster the ordering process. Automating the order procedure increases the velocity of transaction making it faster than traditional

cashiers, however, the system's performance speed is essential in this approach. Shneiderman & Plaisant (2005) illustrate the importance of speed in systems' performance for commercial uses, "Speed of performance becomes central for most of these applications because of the high volume of transactions, but operator fatigue, stress, and burnout are legitimate concerns. Trimming 10% off the mean transaction time could mean 10% fewer operators, 10% fewer terminal workstations, and a 10% reduction in hardware costs".

2.2.2 Usability

In McDonalds' perspective, incoming orders from self-service kiosks to internal kitchens do not differ from orders taken by traditional cashiers. Cash registry employees utilizes the same POS system featured on the large self-service screens. However, keeping in mind the human error factor, the reduction of human stages in the process flow accompanies less errors caused by humans. Service failure in terms of human error usually results in unsatisfaction of the customer experience. According to the study on the effect of perceived justice on customer satisfaction, "in the exchange processes between service providers and customers, service failure is often unavoidable. Service failure is usually beyond the service provider's control, owing to uncontrollable external factors related to human error" (Purwanto, Ellyawati, & Dharmmesta, 2012). The ability for customers to be in control of modifying and personalizing orders themselves eliminates the possibility of errors in the information exchanging phase between customers and cash register employees. Thus, customers become in charge and in control of their orders, in case of mistake occurrence during the preparation of orders, it becomes easier for McDonalds to manage the situation resulting in a better customer service.

2.2.3 Aesthetics

In the context of aesthetics in a business perspective, aesthetics can be used as a strategic tool in building a brand image. As mentioned above, the deployment of Dominos' digitalized order allowed customers to track their orders' location online, thus, increasing the professional digital image of Dominos. The performance and the visual aesthetics of "NewPOS" McDonalds' private POS system, reflects the brand image directly into customers' perception of the brand identity. Marketing aesthetics refers to the marketing of sensory experiences for customers and the brand output that contributes to the brand's identity. Multimedia and digital presence communicate the intended image of the brand to customers (Simonson & Schmitt, 1997).

2.3 Customer perspective

Experience quality and customer satisfaction rate are important measurements of customer retention rate as customers are the main drive of businesses. The increase of loyalty over customers to a specific brand, the higher the chance of repurchase behavior to be expected (Anderson, Fornell, & Lehmann, 1994). On the other hand, Ranaweera and Prabhu (2003) study the relative importance of customer satisfaction and trust as determinants of customer retention. Satisfaction and trust are emotional responses that triggers better mood, thus, encouraging customers positively to recommend the service or the product to other customers. In comparison of the study of Ranaweera & Prabhu (2003) to the extended DMH Model by Karson & Fisher (2005), effectiveness of an e-commerce platform induces a "good mood" stimuli, impacting the customer perception towards the brand, thus, resulting in higher retention rate. According to Lary E. Wood (1998) in defining effectiveness criteria, functionality, usability, and aesthetics needs to be understood from a customer perspective.

2.3.1 Functionality

The main function of McDonalds' platform in customers' perspective is to facilitate a fast and a reliable method for ordering food and beverages. In this specific study for McDonalds' branch in the Hague (Holland Spoor) area, the role of time for customers appears to be significant. The branch is located nearby students' residences, an educational institution and office work environments. Waiting in line for purchasing lunch is time consuming, therefore, utilizing primary research method of participant as observer, most customers are observed to be utilizing the self-order kiosks. After the observation during lunch hours on three different days at McDonalds Holland Spoor, an average of eight customers out of ten make use of the self-service touch screen for placing orders. The data can be inconsistent due to lack of data provided by the branch management. However, through observation and self-utilization of both provided methods by the branch, flow of process chart has been constructed*. (Figure 2.4 & Figure 2.5)*

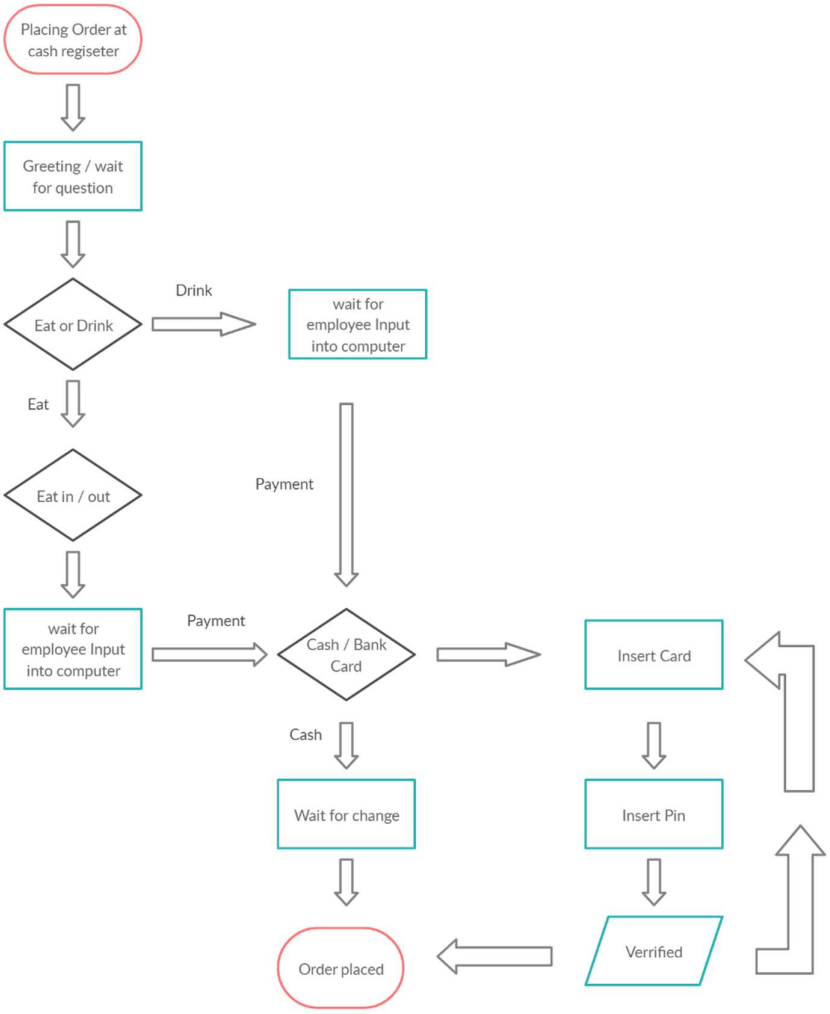


Figure 2.4 Stages of placing an order at cash register

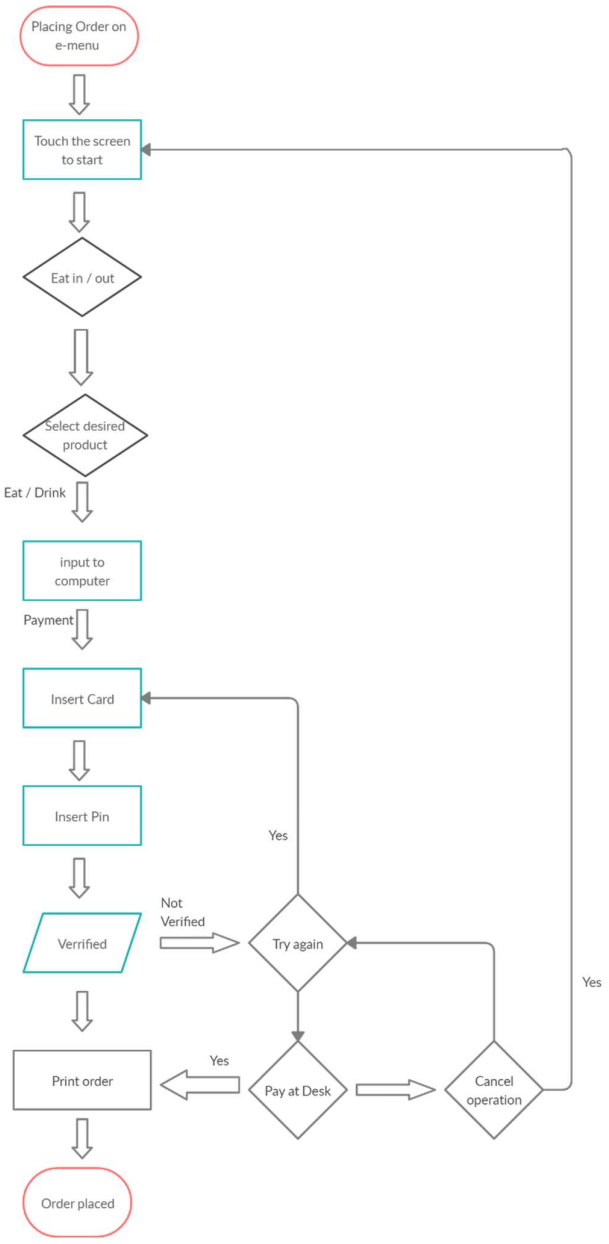


Figure 2.5 Stages of placing an order on Self-Service Kiosk.

In comparison of previously conducted process flow charts, with no consideration to waiting in line, stages of waiting for employee to respond and input the given data are eliminated. However, the previous charts cannot display the general time taken for order completion due to individual differences in McDonalds' interface utilization experience.

2.3.2 Usability

The term usability in computer systems' development specifies the effort needed to successfully manage an operation in the shortest time possible. In this specific study, adoption of usability as a measurement for effectiveness in customers' perspective is crucial for carrying out the level of ease of use, which in return is fundamental to accomplish customer satisfaction. Familiarity of users to the system is considered a very important factor for the development of McDonalds' platform. Matching customers' perceived usability of electronic commerce by the actual usability of the electronic system, raises satisfaction among customers. (Guinalı´u, Casalo, & Belanche, 2012) See *(Figure 2.6)*

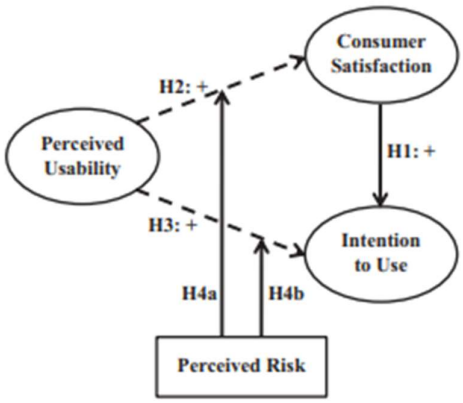


Figure 2.6: Guinalı´u, Casalo, & Belanche, (2012) on perceived usability

Usability in user interface design is extremely complex due to the existence of multiple variable factors. Variability relies among who uses the system, where the system is being used and how does the system interact with users. Synthesizing an effective usable user interface relies on the standardization of principles (Picking, Grout, McGinn, Crisp, & Grout, 2010). Theoretical data on usability principles will be discussed in chapter 2.5.

2.3.3 Aesthetics

The human phenomenal fondness to aesthetically pleasing artifacts is demonstrated by the lasting artistic and architectural work through multiple epochs of civilizations. When interacting with automated computerized versions of human intensive tasks such as E-menu, the aesthetics and its design highly reflects the image of the owning brand. Usually, the first impression for customers of an interface is made within few seconds, and users' decision of reusing the system will be made after judging the interface's simplicity and its design. Aesthetics' simplicity is derived from aesthetically intriguing graphical user interface (GUI) design (Robins & Holmes, 2007). For example, in a conducted study by Ractinsky,

Katz, and Ikar (2000) in order to understand the role of aesthetics in human computer interactions (HCI), the researchers concluded "people associate a person's physical attractiveness with other personal attributes. Similarly, research in the areas of marketing and consumer behaviour indicate that aesthetic features of the shopping environment are perceived as related to other, seemingly independent attributes (e.g. functional) of that environment."

2.4 Perception Matrix

The breakdown of effectiveness in the means of Lary E Wood (1998), functionality, usability and aesthetics from a business and a customer perspective, allows additional improvements to be analyzed through matching perspectives and understanding opportunities.

In terms of functionality, both of customers and business are in favor for speed of service. The customer group is perceived as time sensitive, as well as, faster service means higher velocity and increased rate of sales for McDonalds. McDonalds customization of orders ability offering on their platform, increases the time required for order completion. Thus, higher number of self-service kiosks can process orders at a higher rate, however, at lunch times, this may not be applicable due to the limitation of users' speed of utilization. More computers mean less time for queuing in line to place an order, however, it does not eliminate the queuing time entirely, but it will result in reduction of wait time.

In terms of usability, both customers and businesses benefit from a user-friendly design. It increases satisfaction among customers and results in a higher retention rate of customers in business perspective. However, parameters of a user-friendly design differ, as the machines offer the same services and possibilities for customers in means of order selection, customization and payment. Ease of use within the interface is highly subjective, however, standardization in principles of design is required. (Shneiderman & Plaisant, 2005)

In terms of aesthetics, self-service kiosks became the main node between the brand and customers. It achieves the purpose of implementing the brand image the way McDonalds intends to do. In the same time, it results in good mood stimuli inducement for the creation of a satisfying feeling. However, the lack of human interaction can be substituted in terms of software for the inducement of joy, satisfaction and good mood stimuli inducement which results in a higher retention rate of customers.

2.5 Theoretical data

2.5.1 Theories on functionality

- *Theory of Gallino & Moreno (2014).*

Integration of online and offline sales is a recent phenomenon; this report studies the behavior of "Buy online and pick up in store" (BOPS), as well as, Research online and purchase offline (ROPO). The study is based on a collected novel proprietary data set from a pioneering nationwide retailer that has been utilizing the BOPS functionality. When customers seek to visit a physical store, risk of out of stock products cannot be avoided, however, the observation of customer behavior shows that customers are more likely to substitute the desired product by another one in the same category. While studying the impact, traffic increase of customers in the branches of the store that utilize the BOPS functionality can be quantified to be around 13 percent, the analysis included an additional control of sales, the conservative estimate of the magnitude of sales risen around 6 percent of total sales of the studied store. In order for the study to be precise, discount periods have been excluded from the study such as Black Friday, Christmas day and Cyber Monday. In regard to ROPO, evidence show that more customers engage in the online channel to research online availability but make purchases in the store. (Gallino & Moreno, 2014)

2.5.2 Theories on usability

In terms of usability of digital interfaces design, various parameters and principles are distinguished for designers in order to construct an effective platform. Some of the most reliable theories that designers base their work on are:

- *Theory of Ben Shneiderman & Catherine Plaisent (2005)*

Shneiderman & Plaisent in their book "Designing the user interface" have assigned multiple relevant principles which are adopted in designing most of our daily interactive systems. They identified their guide as "the eight golden rules of interface design".

Their golden rules consist of:

1- Striving for consistency: this rule refers to consistent pattern of familiar actions in terms of coloring, typography, and layouts. As well as, identical terminology in the use of prompts, menus and help screens is required.
2- Catering for 11lliversallisability: frequent users of the interface desire for reduction in interactive stages must be applicable. The use of shortcuts, abbreviations, and function keys increases plasticity and results in a faster pace for the advanced users.
3- Offering informative feedback: system feedback in every user action roleplays the response for major and minor actions. It is a change in the visual environment which provides the user a sense of feedback that the system is healthy and running as intended to.
4- Designing the dialogue for closure yielding: the organization of actions must be sequenced in a group leading to a pattern of beginning, middle, and end. Informative feedback upon completion of the designated task gives the user the satisfaction of accomplishment and a sense of relief.
5- Error prevention: the system must be designed in the most possible way to prevent a serious error. In case of stumbling upon an error, the system must recognize the situation and offer the user a comprehensible structure for approaching and handling the error simply.
6- Ease of reversal permission: reversible actions relieve anxiety among users since the mistake can be undone easily. The ability to navigate into the previous page and to correct input parameters is necessary and must be as easy as possible.
7- Supporting the internal locus of control: highly experienced users desire to oversee the system, as the interface responds to their actions. Inability for users of producing the desired actions, builds anxiety and dissatisfaction.
8- Short-term memory load reduction: display must be simple as consolidation of multiple pages display requires simplicity of multi layered interface. This is a necessary adjustment to the system due to the human limitation in information processing in short-term memory.

The golden rules principles do not apply in every application due to limitations, however, its interpretation can be extended to design mobile, desktop and websites applications. (Shneiderman & Plaisant, 2005)

- *Theory of Larry L. Constantine, Lucy A.D. Lockwood (1999)*

In the book of "Software for Use", Constantine & Lockwood presented their module for effective usability for website design in six principles:

1- Structure: the interface must be organized purposefully and logically in a useful way which categorize things together and separately group unrelated options. Achieving consistency among the entire platform is considered essential in the means of visibility and recognition.
2- Simplicity: this principle seeks clear communication between the user and the interface, in means of providing meaningful shortcuts in order to abbreviate the procedure to reach a specific task.
3- Visibility: the design must keep all necessary materials and options clearly visible without exposing the user into distracting and superfluous information.
4- Feedback: selection of specific options and navigation through the interface must provide feedback for the user, state changes or conditions must accompany a visual feedback in order to verify reception of information.
5- Tolerance: user's mistakes in utilizing the interface is inevitable, however, reduction of consequences of a mistake, and permitting users to undo certain inputs in highly essential.
6- Reuse: maintaining consistency with purpose rather than arbitrary through reusing internal and external components is important. Utilizing this principle will result in reduced usage of short-term memory and remembering.

Creation of a user-friendly interface is rather a complex subject, however, applying the six principles of usability can improve the user experience resulting in an improved connection between end user and the interface. (Constantine & Lockwood, 1999)

2.5.3 Theories on aesthetics

Aesthetics refers to the visual rather than the mechanical aspect of the interface, stimuli is presented when a user views an interface. Stimuli vary depending on the content such as combination of colors, layout, fonts and positive visual experience. (Robins & Holmes, 2007)

McDonalds is known for utilizing such stimuli in the marketing of happy meals and the aesthetics of their packaging. *(Figure 2.7)*

Figure 2.7 McDonalds' packaging of happy meals

- *Theory of Fadhil, Wang, Schiavo & Yilma (2018).*

A collaborative research for the European Alliance for Innovation, elaborates on the effect of emojis when interacting with conversational interface. The research's main concept is to study human-centered computing through immersive visualization design. As the researchers discuss the effect of communication style and evaluates the use of emojis against plain texts in conversational interface among participants. The study involved 58 randomly assigned participants whom were exposed to dialogues including Emojis and plain texts through a chatbot. Data results of the study were analyzed through a mixed-design ANOVA model and concluded that emojis can benefit enjoyment, attitude and confidence. Participants were noticeably more confident in sharing information about their mental wellbeing when exposed to the dialogue with emojis while they were less confident when exposed to plain texts only.

- *Theory of NGO, Teo & Byrne (2002)*

Studying the aesthetics and its relevancy to screen design, the researchers aimed to introduce principles in order to measure aesthetics of a digital interface. In order to measure aesthetics, the guideline measures of design are:

1- Balance: it is defined as the distribution of visual objects on a screen. Larger objects are considered heavy whereas smaller objects are lighter, the balance can be achieved by distributing weight to the left, right, top and bottom of the screen equally.
2- Equilibrium: is the midway center of suspension, it is accomplished by centering the layout of the screen. Meaning that the computed center of layout design must match the physical center of the screen.

3- Symmetry: is the duplication of the layout on replicated pages of the interface. Vertical symmetry refers to balance of the layout vertically, horizontal symmetry refers to the balance horizontally, where radial asymmetry consists of merging horizontal and vertical symmetry on two or more axes.
4- Sequence: object arrangement in layouts which facilitates movement of the eye on the displayed information. Eyes are trained by reading, they start by upper left to bottom right, as it moves from big objects to smaller objects.
5- Cohesion: refers to the aspect ratio of the screen. It refers to the computed width and height of the physical screen. The ration should stay the same during the scanning of a display by users.
6- Unity: refers to the coherence of the total elements. It is achieved by using similar sizes and leaving less spaces between categories and margins.
7- Proportionality: aesthetically pleasing shapes can differ due to preferability among different people and cultures. However, some proportional shapes became popular and abundant in aesthetically pleasing design.
   • Square (1:1)
   • Square root of two (1:1.414)
   • Golden rectangle (1:1.618)
   • Square root of three (1:1.732)
   • Double square (1:2)
8- Simplicity: is the combination of elements that results in easy comprehensible meaning of a specific pattern. Aesthetically simple designs achieve ease of use of interfaces.
9- Regularity: is a measurement of how regular the interface is in regard to the physical screen. It is achieved by consistency of aligned elements both vertically and horizontally.
10- Economy: it is the discreet use of elements carefully to simplify the interface as possible. It measures how economically has the spaces on screen been used, it is achieved by using as few sizes as possible.
11- Homogeneity: it is the degree of how evenly objects are distributed relatively to the four quadrants of the screen.
12- Rhythm: it refers to the consistency of regular patterns and changes in the elements. This measure can be accomplished through variation of dimensions, arrangement, shape or number of elements.

Visual aesthetics play a great role in affecting system usability, careful application of aesthetics concepts improves acceptability, learnability, comprehensibility and productivity. (Ngo, Teo, & Byrne, 2002)

2.6 Theory Comparison

Firstly, the platform ability to benefit from applying the most updated Shneiderman & Plaisent (2005) eight golden rules in user interface design in order to facilitate a ground of easy communication between customers and McDonalds will be analyzed. In interface design, the three discussed elements: Functionality, Usability and Aesthetics are interrelated and, in some cases, cannot be divided. For example: The Theory of NGO, Teo & Byrne on modelling interface aesthetics, is supported by multiple Graphical User Interface (GUI) design theories. Thus, it is important to mention similarities and differences between the provided theories and utilize some guidelines in sections where applicable. Therefore, for efficient use of theoretical data, some guidelines of usability in the theory of Shneiderman & Plaisant (2005) regarding responsiveness, and time related elements will be studied in the functionality chapter due to the synergy of business and customer perspective on the matter of time. As well as, the case study of Gallino & Moreno (2014) will be examined on increasing sales through integrating offline interface infrastructure of McDonalds into an online channel, allowing customers to buy online and pick up at store. Secondly, in measuring usability, the eight golden rules of Shneiderman & Plaisant (2005) are the most recent and updated guideline for interface design. However, the selection of the measuring theory was not based on the publishing timeline, Shneiderman and Plaisant had based their findings and guidelines on academic sources and researchers. The theoretical pillar of their guidelines was based on the six years older theory of Larry L. Constantine and Lucy A.D. Lockwood (1999). Shneiderman and Plaisant provided a more recent and in-depth analysis of the six principles of Constantine and Lockwood (1999), thus, placing it as the best candidate for measuring usability. Finally, while distinguishing key differences in business and customer perspectives, aesthetics are highly subjective. The theory of NGO, Teo & Byrne (2002) on aesthetic modelling extends to all digital interface design. However, this study is focused on the aesthetics of McDonalds' Self-Service kiosk, where, most of the guidelines within the theory are perfectly utilized by McDonalds such as balance and rhythm due to the efforts of the R&D department. As well as, due to the limitation of internal data access of the corporation, this study will mainly focus on studying customers' perspective of aesthetics, and mirror customer perception of the provided guidelines in the theory of NGO, Teo & Byrne (2002). As well as, the theory of Fadhil, Wang, Schiavo & Yilma will examine the use of Emojis within the interface and measure the

possibility of equivalent alternative of the missing emotional factor of human interaction. All applications of the theoretical data seek improvements to the system, to increase satisfaction and retention rate of customers in accordance to the Extended Dual Mediation Hypothesis. See operationalization table for theoretical examples *(Table 2.0).*

Effectiveness of McDonalds Self-Service Kiosk

Criteria	Business Perspective	Customer Perspective	Theoretical Examples	Questions	Questionnaire
Functionality	- Speed of Service - Low cost	- Faster approach (time sensitive) - Less process stages in customization of orders	- Shneiderman & Plaisant: performance speed is central to commercial applications, trimming 10% off the mean transaction time could mean 10% fewer operators, 10% fewer terminal workstations, and a 10% reduction in hardware costs. - Catering for 11liversallisability: advanced user desire to reduce stages through use of shortcuts results in a faster pace. (Shneiderman & Plaisant) - Reduction in time needed for customers' decision making through utilization of ROPO (research online purchase offline). (Gallino & Moreno, 2014) - The system must recognize errors and offer the user a simple fix for the error.	1- How responsive the current interface is? 2- Does the system provide shortcuts for time efficiency? 3- Does the system offer fixes for errors? 4- Possibility of implementing BOPS in McDonalds?	1- How do you rate your experience of interface knowledge such as the use of smart devices? 2- Are you familiar to McDonald's self-service kiosk? 3- How do you rate responsiveness of the system? In means of the speed of interaction 4- When do you decide what meal/beverage to order? 5- How likely would you use the search bar instead of navigating through the menu? 6- How important time of service is for you? (time from entering the restaurant until acquiring your meal) 7- If online ordering is possible, how likely would you order online and pick up at store? 8- Have you ever encountered errors while using the electronic menu? 9- Do you know if McDonalds' offer their menu online? 10- Have you ever visited the online McDonalds' webpage/app?
Usability	- Reduction in human error - no necessary kitchen staff training is required.	- Standardized interface design for shorter learning curve. - Ease of use induces satisfaction among users.	- Identical terminology and consistency of patterns in terms of coloring, typography and layout. (Shneiderman & Plaisant) - Supporting the internal locus of control, inability of the system to match users' desired actions builds anxiety and dissatisfaction. (Shneiderman & Plaisant) - Ease of actions reversal relives anxiety of customers due to the ability of reversal navigation to the previous step for correcting parameters. (Shneiderman & Plaisant) - Reduction in short memory load is necessary through simplifying multi layered interfaces in order to match human limitation of information processing in short-term memory. (Shneiderman & Plaisant)	1- Does the system keep steady interface consistency? 2- How easy is it for customers to correct mistakes and continue ordering? 3- How simple is the multilayered design? 4- Is the interface overstimulated (clutter)? 5- In terms of locus of control? Are users able to fully customize orders?	11- Does the current selected meal include cheese? 12- In case you forgot to add extra cheese, how do you fix it? 13- Where can you find coffee? 14- How many burger sorts are there within the displayed Menu? 15- You have selected French Fries, what page follows the selection? 16- How often do you repeat the same order? 17- Can you customize your burger ingredients? 18- How often do you customize your burger ingredients? 19- How likely would you save a preset of your own custom burger to reorder next time you visit McDonald's? 20- How easy the interface is for you to use?
Aesthetics	- Marketing of sensory experience. - Presenting the brand image digitally.	- Lack of human interaction - Aesthetics features derived from graphical user interface, are perceived as related to the shopping environment (visual aesthetics).	- Proportionality in aesthetically pleasing shapes is a measure to achieve in order to accomplish an aesthetically pleasing design. - Economy of the display estate is important; it measures the economic use of spaces on a screen. - Designing the dialogue in a of beginning middle and end yield closure among consumers. Informative feedback among completion of the task gives the user a satisfaction of accomplishment and a sense of relief. - Immersive visualization design using Emojis increases confidence in sharing information about mental wellbeing.	1- How pleasing the external aesthetics are? 2- Does the interface use the screen economically? 3- What image does the design represent for customers? 4- Are the shapes aesthetically pleasing to the customers? 5- Are human-related objects in dialogue sequence such as the use of emojis replaces human interaction? 6- What impression does the interface leave?	21- How would you rate the aesthetics / looks of McDonald's self-service Kiosk? 22- What impression do the design and the experience of using the Kiosk communicate to you? 23- What impression do you have after placing an order using the self-service kiosk? 24- Which design do you prefer most? 25- What shape is the most pleasing for you? 26- How important is human interaction for you while ordering? 27- How important smiling is for you? 28- How often do you use Emojis while chatting online? 29- What impression does this picture leave? 30- Which screen would you Like to see at the end of your order?

Table 2.0

3. Methodology

3.1 Research Philosophy

The main aim of this report is to identify the main elements in order to improve the effectiveness of the self-service kiosk presented by McDonalds. Measuring intangible effectiveness of the subject and its users requires a deductive approach for the theoretical framework to be constructed. The utilized deduction process of determining the criterium of measuring effectiveness began with studying the effectiveness of daily used artifacts, then projecting the findings specifically on the Self-Service Kiosk. Eventually, within the process of recognizing fundamental components of the projected findings, better understanding of the affected parties was vital for deducing an operational framework. The affected parties by any changes to the presented kiosk of McDonalds' were examined through applying the criterium on both customer and business perspectives, thus, ultimately understanding effectiveness via a matrix in order to improve the quality without the need to marginalize any of the affected parties' objectives. However, the research will carry on with an inductive approach within the presented theoretical framework without measuring any predetermined theoretical result, but instead to understand customers and establish a set of recommendations to McDonalds' assisted by the collected data.

3.2 Scope and Limitations

The recency of technological applications in the restaurant industry resulted in lack of access to prior research if any existed. The foundation of this research is built upon previous studies regarding general interfaces and not specifically the Self-Service Kiosk, thus, limiting the theoretical data to interfaces prior to the existence of such technology. Further, this research cannot continue without mentioning the effects of the global pandemic "Covid-19" on the methodology of conducting and acquiring data, field research such as interviews and selective sampling were planned to take place in McDonalds Holland Spoor area before the outbreak of the virus. Domestic lockdowns of restaurants and social events limited the study to utilize internet-mediated questionnaires where multiple choice questions remained the only option of acquiring customers' qualitative data. Regarding data collection of business perspective towards the study, contact with the management of McDonalds via online methods was conducted and resulted in denial to providing data for non-interns. Therefore, the study was built presuming the intention of McDonalds to increase customer satisfaction, and retention rate in order to increase sales and revenue which is ultimately the goal of a business model.

3.3 Data collection methods

The applied deductive approach while constructing the theoretical framework was made possible by using "participant as observer" primary research methods to measure customers regularities and to diagram proportional key differences between traditional and digitalized ordering process at McDonalds' Holland Spoor. As well as, the utilization of desk research "secondary research methods" for concluding a decisive academic criterium for effectiveness measurements. Key platforms for desk research include: A-Z databases provided by The Hague University academic library platform, as well as, the significant role of Google Scholar platform in contributing essential theoretical data for the purpose of this research. Selection methods of theoretical data include historical validity evidence of repeated studies such as the Dual Mediation Hypothesis, where the theory had been tested on multiple occasions by different researchers concluding and verifying similar results. Other selected theories have proven reliable due to their revalidation through Elsevier.com which verifies scholar documents and validate their data outcome through multiple academic revisions. In order to collect data surrounding the subject while keeping the limitations of this research in mind, a questionnaire has been developed by blending both qualitative and quantitative methods. The creation of such questionnaire was necessary due to the complexity of the questions which needed to be answered for the average users of the interface. For example, to measure familiarity of the average user to the interface, the questionnaire enabled participants to choose correct answers from multiple choice questions, where their answers have been observed and analyzed in order to answer the main investigation of familiarity measurement (Questionnaire in Appendices page 50). This method was made possible by presenting visuals to participants through Internet-mediated questionnaire which was powered by Surveyhero.com.

3.4 Sample collection methods

This report examines customers' perspective on the Self-Service Kiosk located in McDonalds' Holland Spoor. Therefore, the questionnaire's hyperlink was mainly published on the Facebook community page of European Studies students, thus, minimizing undesired participation of people not living, studying or working in the Hague Holland Spoor area. However, the main technique for yielding the maximum number of participants in the self-selection sampling method was through incentivizing members of the community with an opportunity to be rewarded with a Bol.com gift card valued at 30 Euros via an online random name picker. In this case of publicity to the questionnaire, with full acknowledgment of participants' ability to abuse the opportunity by repeated inputs for personal gains, certain

parameters were set for the giveaway entry requirements. Surveyhero.com makes full use of the cookies system to prevent participants from multiple entries, every member can answer the questionnaire once on a single device. However, to prevent participants from using different devices to repeat their inputs for higher giveaway entries, their university email was required and the only option to enter the giveaway. Each student of the Hague University is provided with a single email of which the reward had been sent to. Responses of duplicate university emails were removed from this report for a higher validity rate. This method allowed the questionnaire to reach a maximum of 42 responses, and due to the time limitation of this report, the survey had been deactivated after two weeks of public access (See *figure 9.1* in appendix for the full Facebook publicity post). In terms of research ethics, the questionnaire sought transparency in providing information regarding participants' data accessibility in the first page of the questionnaire. (review Student Ethics Form in appendices page 83).

Regarding outcome reliability of the collected data, the acquired results of the questionnaire will be closely examined and grouped in sections in order to answer the general questions. The questionnaire made full use of qualitative and quantitative methods aligning every group of questions to measure a specific dimension of effectiveness, therefore, internal consistency of the collected data which is divided among certain items will be measured using inter-item correlation reliability method if applicable. In most of the areas within the gathered data, where observations are made upon variables and no values can be given for specific answers, statistical reliability measuring methods are not applicable such as "coefficient alpha" due to the uncorrelation of variables collected.

4. Results

This section will present the findings of the answers collected by the questionnaire grouped by dimensions of effectiveness.

While exploring the gathered data regarding functionality, inconsistency among data was imminent due to the variation of knowledge in the studied subjects. Therefore, certain questions within the questionnaire can be used as identifiers in order to study the results closely among clusters of groups based on their experience of using McDonalds self-service kiosk. The criteria of dividing subjects into clusters of users based on their experience can be extracted from three selected questions that can identify the level of knowledge. The questions were presented with visuals and the data was observed and calculated.

Selected questions to identify level of experience:

1- In case you forgot to add extra cheese to your order, how do you fix it?

the picture in (*Figure 4.1)* was presented to give the participant a clear image of the situation. Four answers were presented with the possibility to select one option only.

- I press Cancel and restart the order
- I press the Edit button next to my order
- I search for cheese in the menu and add it
- I do not know

The correct answer is the second option and will be given a weight value of (2). However, the first option is viable but not how the system was designed for order editing, and therefore, a weight value of (1) was given. The rest of the answers are incorrect thus, no value was given.

Figure 4.1

2- You would like a coffee, where can you find the coffee section?

Again, the picture in (Figure 4.2) was presented to participants for better association to the situation.

Four answers were presented with the possibility to select one option only.

I can find coffee by:

- Scrolling through the burger menu
- Scrolling down the left vertical category column
- Clicking the Green Edit button under my order at the bottom
- Going to Home menu

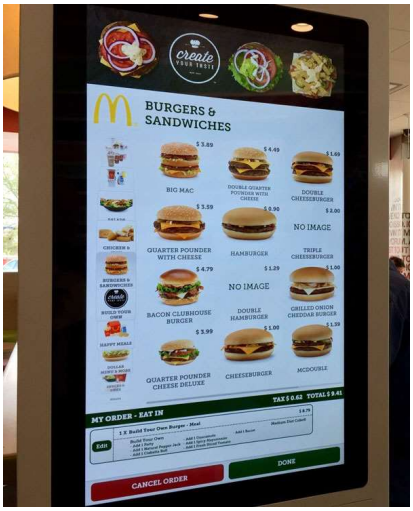


Figure 4.2

The second option is the correct answer therefore, a weight value of (2) was given. The rest of the options are unrelated thus, none were given any value.

3- How many burgers sorts can you choose from the displayed page of the menu?

The same picture *(figure 4.2)* was provided in larger dimensions for the participants to be able to calculate the number of burgers displayed. Four answers were presented with the possibility to select one option only.

There are:

- 12 sorts
- 10 sorts
- More than 12
- I do not know

As the picture displays, there is horizontal slider bar at the bottom of the screen to indicate the possibility of sliding the menu to the right for more burger assortments. Option 3 was the correct answer and was given a weight value of (2). The first option is relevant and indicates that people were able to calculate the number of burgers without noticing the slider bar, thus, was given a value of (1). The rest of the options were irrelevant for this measurement and given no value.

Subjects who answered correctly for all the above questions will be considered "extremely familiar", participants who scored above average of the entire sum will

be considered "familiar", however, subjects with a lower than average score will be considered "unfamiliar" to the McDonalds' interface. (Appendices *Table 9.1*) shows the collected data of all the participants and their scores. The average score per participant is: 4.71 out of 6, thus, dividing the subjects into three distinctive groups of: 8 (19%) extremely familiar users, 21(50%) familiar users, and 13 (31%) unfamiliar users.

4.1 Functionality:

1- How responsive the current interface is?

In order to understand responsiveness from a customer perspective, the customer need to be familiar with responsiveness. Therefore, participants were asked to rate their experience and familiarity of interface utilization knowledge. Experienced general interface users are more likely to understand responsiveness of systems.

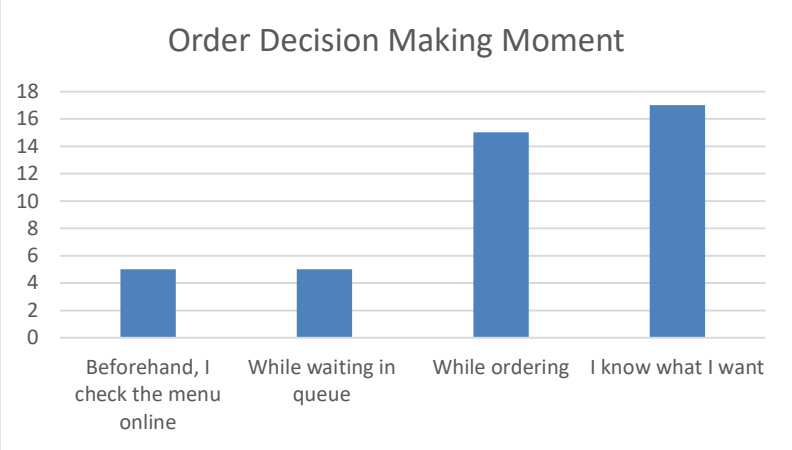
Sample	Average score of general interface experience	Average score of Kiosk interface responsiveness
Extremely familiar	8.2	6.2
Familiar	7.5	6.7
Unfamiliar	7.4	6.6
Overall	7.7	6.5

Table 4.1 on the rate of responsiveness

On a scale from one to ten, the findings present a general result of all participants scoring 7.7 on their general interface experience such as utilization of smart devices, and a general score of 6.5 regarding responsiveness of McDonalds' self-service kiosk. As expected, extremely familiar users of McDonalds interface, scored the highest on general interface experience, whilst the unfamiliar group scored the least. However, no dramatic fluctuation between familiar and unfamiliar participants while rating the responsiveness of the kiosk's interface, scoring as low as 6.2 and as high as 6.7 while the lowest score was given by the extremely familiar users as shown in *(Table 4.1).*

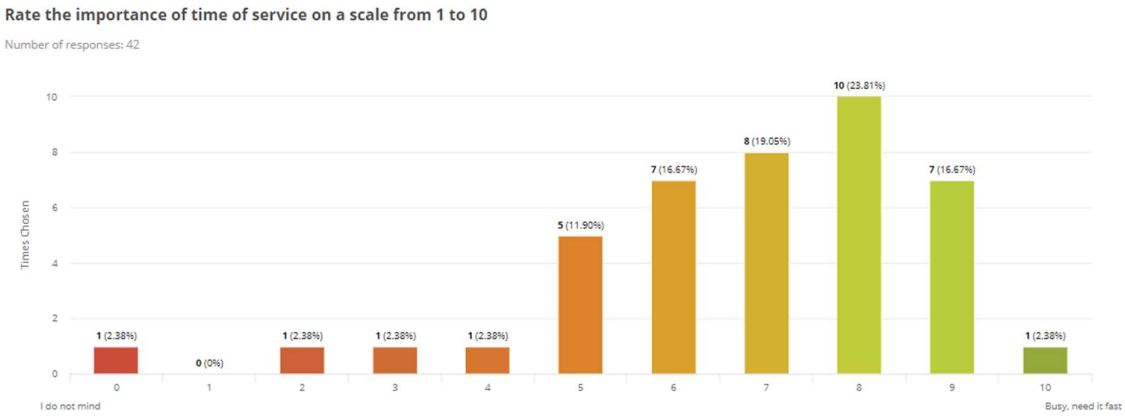
2- Does the system provide shortcuts for time efficiency?

In order to comprehend shortcuts for time efficiency, first, participants were asked on what moment do they decide on what meal to have, then, to rate the importance of time of service. Finally, how likely an addition such as "search bars" for faster navigation would be utilized.



Graph 4.1

A total of 21 out of 42 participants know their desired meal in advance, while the second majority take their decision while ordering. *(Graph 4.1)*



Graph 4.2 importance of time of service

Graph 4.2 depicts that most participants are partially time sensitive averaging the score of the scale at 6,7.

Finally, participants where asked on the possible frequency of using a search bar - as a shortcut- for faster navigation on a scale from one to ten. The overall average results showed that participants are highly unlikely to utilize the search bar with a score of 3,7 out of ten. (*Table 4.2)*

Sample	Possible frequent use of the search bar
Extremely familiar	5.1
Familiar	3.4
Unfamiliar	2.7
Overall	*3.7*

Table 4.2 use of shortcuts

The system does provide some type of shortcuts to navigate to the end of the menu, however, finding a specific item in the menu requires a search bar for time efficiency which does not exist. In case existed, the overall majority showed no interest in utilizing the search bar frequently, whilst the extremely familiar users showed the highest interest as predicted.

3- Does the system offer fixes for errors?

To answer the question, participants were asked if they have ever encountered any errors, and in case any existed, what the measures were taken?

A total of 14 users presenting 33.3% of this study have encountered errors while ordering, and the only taken measure by every user was to utilize another self-service workstation. The system did not provide a fix for the error, neither any staff member has showed up to fix the error.

4- Possibility of implementing BOPS in McDonalds?

For an accurate measurement, three questions were presented to the participants, beginning of measuring participant's awareness of the McDonalds' online menu presence, whether they have ever visited the online menu, and finally, how likely would users order online and pick up at store if possible?

Aware users of McDonalds' online presence form 69% of participants, as well as, out of the 29 participants who acknowledge McDonalds' online menu, 93% have visited the online menu on their smart devices forming a total of 27 users. However, the provided results of the overall participants when asked "how likely they would order online and pick up at store" was highly volatile with an average score of 5.4 and a standard deviation of 3.2. for better understanding, a closer look to the 27 participants who have visited the menu online before, showed little interest in BOPS with a score of 6.2 and a standard deviation of 3.1 while the most prominent score was 8. *(Graph 4.3)*

Graph 4.3 online ordering possibility

4.2 Usability:

1- Does the system keep steady interface consistency?

When selecting a meal on the online menu added by McDonalds, another page follows up with meal descriptions on the left side and the picture of the meal on the left side *(Figure 4.3)*. However, the user's eyes are trained to start reading from top left to bottom right. Participants were asked to select which page they would prefer to see once a meal selected. Only ten participants preferred the current structure consistency presented by McDonalds', as double the participants preferred to have the text on the left side. However, 12 participants had no strong opinion on the matter. *(Graph 4.4)*

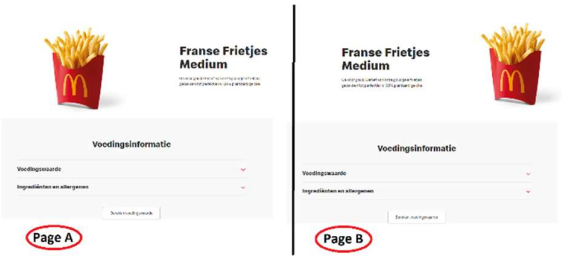
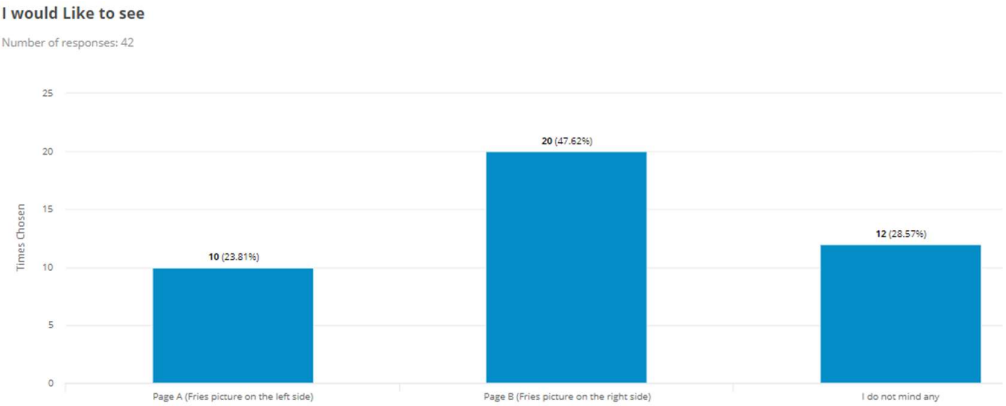


Figure 4.3 consistency within the interface



Graph 4.4 consistency preference within the interface

2- How easy is it for customers to correct mistakes and continue ordering?

To measure the difficulty of mistakes correction by users, a graphic visual was displayed, and asked how to add cheese in case forgotten (see *Figure 4.1 p.26*). Apparently, 85.7% of all participants were able to navigate through the interface and fix the issue, while 9.5% of participants decided to cancel the order and start from the beginning, and only 4.8% of participants did not know the answer. Thus, proving that the interface provides easy fix in case a mistake was done.

3- How simple is the multilayered design?

In order to understand the ease of use from a user perspective, people were asked generally to rate the interface difficulty of utilization. The question scored an average of 7.4 out of ten, while ten being very easy. The consensus of the overall score fluctuates with a standard deviation of 2.1, the score of 7 has obtained the majority's selection of 35.7% of people, the second highest score was 10 which represents 23.8% of all participants. However, looking into the categorized samples by level of experience, familiar sample scored the highest with a score of 7.7, then to be followed by extremely familiar sample with a score of 7.1 and lastly, the unfamiliar sample with a score of 7. Meaning the multilayered interface is likely easy for all selected samples to utilize and leaves a small room for improvements.

4- Is the interface overstimulated (clutter)?

For studying cluttering of the interface and how customers perceive it, participants needed to visualize and therefore were provided with a picture showing the original menu, and another showing the main bar being on the top as shown in *(Figure 4.5*).

Figure 4.5 Structure of the interface

54.7% representing 23 participants voted for the currently used menu at McDonalds, while 19 people voted for the modified menu bar. No consensus regarding the overstimulation of the interface, leaving some room for improvements and further studies.

5- In terms of locus of control? Are users able to fully customize orders?

Order customization is possible with the current interface, participants knowledge of such feature represents 95.2% of participants acknowledging the possibility of customization of orders. However, when participants where asked on the frequency of their order customization, the data fluctuates inconsistently with an average score of 3.6 and a standard deviation of 3.5.

Lastly, the likeliness of participants saving a preset to reorder next time they visit McDonalds, is 4.98 with a standard deviation of 3.34. To understand which segment is likely to utilize the locus of control, the three categorized samples give an inner insight of extremely familiar users are more likely to utilize the feature with a score of 5.7 of order customization and 7 for saving a preset, followed by the familiar group with a score of 3.3 of regular order customization and 4.1 for saving a preset for future orders, lastly, the group of unfamiliar participant with a score of 2.6 of regular order customization and a score of 5 to the likeliness of saving a preset for reorders.

4.3 Aesthetics:

In terms of aesthetics, the measurement samples of experience utilized in previous sections is no longer valid, aesthetics are highly subjective and the average score of all participants will be considered as the final result.

1- How pleasing the external aesthetics are?

On a scale of five stars, participants were able to rate the aesthetics of the terminal workstation in McDonalds with an average score of 3.7, resulting in an above average consensus.

2- Does the interface use the screen economically?

In terms of screen economy, participants were provided with picture in *(figure 4.2)* but with a larger dimension for better details. Users were asked how many burger types they can choose from with the correct answer being "more than 12" due to the bottom slid bar. However, only nine participants representing 21% of the study population were able answer correctly, while the highest majority counted solely the burgers presented with an answer of 12 burger sorts. Therefore, the economy of the screen poorly represents the entirety of burgers selection pool with only 21% recognizing the ability to view more products.

3- What image does the design represent for customers?

In terms of aesthetics, the workstation of the Self-Service kiosk communicates an image to the customers perception. Thus, the survey takers had the possibility to select more than a single impression of the platform. The highest impression participants agreed upon was "High Tech" with a 25 vote, followed by "Friendly" with 19 votes, "Professional" impression acquired 12 votes, "Elegant" occupying 8 votes, and finally, 2 members of the Survey clarified their unattractiveness towards the design of the platform.

4- Are the shapes aesthetically pleasing to the customers?

McDonalds utilizes the square shape (1:1) the most in presenting their variety of products, however, it is not the only utilized shape. Thus, participants were asked to personally pick the most pleasing shape from five different shapes provided by the theory of NGO, Teo & Bryne. Square root of two (1:1.414) scored the highest with 16 votes, followed by square (1:1) with a score of 11, then, square root of three (1:1.732) scoring a 9, Golden Rectangle (1.1618) with 4 votes, and finally, Double Square (1:2) with 2 votes.

5- Are human-related objects in dialogue sequence such as the use of emojis replaces human interaction?

In order to give an accurate measurement, a group of questions consisting of the following needed to be answered:

- How important is human interaction for you while ordering?
- How important smiling is for you?
- How often do you use Emojis while chatting online?
- Which screen would you Like to see at the end of your order?

Regarding human interaction importance for the studied users, an average score of 3.6 on a scale of ten being considered as "very important". The importance of smiling for the overall samples is 6.5 on scale of ten, the higher the more important. When participants were asked about their use of emojis on daily basis, a high average score of 7.6 was recorded. However, when the studied sample was asked to select from two screen on the end of their order, the first screen being "Thank you for your order!" and "Thank you for your order with a happy emoji", opinion were shattered and settled at 50% in favor of each. Therefore, for an advanced measurement, people in favor of human interaction where studied separately and provided the following results.

A total of 11 participants who scored higher than five were isolated to study whether they are more preceptive to emoji use in the Self-Service Kiosk.

Question	Average Score of Human Interaction Fans (11 users).	Average Score of Human Interaction nonfans (31 users).
How important is human interaction for you while ordering?	6.9	2.4
How important is smiling for you?	8.5	5.8
How often do you use Emojis while chatting online?	7.5	7.6
In Favor of using emojis at the end of order	72.7%	41.9%

Table 4.3 emoji preference for subjects with a higher tendency of human interaction

As shown in (*Table 4.3*), subjects with higher tendency towards human interaction have valued the importance of smiling at a higher rate than average nonfans, scoring 8.5, and slightly less often at using emojis at a score of 7.5. However, human interaction fans scored 72.7% in comparison to 41.9% of nonfans.

6- What impression does the interface leave?

Upon placing an order, participants were asked to choose one on the following impressions:

1- I did a great job
2- Did I forget anything?
3- I miss human interaction
4- What a bad system
5- Neutral

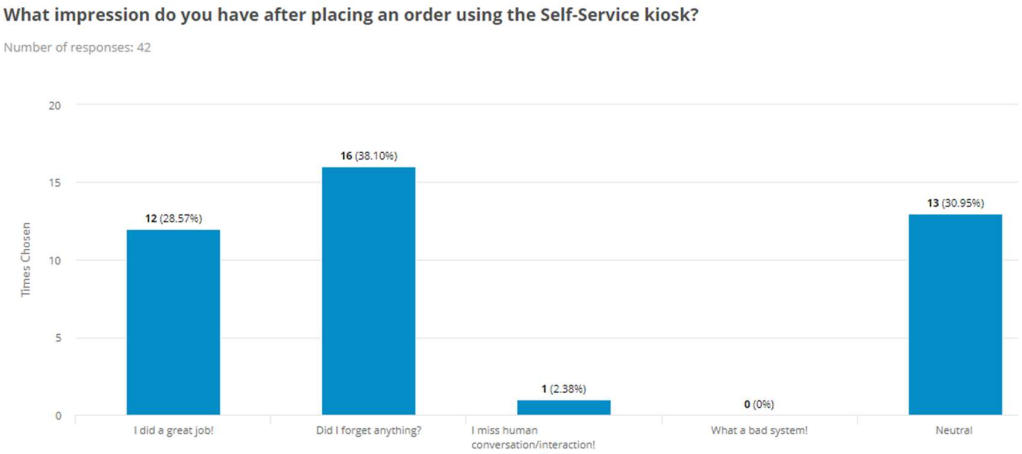


Figure 4.5 impression after placing an order

As shown in *Graph 4.5* most participants (16) questioned whether they forgot to order something, while the second majority being neutral, the third majority consisting of 12 participants were satisfied with their experience. Finally, only one participant missed human interaction while no complaints were recorded.

5. Analysis & Discussion

The findings were based on 42 participants consisting of a gender range of 30 females and 12 males, of which 36 participants living, working or studying in the vicinity of holland spoor, in The Hague. The highest selected age range was 21 – 30 years old, presenting 57.1% of the study population, followed by 17 – 21 years old ranging 33.3%, finally, the lowest range selected by 4 participants was 30-55.

This section will analyze all gathered data and findings presented in the previous section to understand every step required for each segment to ultimately recommend specific fields for improving McDonalds' POS.

5.1 Functionality:

First, improving effectiveness on a functional basis must meet both of customers' and businesses' perspectives on the topic. In this section, data obtained by the study of the 42 participants will be analyzed to evaluate the findings in comparison to the theoretical framework of this study.

On the theory of Shneiderman & Plaisant (2005) "advanced users desire for stage reduction through use of shortcuts results in a faster pace". According to the findings, users are not likely to use effective shortcuts such as "search bars" in McDonalds' interface, the average rating score was 3.7 on a one to ten scale. However, advanced users are more likely to desire reduction in stages, which is evident in the results (*Table 4.4).*

Sample	Average score of search bar utilization possibility.
Extremely familiar	5.1
Familiar	3.4
Unfamiliar	2.7
Overall	3.7

Table 4.4 possible shortcut use

As apparent, advanced users are more likely to use the search bar than less advanced users. However, the average score of the extremely familiar users is still relatively lower than expected and considered to be neutral and susceptive to change. Advanced users of McDonalds' POS reflect 19% of the study population, representing 16.6% of total female participants and 25% of total male participants. Due to the low turnout, the same samples

were compared to the satisfaction rate, showing that extremely familiar users scored 7.1 on rating ease of use. Thus, deployment of advanced shortcuts i.e. "search bars" remains in the risk zone, advanced users' satisfaction rate on the ease of use of McDonalds' interface is higher than the possible use of "search bar" rate.

Secondly, the theory of Shneiderman & Plaisant (2005) on the essentiality of responsiveness in interface design forms a strong argument on the subject by stating the benefits of performance speed. The researchers' theoretical example "performance speed is central to commercial applications, trimming 10% off the mean transaction time could mean 10% fewer operators, 10% fewer terminal workstations, and a 10% reduction in hardware costs" (Shneiderman & Plaisant, 2005). It can be measured accurately by gaining access to internal statistical data of the McDonalds' POS. However, it is important to mention for the purpose of future studies, customers' opinion regarding responsiveness will vary over time. Responsiveness is tangible and can be calculated, however, customers' expectations are intangible and depends on historical events.

Currently, the interface technology leaders, phone manufacturers are leaning to responsiveness for competitive advantage, for example: current Samsung flagship devices are equipped with 120hz (hertz) screen refresh rate and 240hz (hertz) touch sampling rate. Thus, increasing the velocity of interaction between users and devices, as well as, according to Statista, Samsung being the global leader in smartphone parts distribution, this technology is susceptible into becoming world-wide mainstream (O'Dea, 2020). Increasing responsiveness among daily used artifacts, such as, smartphones and computers, will increase the standards, and thus, increasing customers' expectations of responsiveness and decreasing the satisfaction rate of McDonalds' POS if not improved and maintained. The current results show an improvement possibility in the field of responsiveness. As expected, extremely familiar users of McDonalds POS, scored the highest average of general interface experience. However, the same sample group, scored the lowest regarding McDonalds' system rate of responsiveness with an average of 6.2. The overall average of interface responsiveness perception by customers was 6.5 with a standard deviation of 1.19, uniting the general customers' need for better preforming Self-Service Kiosks.

Finally, the case study of Gallino & Moreno on studying the impact of utilizing BOPS & ROPO will be analyzed for possible deployment. Findings depict a high awareness level of McDonalds online presence forming 69% of participants. For a highly accurate measurement, both affected parties i.e. business and customers share a common objective regarding speed of service, therefore, this part will focus on time sensitive customers and

analyze the outcome of the obtained data. In any case, it is important for McDonalds to understand the online opportunities that exists with integrating both offline and online infrastructure. The questionnaire participant users were presented with the ability to save customized burgers for ordering every time they visit a McDonalds' branch. The overall study group scored a low average on this matter settling at 4.98, however, time sensitive group consisting of 18 participants, had a higher average score of 6 and a high standard deviation of 3. As well as, while the overall participants gave an average score of 5.48 regarding the possibility of using BOPS if adopted by McDonalds, the time sensitive group scored a higher average of 6.27 with a standard deviation of 3.37. It is worth mentioning, users with a high rate of order customization scored 6, as they have a higher interest in saving their personalized orders with an average of 7.6. An important fact, opinions regarding BOPS are highly volatile, average scores were lower than expected, due to high standard deviation in scores regarding the subject. In other words, the neutral score is leaning towards positivity more in the case of BOPS adoption. Meaning, 43% of participants are capable of perceiving BOPS positively if marketed by McDonalds.

As an anomaly, results are inconsistent due to the inexistence of BOPS, therefore, participants were asked to predict future events and rate upon, thus, resulting in a high standard deviation average. It is important to mention the benefits of the online presence if deployed, such technology will not be limited to online orders. It can be utilized by customers to own a profile to save customized menus with keeping in mind user's limitations, such as, allergic reactions, religious beliefs towards certain ingredients, and preferred side beverages. As well as, in a business perspective, such technology will empower McDonalds to better understand trends and statistics of consumers preferred ingredients. Utilization of BOPS will become the main source of feeding McDonalds' database for lowering the stress on the supply chain, where trends of certain ingredients can be measured accurately. Surely, current existence of such database is unquestionable, currently, for example: McDonalds can provide information on how many vegetarian meals are being served, however, not how many vegetarians are visiting McDonalds accurately due to repetitive visits by a single vegetarian customer. BOPS will allow McDonalds to acquire very specific data regarding its consumers, thus, allowing marketing and loyalty programs to be personalized establishing a more efficient supply chain and lower future risks of R&D. The opportunities mentioned in this section are not the only options, the online infrastructure offer a limitless opportunities, which is worth mentioning, the use of "push notification" features on smartphones to notify app users of special offers once they enter a shopping mall with concentrated competition to be the first brand to market in the area through the use of geolocation. This study focusses on McDonalds in Holland Spoor area,

the Hague, where a concentrated number of students and office employees set MegaStores as their destination for having a lunch. In other branches, online integration of NEWPoS will eliminate the current need for McDonalds to rely on third party applications such as Thuisbezorged and Uber Eats in circumstances of lockdowns as seen in the current period. As well as, online deployment will result in acceleration of Drive-thru process in other branches where exists.

5.2 Usability

Firstly, following the theoretical principles offered by Shneiderman & Plaisant (2005) of consistency in typography. The highest amount of participants' selection leaned toward consistency in text being on the left side rather than on the right side when asked about meal's description location preference, portraying 47.6% of users. As well as, the arrangement of sequence mentioned by NGO, Teo & Byrne (2002) emphasize the importance of consistency, the researchers make a strong argument of how the human eyes are trained to read texts from top left to bottom right. Also, the theory highlights the symmetry principle which was not met by McDonalds' interface due to utilizing vertical scrolling ability in the category bar, and horizontal scrolling ability within the menu page as shown in *(Figure 5.1).* NGO, Teo and Byrne (2002) refer to the use of both horizontal and vertical axes as radial asymmetry which cause imbalance and lead users to confusion due to inconsistency. Such negative results of radial asymmetric use are clearly visible within the findings of the questionnaire, where 79% of total participants failed to realize the ability to scroll horizontally in the burger menu.

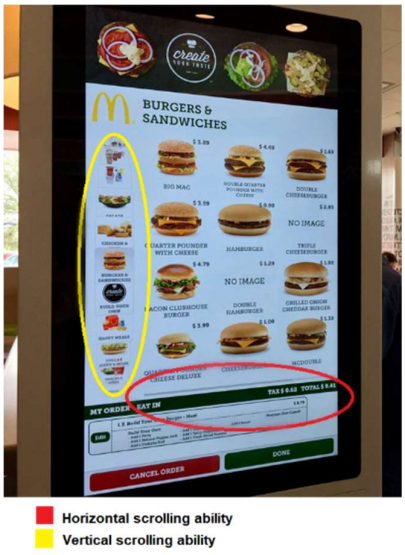


Figure 5.1 interpreting radial asymmetry

Secondly, in terms of errors, McDonalds' workstation function is essential for the fluidity of the process flow. 33.3% of users has encountered errors at least once according to the questionnaire findings. The theory of Shneiderman and Plaisent (2005) specify the importance of error prevention within the eight golden rules endorsing developers to provide a simple fix in case of stumbling upon an error. However, McDonalds' workstations do not provide any sort of fix in case of system failure, all participants who encountered errors while utilizing the kiosk leaned toward using another workstation due to impossibility of fixing the error.

Thirdly, supporting the internal locus of control to match users' desired actions to relief anxiety and dissatisfaction as discussed by Shneiderman and Plaisant (2005). In terms of actions desired, users are fully capable of controlling size, amount and addition of extra ingredients. The ability to customize orders allow customers to take full control of their meal, as the findings portrays, 95.2% of participants are fully aware of the possibility to customize orders, however, a lower percentage of users would utilize the customizing option with an average score measured at 3.6 with a standard deviation of 3.49. Low usage of the customization option does not portray its level of importance, its existence is essential for some users with high customization preference.

Further, regarding the eight golden rules in terms of ease of reversal, McDonalds' POS provides a dynamic solution for reversal in case of incorrect actions were taken. 95% of users were able to successfully edit or cancel incorrect parameters. Thus, proving the interface ability of providing ease of action reversal.

Finally, in terms of simplicity regarding ease of use, the purpose of rating the simplicity of McDonalds' interface in the questionnaire was to measure satisfaction and to support specific questions. However, regarding McDonalds' system ease of use, an average score of 7.4 was recorded on a scale of 1 (very difficult) to 10 (very easy). Most questionnaire participants could manage digital ordering and customizing meals, as the findings portrays, even unfamiliar users of the interface consisting of 31% were partially able to reverse actions and fix mistakes. As well as, their ability to navigate through the menu was apparent in ten unfamiliar participants out of 13 who could navigate and order coffee through scrolling the vertical category column.

5.3 Aesthetics

First, in terms of external aesthetics of the Self-Service platforms, questionnaire participants gave a rating of 3.7 / 5 stars regarding the looks of McDonalds' implementation. As mentioned in the theoretical framework, the self-service kiosks leave certain impressions which affect customer's image towards the brand. In this case, participants voted the most for "High Tech" impression upon looking at the workstation, however, the intended image for McDonalds' to induce is unknown and therefore, is just presented. In terms of impressions subsequent to placing an order, 38.1% of participants represented the highest majority of users had to question themselves whether they forgot to include a product in their order. Such impression leads to distrust of communication between the interface and customers. This impression can be linked to the principle of short-term memory reduction by Shneiderman and Plaisant (2005).

Second, in terms of interface aesthetics, the theory of NGO, Teo and Byrne (2002) clarify the subjectivity regarding proportionality in aesthetically pleasing shapes. Accordingly, the theory specifies most common used shapes in aesthetically pleasing design, however, intention of measuring popularity was not to validate McDonalds' decision on utilizing certain shapes, but to collect data regarding the targeted group of this study. Data regarding McDonalds' utilized shapes were calculated through downloading product images from the online menu and calculating the width and length of pixels per picture. The results show that McDonalds is designing images to match (1:1) proportional shape, showing 178 pixels in length and 178 pixels in width. However, the findings portray the most preferred shape for questionnaire participants to be square root of two (1:1.414) followed by the current utilized shape (1:1) in the Hague area. This measure is highly subjective to change depending on the region of McDonalds' operation, thus, a similar study on a larger scale must be conducted in order to measure proportional shape preference on a nationwide scale.

Third, screen economy is the discreet use of elements in regard to screen real estate (NGO, Teo & Byrne, 2002). This section is focused on the effect of poor use of economy in McDonalds' interface, the findings raised a red flag on the use of screen economy. Only 21% of participants were able to acknowledge the existence of the bottom slide bar which communicate multiple page existence to the user, however, 79% of participants failed to recognize it and ended up calculating the exact number of burgers displayed. It is possible for users to calculate the number of displayed burgers without realizing the slide bar. However, such measure raises a red flag due to its essentiality, some customers will be unable to locate some desired meals while navigating through the menu which might cause

anxiety and confusion. To solve the issue, NGO, Teo & Byrne (2002) propose using a smaller icon size to fit into the screen real estate, however, the principle of balance mentioned in the same theory might pose another solution to the problem. The principle argues the distribution of visual objects on the screen, and advices to distribute weight to the left, right, top and bottom. Glancing at the current McDonalds' interface, the use of left side menu bar is apparent, thus, the questionnaire suggested the use of a top bar instead to recover extra space for products by editing McDonalds' online menu. The results show 54.7% of participants were in favor of the left menu bar. However, no consensus nor strong opinions regarding the position of the menu bar was conducted, thus, leaving some room for change. McDonalds' interface reserves an extra room at the top for advertising which can be substituted to release extra space for better product arrangement, or the use of symmetric principle in terms of direction of scrolling on a single axis as mentioned above.

Finally, McDonalds' kiosk communicates a conversational interface with customers, for example when selecting a meal, the interface forwards a question towards consumers asking about the size of the meal and type of the beverage. The study conducted by Fadhil, Wang, Schiavo and Yilma (2018) concluded that human centered computing through immersive visualization design has measured increase in enjoyment, attitude and confidence using emojis in a chat bot dialogues. Observing the findings of this study, opinions regarding the use of emojis at the end are split in half, 50% of users where in favor of the use of emojis. Although, users with a higher interest in human interaction while ordering accentuate the use of emojis, 72.7% of people who find human interaction important preferred to see emojis at the end of their order. Thus, punctuating the results of the study on the effect of emojis when interacting with conversational interface.

6. Conclusion

Technological advancement integrations with daily used artifacts is accelerating, social media role of global communication between separate and different cultures from every corner on the planet is increasing. However, human – machine communication using a mediator interface is becoming more essential and imminent on daily basis. In this case, McDonalds' interface communicates a brand image towards customers and affects customers' interpretation of the brand as discussed in the theoretical framework chapter. This study had focused on improving effectiveness of McDonalds' Self-Service Kiosk in order to increase customer satisfaction rate in utilizing the technology, resulting in good mood stimuli inducement affects customers' return intention rate in accordance to the Dual Mediation Hypothesis. The research's objectives began with identifying a defining criterion of effectiveness derived from Larry E. Wood's book on the *User Interface Design* (1998). Functionality, usability, and aesthetics found to be to the strongest argument utilized by Larry E. Woods for interface design which was inspired by Don Norman's book on the *Design of Everyday Things* (1998). In order to apply the appointed criteria, its effects on business and customers has been investigated and resulted in a synergy to improve the self-service Kiosk without marginalizing any of the affected parties' objectives. The studied improvements were categorized through multiple theoretical data pouring prior knowledge of general system interface design to the mutual benefits of McDonalds and its customers. In the results chapter, the research began to clarify key differences between select participants, however, the theory of Ben Shneiderman and Catherine Plaisent (2005) distinguished general differences between advanced and average users, thus, some of the gathered data were utilized to categorize participants on the manner of experience. Additionally, this report sought opportunities in previously conducted studies which match the current report objectives, such as the research of Gallino & Moreno (2014) as well as, the conducted research of Fadhil, Wang, Schiavo & Yilma (2018). In addition, some matching key principles of the theory on aesthetics of interface design conducted by Ngo, Teo & Byrne (2002) were utilized where necessary. While keeping the limitations in mind, the research utilized internet mediated questionnaire in order to gather qualitative and quantitative data for accurate measurements of the theoretical framework. As a result, the report has identified room for improving effectiveness of the self-service kiosk. First, the study concluded major elements for a more effective implementation of the Self-Service kiosk. The interface can further benefit from the use of Consistency principle by Shneiderman and Plaisent (2005), Symmetry and Economy principle by NGO, Teo & Byrne (2002). Due to the poor use of the consistency, symmetry and the economy principles within

the interface, 79% of participants failed to acknowledge the total number of available products. Additionally, McDonalds can benefit from improving responsiveness of their workstations to increase current customers' perception of responsiveness which settled at an average score of 6.5. Second, distrust of communications between the interface and users is highlighted when participants' major impression was to question themselves whether they forgot to add an item to their order upon end of procedure. Third, participants showed low interest in features presented by the questionnaire to increase the locus of control presented in the theory of Shneiderman and Plaisent (2005). Finally, minor improvement elements such as the utilization of BOPS and Emojis were identified and discussed, however, they require further research prior to implementation.

7. Recommendations

The research has identified fundamental missing principles by McDonalds' interface affecting its functionality, usability and aesthetics. Applicable measures for improving current Self-Service Kiosks' effectiveness will be listed from high priority to low priority. The higher the priority of implementation, the more it is supported by negative outcome in findings of the questionnaire.

1- Customers' failure in recognizing the entirety of the product range listed on the E-menu:

   The theoretical data suggests using smaller icons of products to fit the entire variety of burgers under one category in a one page. However, as an additional fix, the use of the symmetry principle by establishing consistency of the scrolling capability direction within the menu. As well as, utilization of a top category bar will reserve extra space to fit the entirety of the product range.

2- Distrust of communication between the interface and customers:

   The issue is presented by users' impression of questioning their short-term memory whether they forgot to add an item to their order upon end of process. McDonalds' Self-Service kiosk prints a receipt upon ordering, however, for better communication, the workstation can be equipped with a high contrast colored printer. Utilization of colored printed receipts including visual pictures of the ordered products will result in a short-term memory reduction, thus, increasing satisfaction and reducing anxiety among customers.

3- The use of proportional shapes:

   The study focused on the area of Holland Spoor in the Hague, it illustrates the most preferred shape by customers within the region. Square root of two (1:1.414) was

found to be the most preferred proportional shape, thus, utilization of the square root of two will result in more aesthetically pleasing design.

4- Mediocre responsiveness rate while utilizing the Self-Service kiosk:
Responsiveness refers to the speed of process, increasing responsiveness results in a fewer terminal workstation, lower transaction time, and increased satisfaction rate among users of the interface. Daily used interfaces such as smartphones are becoming consistently faster, expectations of customers toward responsiveness is increasing, thus, not meeting the expectations will result in a lower satisfaction rate. In order to increase responsiveness, further research is required to determine whether the issue is hardware or software related.

Possible improvements which require further research:

5- Integration of online and offline channels:
Currently, McDonalds "Waldorpstraat" located in the Hague is offering online ordering and delivery after the recent Dutch regulations regarding the circumstances of Covid-19. Prior to the first of June, Dutch regulations regarding the hospitality industry allowed restaurant businesses to operate remotely through delivery (Government of the Netherlands, 2020). The impact of such measure drove the decision of McDonalds to outsource online ordering platforms such as Thuisbezorged & UberEats. The integration of online and offline channels of McDonalds' own interface will allow customers to make orders using McDonalds' own online application. Additionally, such application will allow customers to create an account, save customized meals and warn customers with allergic reactions. As well as, McDonalds ability to benefits from collecting data, data collection is essential for understanding customers' trends, lowering the stress on the supply chain and much more.

6- Use of immersive human centered visualization design:

The questionnaire findings illustrated neutrality regarding the use of emojis within the conversational interface. However, customers with a higher tendency for human interaction showed a higher interest with the use of emojis in the interface communication design. Finally, a larger scale research is highly recommended in order to collect higher amount of data for a drastic change, as well as, McDonalds' strategic planning and brand image establishing must be considered in the case of a future study.

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9. Appendices

Questionnaire:

SurveyHero

McDonalds' Self-Service Kiosk

McDonalds' Self-Service Kiosk

The main focus of this questionnaire is to collect data about the use of McDonald's Self-Service Kiosk.
All the collected data will be treated privately, the sole access will be granted to the Hague University.
There are no wrong answers, please select the answers that make you satisfied the most.
The estimated time to complete the Questionnaire is 5 ~10 minutes.

Basic Personal Information

Gender *

Please choose...

Age Range *

Please choose...

Do you live, study or work in the Hague Holland Spoor Area *

Please choose...

How would you rate your skills of interface knowledge such as the use of smart devices?

Rate your expert level on a scale from 1 to 10 *

Rookie										Expert
0	1	2	3	4	5	6	7	8	9	10

How often do you use McDonald's self-service kiosk?

I use the Self-Service Kiosk on a scale from 1 to 10 *

Not at all All time

0	1	2	3	4	5	6	7	8	9	10

How do you rate responsiveness of the system? in means of speed of interaction

Rate responsiveness on a scale from 1 to 10 *

Laggy										Very responsive
0	1	2	3	4	5	6	7	8	9	10

When do you usually decide what meal/beverage to order?

I decide what to have: *

- ◯ Beforehand, I check the menu online
- ◯ While waiting in queue
- ◯ While ordering
- ◯ I know what I want

In case you know what you want beforehand

How likely would you use the search bar option instead of navigating through the menu? (if exists)

Not at all likely Extremely likely

0	1	2	3	4	5	6	7	8	9	10

Online Menu

Do you know if McDonalds' offer their menu online? *

- ◯ Yes
- ◯ No

In case you know of McDonalds online Menu, have you ever visited the online webpage/app of McDonald's?

- ◯ Yes
- ◯ No

How important is the time of service for you? (time from entering the restaurant until getting your meal)

Rate the importance of time of service on a scale from 1 to 10 *

I do not mind Busy, need it fast

0	1	2	3	4	5	6	7	8	9	10

If online ordering is possible, how likely would you order online and pick up at store? *

Not at all likely Extremely likely

0	1	2	3	4	5	6	7	8	9	10

This is an example of a system error

Have you ever encountered errors while using the electronic menu? *

- ◯ Yes
- ◯ No

In case you have encountered errors while using the system, what happened next?

- ◯ It never occurred to me
- ◯ I used another Self-Service Kiosk
- ◯ The system told me what to do
- ◯ A member of the staff showed up to help

While ordering..

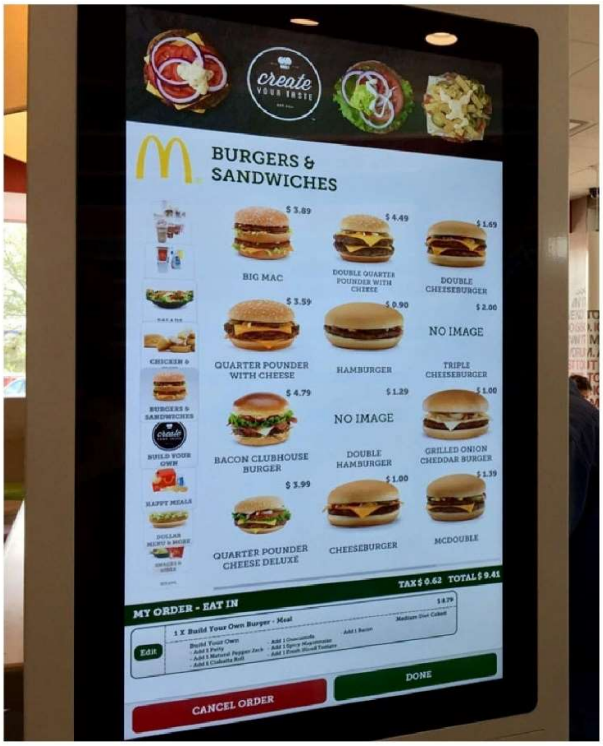
Does the current order include cheese? *

- ◯ Yes
- ◯ No
- ◯ I do not know

In case you forgot to add extra cheese, how do you fix it? *

- ◯ I press Cancel and restart the order
- ◯ I press the Edit button next to my order
- ◯ I search for cheese in the menu and add it
- ◯ I do not know

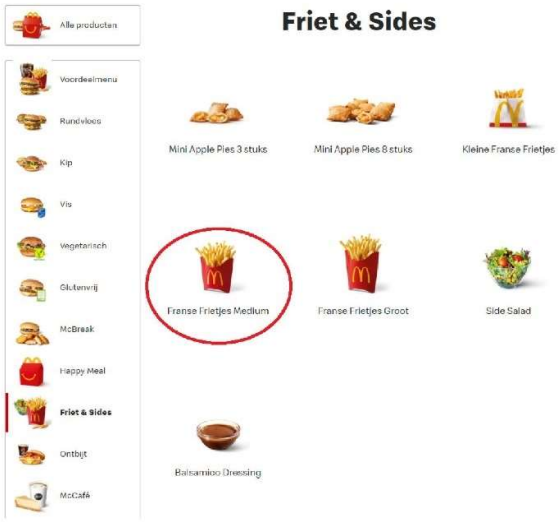
You would like a coffee, where can you find the coffee section?



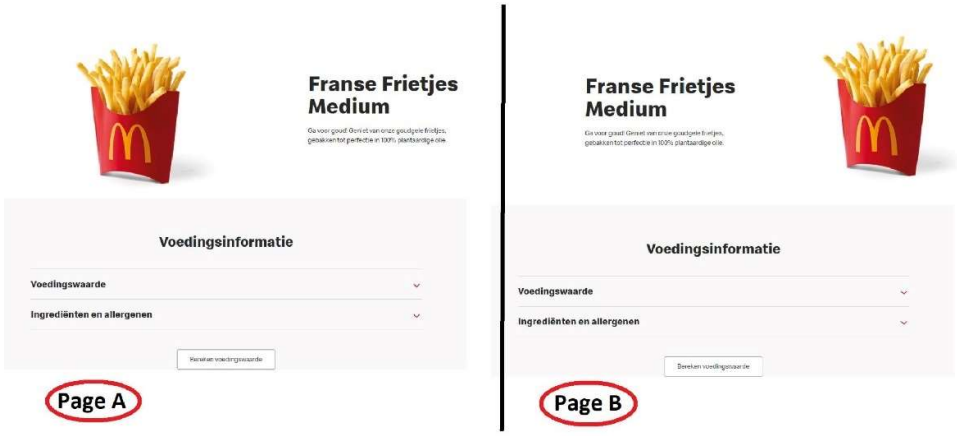
I can find coffee by *

- ◯ Scrolling through the burger menu
- ◯ Scrolling down the left vertical catagory column
- ◯ Clicking the Green Edit button under my order at the bottom
- ◯ Going to Home menu

You have selected French Fries Medium



What page would you like to see next?



I would Like to see *

- ◯ Page A (Fries picture on the left side)
- ◯ Page B (Fries picture on the right side)

Burger Customization

How often do you repeat the same order on different occasions *

Rarely Every time

0	1	2	3	4	5	6	7	8	9	10

Can you customize burger ingredients using the self-service kiosk? *

◯ Yes	◯ No

How often do you customize your burger ingredients? *

Never Every time

0	1	2	3	4	5	6	7	8	9	10

How likely would you save a preset of your own custom burger to re-order another time you visit McDonald's? *

Not at all likely Extremely likely

0	1	2	3	4	5	6	7	8	9	10

How would you rate the difficulty of using Mconalds' System? *

Very difficult										Very easy
0	1	2	3	4	5	6	7	8	9	10

Aesthetics

How would you rate the aesthetics/looks of McDonald's self-service Kiosk? *

What impression do the design and the experience of using the Kiosk communicate to you?
You can select multiple options. *****

- [ ] High Tech
- [ ] Friendly
- [ ] Elegant
- [ ] Professional
- [ ] I do not like it

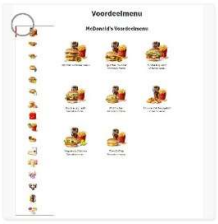
What impression do you have after placing an order using the Self-Service kiosk? *

- ◯ I did a great job!
- ◯ Did I forget anything?
- ◯ I miss human conversation/interaction!
- ◯ What a bad system!
- ◯ Neutral

Looking at both designs

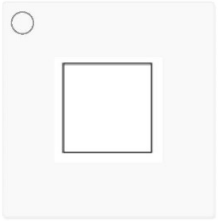
Which design is less crowded? (you can zoom in) *

Top Menu

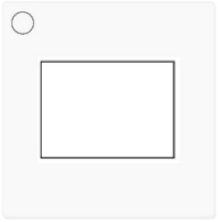


Side Menu

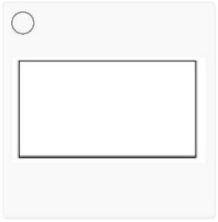
What shape is most pleasing for you? *



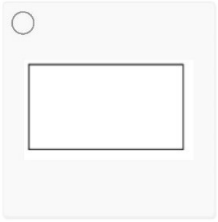
Square



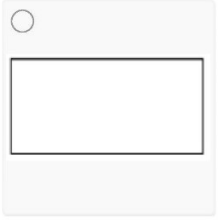
Square root of two



Square root of three

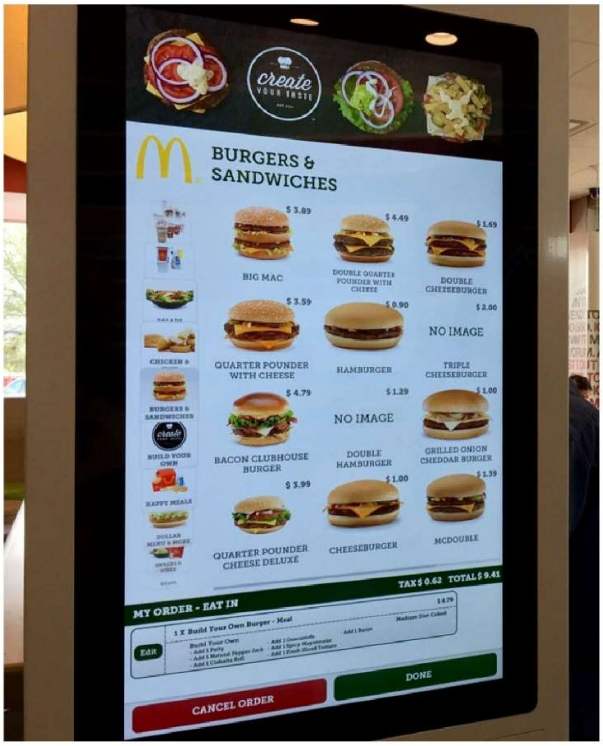


Golden rectangle



Double square

How many burgers sorts you can choose from the displayed page of the menu?



There are.. *

- ◯ 12 sorts
- ◯ 10 sorts
- ◯ More than 12
- ◯ I do not Know

Hi there! how can I help you?

How important is human interaction for you while ordering? *

Not at all Very important!

0	1	2	3	4	5	6	7	8	9	10

How important is smiling for you? *

Not at all Very important!

0	1	2	3	4	5	6	7	8	9	10

How often do you use Emojis while chatting online? *

Rarely Every time

0	1	2	3	4	5	6	7	8	9	10

Emojis :)

What impression does this picture leave? *

You can select multiple options.

- [ ] Happiness
- [ ] Joy
- [ ] Warmth
- [ ] Shyness
- [ ] Nothing at all

Which screen would you Like to see at the end of your order? *

Thank you for your order!

Thank you for your order :)

End of questionnaire

Thank you very much for taking the time in order to fill in the questionnaire!

Please enter your university email address if you are willing to participate in the Giveaway:

@

Subject/Question	Q1	Q2	Q3	Total Score
1	2	2	2	6
2	2	2	2	6
3	2	2	2	6
4	2	2	0	4
5	2	2	1	5
6	1	2	1	4
7	2	0	0	2
8	2	2	0	4
9	2	2	1	5
10	2	2	1	5
11	2	2	1	5
12	2	2	1	5
13	2	2	0	4
14	2	2	1	5
15	1	2	1	4
16	2	2	2	6
17	2	2	0	4
18	2	2	0	4
19	2	2	1	5
20	2	2	1	5
21	2	2	1	5
22	2	2	1	5
23	1	2	2	5
24	2	2	2	6
25	2	2	1	5
26	2	2	2	6
27	0	2	1	3
28	2	2	1	5
29	2	2	1	5
30	2	2	2	6
31	0	2	1	3
32	2	2	1	5
33	2	2	1	5
34	2	2	1	5
35	2	2	1	5
36	2	2	1	5
37	2	0	1	3
38	1	0	1	2
39	2	2	1	5
40	2	2	0	4
41	2	2	1	5
42	2	2	2	6

Table 9.1 identifying level of experience

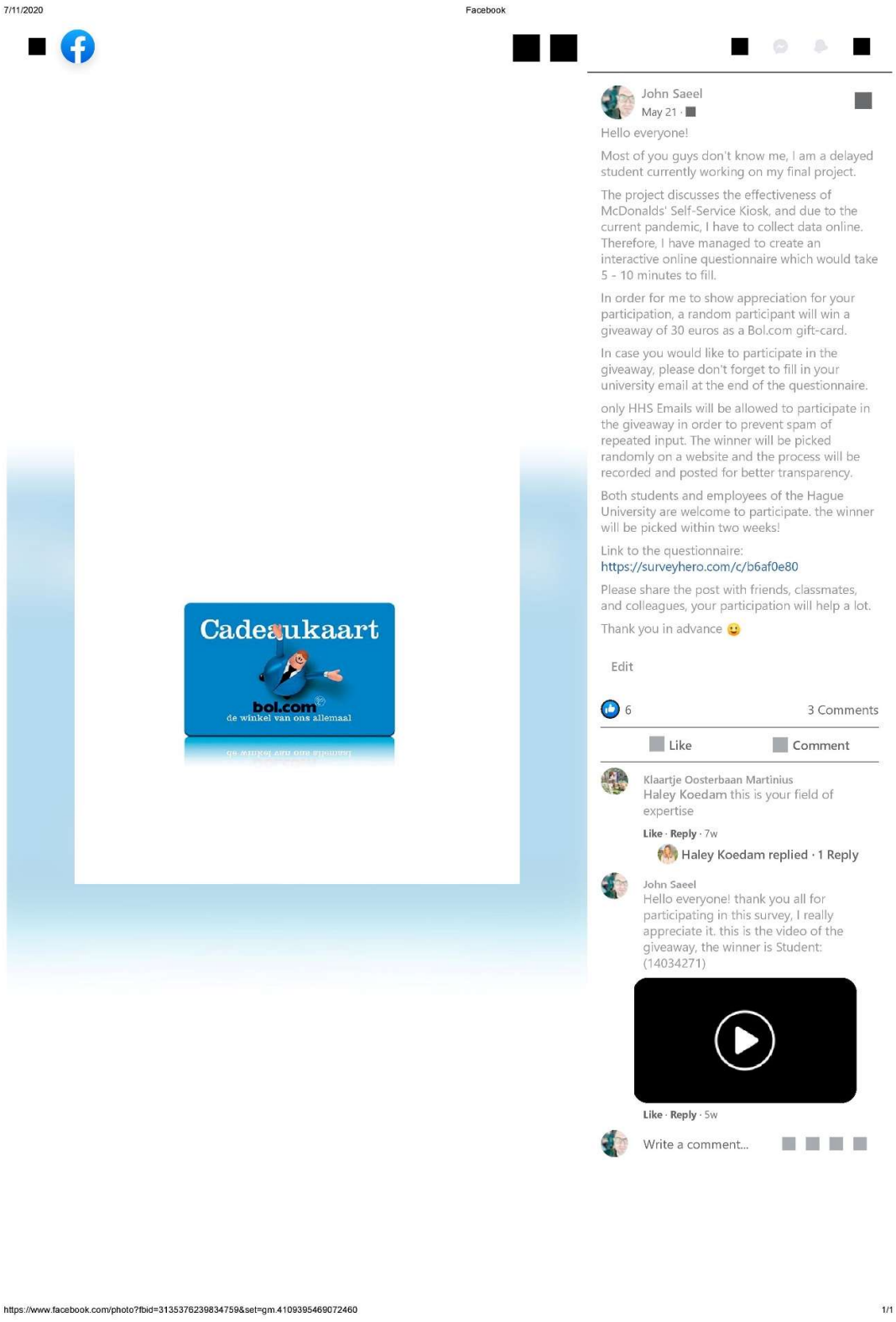


Figure 9 .1 Facebook publicity post

Excel Sheets:

Gender (n = 42)	Answer	Count	%	Value
	Male	12	28,57	1
	Female	30	71,43	2
	Other	0	0	3
	Average			1,71
	Standard Deviation			0,45

Age Range (n = 42)	Answer	Count	%	Value
	17 - 21 Years old	14	33,33	1
	21 - 30 Years old	24	57,14	2
	30 - 55 Years old	4	9,52	3
	>55 Years old	0	0	4
	Average			1,76
	Standard Deviation			0,61

Do you live, study or work in the Hague Holland S	Answer	Count	%	Value
	Yes	36	85,71	1
	No	6	14,29	2
	Average			1,14
	Standard Deviation			0,35

Rate your expert level on a scale from 1 to 10 (n	Description	Rating	Count	%
	Rookie	0	0	0
		1	0	0
		2	0	0
		3	0	0
		4	0	0
		5	1	2,38
		6	8	19,05
		7	14	33,33
		8	8	19,05
		9	4	9,52
	Expert	10	7	16,67
	Average	7,64		
	Standard Deviation	1,39		
	Net Promoter Score	4		

I use the Self-Service Kiosk on a scale from 1 to 1	Description	Rating	Count	%
	Not at all	0	2	4,76
		1	1	2,38
		2	0	0
		3	2	4,76
		4	1	2,38

		5	2	4,76
		6	1	2,38
		7	4	9,52
		8	8	19,05
		9	10	23,81
	All time	10	11	26,19
	Average	7,6		
	Standard Deviation	2,74		
	Net Promoter Score	28		

Rate responsiveness on a scale from 1 to 10 (n =	Description	Rating	Count	%
	Laggy	0	0	0
		1	0	0
		2	0	0
		3	0	0
		4	1	2,38
		5	8	19,05
		6	10	23,81
		7	9	21,43
		8	14	33,33
		9	0	0
	Very responsive	10	0	0
	Average	6,64		
	Standard Deviation	1,19		
	Net Promoter Score	-45		

I decide what to have: (n = 42)	Answer	Count	%	Value
	Beforehand, I check th	5	11,9	1
	While waiting in queue	5	11,9	2
	While ordering	15	35,71	3
	I know what I want	17	40,48	4
	Average			3,05
	Standard Deviation			1

How likely would you use the search bar option i	Description	Rating	Count	%
	Not at all likely	0	9	24,32
		1	5	13,51
		2	3	8,11
		3	6	16,22
		4	1	2,7
		5	1	2,7
		6	1	2,7
		7	7	18,92
		8	3	8,11

		9	1	2,7
	Extremely likely	10	0	0
	Average	3,41		
	Standard Deviation	3,01		
	Net Promoter Score	-67		

Do you know if McDonalds' offer their menu onli	Answer	Count	%	Value
	Yes	29	69,05	1
	No	13	30,95	2
	Average			1,31
	Standard Deviation			0,46

In case you know of McDonalds online Menu, hav	Answer	Count	%	Value
	Yes	27	71,05	1
	No	11	28,95	2
	Average			1,29
	Standard Deviation			0,45

Rate the importance of time of service on a scale	Description	Rating	Count	%
	I do not mind	0	1	2,38
		1	0	0
		2	1	2,38
		3	1	2,38
		4	1	2,38
		5	5	11,9
		6	7	16,67
		7	8	19,05
		8	10	23,81
		9	7	16,67
	Busy, need it fast	10	1	2,38
	Average	6,79		
	Standard Deviation	2,02		
	Net Promoter Score	-19		

If online ordering is possible, how likely would yo	Description	Rating	Count	%
	Not at all likely	0	6	14,29
		1	3	7,14
		2	1	2,38
		3	1	2,38
		4	2	4,76
		5	4	9,52
		6	5	11,9
		7	4	9,52

		8	10	23,81
		9	4	9,52
	Extremely likely	10	2	4,76
	Average	5,48		
	Standard Deviation	3,19		
	Net Promoter Score	-38		
Have you ever encountered errors while using th	Answer	Count	%	Value
	Yes	13	30,95	1
	No	29	69,05	2
	Average			1,69
	Standard Deviation			0,46
In case you have encountered errors while using	Answer	Count	%	Value
	It never occurred to m	24	63,16	1
	I used another Self-Ser	14	36,84	2
	The system told me wh	0	0	3
	A member of the staff	0	0	4
	Average			1,37
	Standard Deviation			0,48
Does the current order include cheese? (n = 42)	Answer	Count	%	Value
	Yes	12	28,57	1
	No	17	40,48	2
	I do not know	13	30,95	3
	Average			2,02
	Standard Deviation			0,77
In case you forgot to add extra cheese, how do y	Answer	Count	%	Value
	I press Cancel and rest	4	9,52	1
	I press the Edit button	36	85,71	2
	I search for cheese in t	1	2,38	3
	I do not know	1	2,38	4
	Average			1,98
	Standard Deviation			0,46
I can find coffee by (n = 42)	Answer	Count	%	Value
	Scrolling through the k	0	0	1
	Scrolling down the left	39	92,86	2
	Clicking the Green Edit	0	0	3
	Going to Home menu	3	7,14	4

	Average			2,14
	Standard Deviation			0,52
I would Like to see (n = 42)	Answer	Count	%	Value
	Page A (Fries picture o	10	23,81	1
	Page B (Fries picture o	20	47,62	2
	I do not mind any	12	28,57	3
	Average			2,05
	Standard Deviation			0,72
How often do you repeat the same order on diffe	Description	Rating	Count	%
	Rarely	0	0	0
		1	0	0
		2	1	2,38
		3	0	0
		4	0	0
		5	5	11,9
		6	3	7,14
		7	13	30,95
		8	11	26,19
		9	7	16,67
	Every time	10	2	4,76
	Average	7,31		
	Standard Deviation	1,55		
	Net Promoter Score	0		
Can you customize burger ingredients using the s	Answer	Count	%	Value
	Yes	40	95,24	1
	No	2	4,76	2
	Average			1,05
	Standard Deviation			0,21
How often do you customize your burger ingredi	Description	Rating	Count	%
	Never	0	16	38,1
		1	1	2,38
		2	3	7,14
		3	0	0
		4	5	11,9
		5	4	9,52
		6	3	7,14
		7	2	4,76
		8	3	7,14
		9	2	4,76
	Every time	10	3	7,14

	Average	3,6		
	Standard Deviation	3,49		
	Net Promoter Score	-64		
How likely would you save a preset of your own c	Description	Rating	Count	%
	Not at all likely	0	6	14,29
		1	3	7,14
		2	4	9,52
		3	4	9,52
		4	1	2,38
		5	3	7,14
		6	3	7,14
		7	5	11,9
		8	7	16,67
		9	2	4,76
	Extremely likely	10	4	9,52
	Average	4,98		
	Standard Deviation	3,34		
	Net Promoter Score	-42		
How would you rate the difficulty of using Mcon	Description	Rating	Count	%
	Very difficult	0	0	0
		1	0	0
		2	2	4,76
		3	0	0
		4	3	7,14
		5	2	4,76
		6	2	4,76
		7	15	35,71
		8	4	9,52
		9	4	9,52
	Very easy	10	10	23,81
	Average	7,4		
	Standard Deviation	2,13		
	Net Promoter Score	11		
How would you rate the aesthetics/looks of McD	Description	Rating	Count	%
		1	0	0
		2	2	4,76
		3	8	19,05
		4	30	71,43
		5	2	4,76
	Average	3,76		

	Standard Deviation	0,61		
What impression do the design and the experien	Answer	Count	%	
	High Tech	25	59,52	
	Friendly	19	45,24	
	Elegant	8	19,05	
	Professional	12	28,57	
	I do not like it	2	4,76	
What impression do you have after placing an or	Answer	Count	%	Value
	I did a great job!	12	28,57	1
	Did I forget anything?	16	38,1	2
	I miss human conversa	1	2,38	3
	What a bad system!	0	0	4
	Neutral	13	30,95	5
	Average			2,67
	Standard Deviation			1,63
Which design is less crowded? (you can zoom in)	Answer	Count	%	
	Top Menu	19	45,24	
	Side Menu	23	54,76	
What shape is most pleasing for you? (n = 42)	Answer	Count	%	
	Square	11	26,19	
	Square root of two	16	38,1	
	Square root of three	9	21,43	
	Golden rectangle	4	9,52	
	Double square	2	4,76	
There are.. (n = 42)	Answer	Count	%	Value
	12 sorts	26	61,9	1
	10 sorts	5	11,9	2
	More than 12	9	21,43	3
	I do not Know	2	4,76	4
	Average			1,69
	Standard Deviation			0,96
How important is human interaction for you whil	Description	Rating	Count	%
	Not at all	0	8	19,05
		1	2	4,76
		2	5	11,9
		3	6	14,29
		4	5	11,9
		5	5	11,9
		6	6	14,29

		7	1	2,38
		8	3	7,14
		9	1	2,38
	Very important!	10	0	0
	Average	3,6		
	Standard Deviation	2,56		
	Net Promoter Score	-85		
How important is smiling for you? (n = 42)	Description	Rating	Count	%
	Not at all	0	2	4,76
		1	0	0
		2	1	2,38
		3	0	0
		4	4	9,52
		5	4	9,52
		6	5	11,9
		7	10	23,81
		8	9	21,43
		9	4	9,52
	Very important!	10	3	7,14
	Average	6,57		
	Standard Deviation	2,31		
	Net Promoter Score	-21		
How often do you use Emojis while chatting onlir	Description	Rating	Count	%
	Rarely	0	0	0
		1	0	0
		2	0	0
		3	0	0
		4	3	7,14
		5	4	9,52
		6	4	9,52
		7	7	16,67
		8	11	26,19
		9	4	9,52
	Every time	10	9	21,43
	Average	7,6		
	Standard Deviation	1,83		
	Net Promoter Score	4		
What impression does this picture leave? (n = 42	Answer	Count	%	
	Happiness	26	61,9	
	Joy	23	54,76	
	Warmth	16	38,1	

	Shyness	4	9,52
	Nothing at all	2	4,76

Which screen would you Like to see at the end of	Answer	Count	%
	Thank you for your ord	21	50
	Thank you for your ord	21	50

European Studies Student Ethics Form

Your name: Jan Sael

Supervisor: Ernst Van Weperen

Title of Project: Improving Effectiveness of McDonalds' Self-Service Kiosk

Aims of project:

In a fast-growing technological age, the necessity to exist digitally is increasing on daily basis. Automation and interface technology integration on multiple fields is transforming the way humans interact with objects. In the service industry, algorithms and artificial intelligence is on the verge of automating human focused labour. Governmental legislations regarding minimum wages is increasingly inflating the cost of service and threatening McDonalds' scheme of providing low priced meals. Thus, McDonalds has sought technology integration in order to decrease artificial costs. The implementation of Self-Service Kiosk is increasingly becoming more popular among another fast-food chains such as Burger king. Thus, keeping in mind the pivotal role of the Self-Service Kiosk in communication between the brand and its customers, diversification in the use of intelligent interfaces is transforming into a competitive advantage as in the case of Dominos.

Aim of the study:

The research focuses on improving effectiveness of the current McDonalds' Self-Service Kiosk through measuring functionality, usability and aesthetics.

Will you involve other people in your project – e.g. via formal or informal interviews, group discussions, questionnaires, internet surveys etc.

YES / N0

Student's signature _____- date : 14.08.2020

What will the participants have to do?

Subjects will fill in internet mediated questionnaire providing qualitative and quantitative data for the purpose of this research. The questionnaire includes questions with multiple answers, questions of rating on a scale from one to ten and questions which require observation of visual material before providing answers.

What sort of people will the participants be and how will they be recruited?

Questionnaire sought simplicity through the formulation of questions for average users of interface technology. The method utilized for participant selection was self-selection sampling where participants decided to take the questionnaire on their own. The questionnaire was published on the Facebook community page of European Studies Students in the Hague University of Applied Sciences.

What sort stimuli or materials will your participants be exposed to, tick the appropriate boxes and then state what they are in the space below?

Questionnaires [X]; Pictures [X]; Sounds [ ]; Words[ ]; Other[ ].

What procedures will you follow in order to guarantee the confidentiality of participants' data?

On the first page of the questionnaire, the nature of the questionnaire was stated, as well as, a declaration clarifying the sole access of the Hague University of Applied Sciences to the collected data. However, the methodology utilized regarding sampling was self-selection sampling, thus, subjects had exercised their free will of participation under the provided information of privacy. Regarding participants consents, participants had the final saying in collaborating, thus, participants' decision of advancing further to the questions chapter has insured a form of digital authorization/consent for the use of collected data. In regard of handling personal data, no personal identifiers will be used for subsequent research nor direct marketing in accordance to Article 1d of the notes to the ICC/ESOMAR International Code.

Student's signature: ..... date: 14/08/2020

Supervisor's signature (if satisfied with the proposed procedures)**: ..... date: .....**