Tampere University of Applied Sciences

Mobile Interaction Design

Is it time for a Universal Gestural Design System?

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BACHELOR'S THESIS
May 2020

Media and Arts
Interactive Media

ABSTRACT

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Bachelor's thesis 51 pages, appendices 5 pages
May 2020

Interaction design in the last 12 years has transitioned to the small screen. Portable devices such as touch screen mobile phones have become the new personal computer. With this new touch screen technology, gestures have risen as the dominant interaction for mobile devices. Gestures will be the branch of interaction design this thesis will focus on as it is the most relevant to subject of portable touch screens.

The purpose of this thesis is to determine through theory and a quantitative survey, if it is possible to have a universal gestural design system. The goal is to determine if the end users would benefit from universal gestures when using their touch screen devices. The theoretical part of the study focuses on User Experience (UX) and User Interface (UI) principles along with the interaction design ideas.

Based on the replies of the survey and mirroring it to the theory of UX and UI principles as well an interaction design, the result of the study is that universal gestural design system would be better for the end users. The theory of UI states through five dimensions of interaction design, that some gestures and interactions are far more learnable, memorable and rewarding for users than others. According to the survey only eight percent of the survey respondents know all possible gestures of their Operating Systems and many feel tutorials are needed to help to learn the gestures. The majority of participants owned multiple touch screen devices from different manufacturers.

Even though the end user might benefit from the universal gestural design systems within touch screen devices, it is still unlikely that it will happen due the nature of competition in the market between different operating systems.

Key words: interaction design, universal design, gestures, Android, iOS

CONTENTS

GLOSSARY

UX	User Experience – focuses on what the user experiences when interacting with a given product, system or service.
UI	User Interaction – the point of human-computer interaction and communication in a device.
HCI	Human Computer Interaction – studies the design and use of computer technology, focused on the interfaces between people and computers.
IxD	Interaction Design – the process of creating interactive products and services by moving beyond the item and focusing on how the user will interact with the item.
UCD	User-centred Design – user centred framework in which the user is the centre of everything.
HCD	Human-centred Design – a problem solving approach that starts with observing the problem within context.
iOS	Apple Inc's mobile operating system used on all Apple mobile devices. Initially released 29th June 2007.
Android	An open source mobile operating system based on a modified version of the Linux Kernel. Initially released 23rd September 2008.
OS	Operating system

1 INTRODUCTION

Currently the number of smartphone users in the world is 3.5 billion, which equates to 45.04% of the world's population (Turner 2020.) More people than ever before are now interacting with technology on the move, no longer needing to access a PC to browse the web, instead using a mobile device. In developing countries, the internet is easier to access via mobile rather than a conventional pc (BBS 2020).

The first mass consumed product with a touch screen, was the iPhone 1, which introduced people to this form of interaction: the gesture. With the gesture becoming a prominent interaction when using a touch screen or mobile device, interaction design has had to evolve along with this change in technology (Hoober & Berkman 2011). Using User experience (2) and User Interaction (3) principles as a basis for the argument for a universal gestural system, this thesis will try to determine what would be best for the end user. The research question is could there be a universal gestural design system across all operating systems. Understanding if a universal gestural system is needed or desired by the end user, it is important to understand the basics of learnability and how user expectations are affected when interacting with gestures.

Currently the most popular operating systems iOS and Android, offer developers a style guide (material design) system for use whilst developing for the operating system. By comparing the gestures included in these design systems, this thesis will analyze the similarities between both systems. Through the survey that produced practical information and the theory of UX, UI and learnability, this thesis hopes to provide an answer to the research question mentioned above.

1.1 Structure of the thesis

This thesis starts with UX principles and more precisely user experience and common sense in mobile interaction design. When designing interactions, understanding the user's needs and abilities is crucial, so understanding interaction design principles is important.

From UX the theory moves into interactions and User interaction (UI). Interactions and UI include theory about behavioral design, the so-called five dimensions of interaction design and goes into more detail in learnability and automatic interactions within learnability. This thesis presents interaction design theory as a way to understand issues of a possible universal design system. Most of the theory was collected using traditional research methods, such as literature including articles, blog posts, books and other thesis.

In the fourth chapter of this thesis, gestures are compared by going through the standard touch gestures of both operating systems; iOS and Android. In this chapter kinesthetic gestures and the affects gestures have had on mobile devices is also studied. The comparison between the operating systems of iOS and Android was done by comparing existing gestures via both systems material design.

The fifth chapter onwards this thesis concentrates on the research methods on which basis the survey was chosen as a data collection method and how the survey questions were created. The survey was produced in order to gather information on users' experiences related to gestures. This was used to create arguments for the possible universal gesture system. The sixth chapter focuses on the general findings of the survey, learnability as well as usability findings and user perceptions.

In the end of the thesis are conclusions, discussion of the thesis and results of the survey and how the replies of the survey are compared to the theory. In this

chapter the research questions about universal gesture design are answered based on the theory and survey findings.

2 UX PRINCIPLES

User experience design (UX), is the design of a user's interaction with any product, service, system or interface. UX design is concerned with the user's perception of the product, before purchase, during use and after use. Don Norman, the director of the Design Lab at the University of California, is credited with coining the phrase User experience design in 1995. (Stevens 2019).

> No product is an island. A product is more than the product. It is a cohesive, integrated set of experiences. Think through all of the stages of a product or service – from initial intentions through final reflections, from first usage to help, service, and maintenance. Make them all work together seamlessly. (Norman 2020)

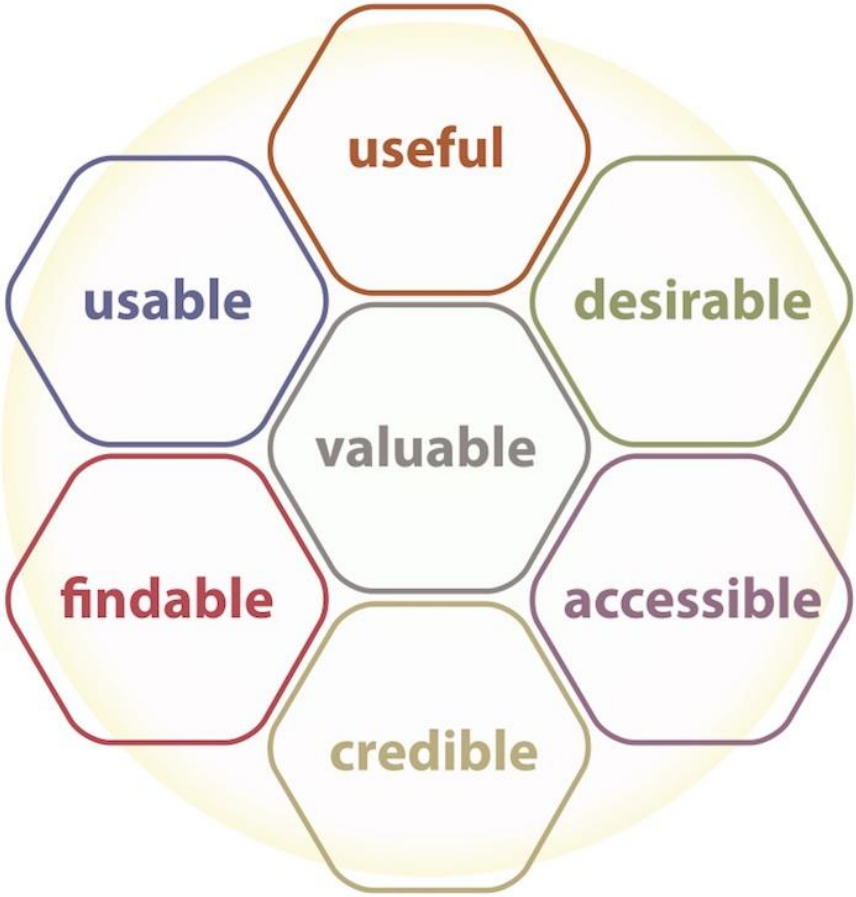
Norman in this quote perfectly sums up all aspects of creating a great user experience. No aspect is bigger than the other, and all parts have to be considered in order to create a great experience. This also illustrates just how UX design has had to adapt over the course of time (Lindeman 2015).

> Design is arguably the defining human endeavour, that separates us from all the other species. Take a look around you and you will notice that everything has been designed. From how you sleep, to how you eat to how you communicate. Everything around you has been designed by someone. In other words, user experience design, or UX design is everywhere. From how you interact with your smartphone, to how your home is designed. (Soegaard n.d.)

The quote from Soegaard, presents the idea that the world is full of designed things. Mads Soegaard is the founder at the Interaction design foundation APS (IDF). UX can play a part in improving the experiences people have within this designed world. The role of a UX designer is to make design more intuitive and easier to use (Interaction Design Foundation n.d.).

2.1 The User Experience Honeycomb

Peter Morville's UX Honeycomb is a popular and understandable way to see the 7 aspects of UX design (Wesolko 2016.) It was created in 2004 with the goal to help understand the similarities between user experience and experience design, and to show that usability is necessary but not sufficient.



PICTURE 1. User Experience Honeycomb (Morville 2004)

Picture 1 shows that UX design is not just usability. This is important as most people believe if something is usable, then it has good UX design (Norman 2020.) This is the reason certain products within a market may work perfectly but fail because the other parts of the honeycomb have been neglected. The user will opt for a different solution, if the section of the honeycomb that is important to them is not there (Fossdal & Berg 2020). The product will be less successful than competitors that have a less usable product but have considered the other aspects of design.

Useful- A product or service has to be useful and fill the needs of the intended end user (Mortensen n.d.) If the product or service is not useful or able to fulfil end user's needs, then why has the product or service been created if it has no purpose. Useful is a subjective category though as it is viewed differently by different sets of users. Usable is in the eye of the beholder (Mortensen n.d). This means things such as art or video games can be deemed useful even if they serve an aesthetic or fun purpose.

Usable - The system in which the product or service is to be delivered to the user needs to be simple and easy to use (IDF n.d.) Systems need to be designed so that they are familiar and easy to understand, with the learning curve being as quick and painless as possible (Wesolko 2016). When designing with UI elements familiarity is incredibly important, as it allows for patterns and behavioural memory to be developed. This will be discussed more in chapter 3.1.

Findable relates more to the finding of needed information. This is important for example in web design. Navigation should be intuitive and easy; the user should know where they are. If any problem should occur the user should know where to find information to solve the problem quickly and easily. When thinking about the navigation structure it should be designed so it makes sense, familiar locations of items throughout the design create consistency. It doesn't matter how much great content you have available to the user if they cannot find it.

Credibility is important to building relationships with users. Users should be able to trust that the product or service has their best intentions at heart. Credibility leads to brand loyalty and end user's increased understanding and tolerance to any changes that may come with development or iteration of the product.

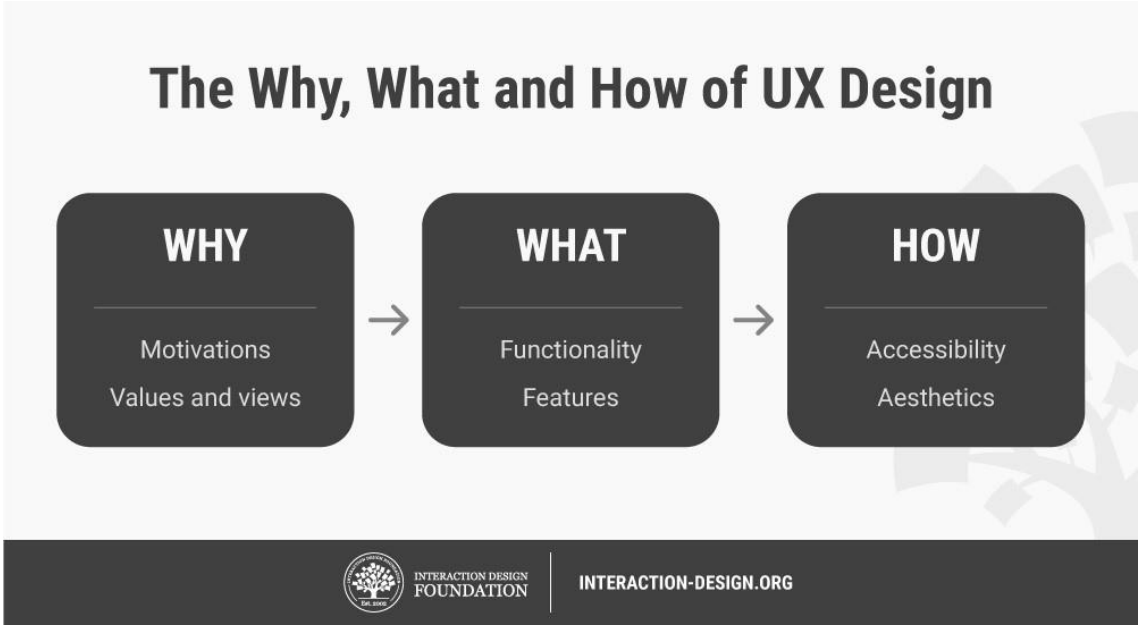
Accessibility is important to designing a product or service, because it allows more people to use the product or service. Accessibility will be discussed in more details later in regard to gestures. Often thinking about accessibility within the design not only helps the group that is targeted, but also users with a range of abilities. This also covers a full range of disabilities from hearing loss, impaired vision, motion and learning. This means that designs should cater to people that

have colour blindness and that visual elements are clear and distinct (Mortensen n.d). When designing for accessibility, you often find that you create products and services that are easier for every user to use and understand (Web Content Accessibility Guidelines 2018).

Desirability is an emotional design system in which the aesthetics and identity of a product or service is portraited to the user via branding and image. Desirability is infectious, if one user desires something they are likely to talk and create desirability in others. If someone was to offer a free house or tent for example, most people would choose a free house over a tent even though both offer the same kind of outcome. Of course, this argument is subjective if you take the monetary value out of the question, but it does show that similar services or products can often be chosen by a user due to desirability (Morville 2004).

Valuable for the end user and creator is key to a successful product or service. Without value any initial success would fade, and the product or service will lose user interest. If the creator adds value by making it durable, lasting an appropriate period of time, in the user's mind they have benefited more than the initial expectations. Value is different from user to user; some users would prioritize desirability over accessibility and vice versa. This is why in the honeycomb valuable is in the centre. It is the sum of all the parts that add to the value of any product or service (Morville 2004).

2.2 The Why, What and How of UX



PICTURE 2. The Why, What and how of UX design (IDF n.d.)

Understanding the users 'Why' often leads to the true problem they are facing; sometimes a user will say a problem is one thing and it's actually solvable by solving a different issue. If a user would need a car for example and the seller didn't understand the why, it would be almost impossible to suggest a car that fits their needs and wants. When learning about the user's values and motivations the solution can often be very different than initially thought. In the field of UX personas play a valuable part in defining user groups and the needs they may have. A persona is a combination of user's wants and needs, so the design can be tailored to patterns instead of direct wants, this helps to create more value in any product or service (IDF n.d; Norman 2020).

What the product or service can do based on its functionality is key in the UX process. When designing for functionality, it is always better to do what is intended incredibly well and make it a focus, rather than creating something that does a lot of things poorly (Mortenson n.d). An example would be a camera, you would want it to take pictures and video, but it doesn't need to have added features like web browsing.

Offering a fluid and accessible product or service is key in making it desirable (Morville 2004.) No one wants to spend valuable time in tutorials learning how to use the thing they have just purchased. Making a simple and clean design will always add value to a user (Norman 2020.) No matter how good your design is, if it's not intuitive or fun to use, users will go elsewhere for a similar service (Krug 2014.) As mentioned before, creating a desirable and usable product will get potential users excited and can lead to the desirability spreading to others through word of mouth.

2.3 Common sense

Common sense is often the term that is used to describe a mindset that will allow for better usability in any given design. The definition of common sense is a sound and prudent judgement based on a simple perception of the situation or facts (Merriam-Webster n.d.) With this information it can be argued that most humans should be able to act and perceive in a common way. However, this is subject to various factors, the user's cultural background, education level and even economic state (Taylor 2011).

As humans our surroundings dictate our beliefs and desires. With the web being a truly global entity, common sense is a little more complicated than the definition provided above. Understanding what is important to the user and allowing for different types of users, that each have different goals to use the same site, does not mean designing tailored sites per user. It means designing with accessibility at the forefront throughout the process so that the product is suitable for everyone. Simple design allows the end user to see the interaction journey and destination, so they can achieve what they need in as short a time a possible. Most of us see ourselves as in a hurry, so when an interaction occurs, clarity and ease of use allows the user to feel that their time is not wasted (Krug 2014).

2.4 Why UX principles matter in Mobile interaction design

The UX principles add substance to the argument for a universal gestural design system. By allowing users to learn and understand how things are done in a simple way, it allows for more users to be catered for within any system. What this could mean for mobile companies, is a higher standard of interactions due to bad designed interactions no longer being used within any services or products.

3 INTERACTIONS & UI

The UX principles presented in this thesis establish a background within UX that can be used when discussing Usability and UI interactions. When interacting with any software or digital product, the main goal for the interaction designer is to make the given action as easy and natural as possible (Krug 2014).

Interaction design is a blended endeavour of process, methodology and attitude. Interaction designers are a mix of programmers, architects, graphic artists, UX designers and other specialists. Interaction design is not a new concept, it did not arrive with computers and computer interfaces. Human computer interaction (HCI), has adapted the role to fit with the modern technological climate. Kevin Silver argues that interaction design lies at the junction of several design disciplines (Silver 2007).

Interaction designers must identify the need of the design, understanding the why is important (see 2.2). To understand interaction design, multiple factors need to be understood: behavioural design (3.1), the five dimensions of interaction (3.2) and learnability (3.3).

3.1 Behavioural Design

Behavioural design is the set of techniques used for persuasion and is not to be used as a technique for coercion (Kong 2018.) The idea is to use behavioural patterns to benefit a given design, so that it allows for the user's freedom of choice, dignity and autonomy to be respected. It takes advantage of learned behaviours, to drive users in the correct way, if used ethically (Combs & Ramsey 2018). The role of the interaction designer here is not to trick users, but make them feel calm and in control, this last point refers back to the UX honeycomb and the section on credibility.

Being credible with the design allows the user to build habits within a design framework that will drive engagement and user retention (Kong 2018). In the book Digital Behavioural Design by T. Dalton Combs PHD & Ramsey A. Brown (2018)

they discuss the CAR model: Cue – Action – Reward. This is a proven design method that helps to induce user habits based on the constant idea that a reward enforces that behaviour. Looking at this model, it is easy to relate it to the basic form of an interaction. That of which an action creates a reaction. A reward is broader than a gift, bonus or a thing we can measure financially. Behavioural scientists and behavioural designers use the term reward to reflect any pleasurable experience that is consequence of a user's action (Combs & Ramsey 2018).

3.2 The Five Dimensions of interaction design

In the introduction to the book, Designing interactions by Bill Moggridge (2007), Gillian Crampton Smith suggests that there are four dimensions to an interaction design language, to which Kevin Silver added a fifth (Silver 2007). Gillian is an interaction design academic, whilst Kevin is a senior interaction designer at IDEXX laboratories (Yu 2020). The following list explain the five dimensions of interaction design.

- **1st Dimension: Words** – especially those used in interactions, like buttons and labels, should be meaningful and simple to understand. They should communicate information to users but not overwhelm them.
- **2nd Dimension: Visual representations** – the graphical elements that the users interact with. Images, typography, Icons, being used along with the 'words' to communicate with the user
- **3rd Dimension: Physical objects or space** – Through what physical objects the user interacts with the product. A laptop with a mouse or touch pad a touch device with the user's finger or stylus. What kind of physical space does the user complete said action? Is the user inside an office browsing on the web, or standing outside in rain trying to use their smartphone? All of these will affect the interaction between the user and the product.
- **4th Dimension: Time** – In terms of media that changes with time, be it video, sound or animation. Motion and sound play a crucial role in giving feedback to the user and their actions. This is also related to how long a

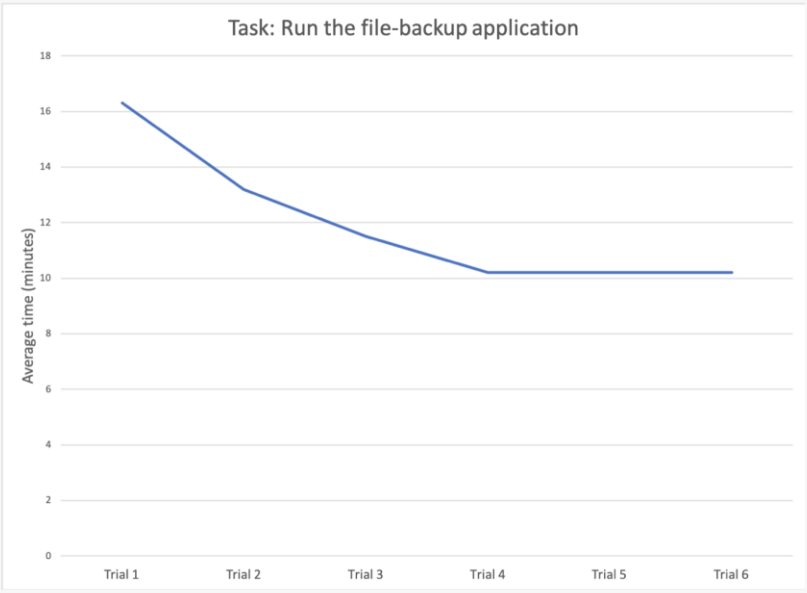
user has to interact with a product, can a user track their progress if they run out of time can they come back later.

- **5th Dimension: Behaviour** – The mechanism of the product, how do users perform tasks or goals? This is how the other dimensions define the interactions within the product. How is the user given feedback? What is the emotional response from the user?

The first three dimensions enable an interaction, the final two dimensions define an interaction. This relates back to the CAR model of Cue-Action-Reaction, in which feedback and a user's response help define credibility along with desirability and build patterns and habits within a user (Combs & Ramsey 2018). This is the information that allows us to understand why some gestures and interactions are far more learnable, rememberable and rewarding for users. Often interactions that we are unaware of, will not only work when a user tries, but will reward the user because the interaction was designed to be intuitive.

3.3 Learnability

Learnability plays a huge role in developing natural and easy to use interactions. In its simplest form, learnability is measured in how easy it is for a user to complete a specific given task the first time they encounter a new interface or design. Often learnability is measured in study groups in which a certain number of users are given a list of tasks to perform. By observing and studying a user's encounter it is possible to see a user's understanding of the new product or service: How many times did they fail? How long it took? How many repetitions did it take for the time taken to plateau? Doing these tests allow the plotting of learning curves, which reveals changes in a user's understanding of the task and often shows a reduction in a user's time to complete the given task (Alita 2019; Krug 2014).



This learning curve shows the hypothetical completion time for a backup as a function of the number of task repetitions (or trials). Notice that the time for the first repetition is longest, and then the completion time decreases — by trial 4, it levels off, reaching the saturation plateau. Although details such as how many repetitions are needed to reach saturation will vary from case to case, this learning curve is representative of all human learning.

PICTURE 3. Learning curve of a given task (Alita 2019)

Picture 3 shows what to expect during the performance of a task. In this case it's to run a file-backup application. Users will start slow and speed up over time when performing the task. This ability to visualize a user's experience with a given interaction is useful at all levels of complexity (Alita 2019).

3.3.1 The 3 aspects of learnability

There are three main stages to the graph that can be seen in picture 3. The initial interaction, the curve, and the plateau. These stages are not just a progression but also an indication of user groups that may have to use the product or service (Alita 2019). Alita determines the three aspects of learnability as follows:

- First-use learnability: How easy is it the first time? This can be seen as the first-time user that may never have to use the interaction again, so the user has no interest in how it behaves, as long as it performs the given task.

- Steepness of the curve: How quickly do users improve with repetition of the given task? This applies to a user that may have to do the task multiple times, but not all the time. This also allows the user to see progression

within themselves by improving with each use of the system. Probably meaning they will stick around and continue to the next phase of mastery. Of course, on the opposite end of this, if progression feels slow the user may look elsewhere for a better solution. This again refers back to the UX honeycomb (2.1).

- The Ultimate plateau: How high is the productivity when the user has achieved mastery of the given interaction. This applies to users that may use the interaction on a frequent basis over a long period of time.

In an ideal world all three of these aspects would be achieved, in reality often compromises have to be made in order give the end user the most amount of value (Alita 2019). When thinking about mobile interaction and gestures in relation to the above aspects. Device specific commands often fall into the slow to learn category because they are not commonly known. This would mean a new user would have to start at the first use every time. An expert of user interaction may start further down the curve due to assumptions based on previous experiences.

Learnability is seen as an active component of Usability (Mifsud n.d.). It's also linked to the behavioral design (3.1). If the user feels rewarded when performing an action, then the idea that an action leads to a reward, first presented in the CAR model (Ramsey & Combs 2018) will lead to the user learning the interaction at a faster rate.

3.3.2 Automatic Interactions

In the book Thinking Fast and Slow by Daniel Kahneman (2011), the idea that we have two systems of thought is introduced. System 1 is a fast instinctive and emotional thought process, whilst System 2 is a slower more logical and deliberate process. Given any period of time and repetition, it is possible that a system 2 process once mastered can move to become a system 1 process. Using the example of drawing eyes, most artists would begin with a reference picture, but with training and drawing countless eyes, any artist would eventually master that

aspect and no longer need reference. At this point something that used to take a lot of time and was a slow process within the system 2 mindset, has transferred with the artists mastery of the skill to process 1.

This is important in relation to time; the first mass market touch screen mobile was the original iPhone. Debuted by Steve Jobs on the 9th January 2007 at Macworld and released for sale 29th June that same year (Wikipedia n.d.). That is 12 years ago in relation to starting this thesis. In that time as previously stated in the introduction 3.5 billion smart phone users exist currently (Turner 2020). That means early adapters to the technology have had 12 years to master gestures and interactions associated with mobile touch screen devices. A lot of the gestures would have originally been system 2 processes but over time and iterations most have moved to system 1.

4 IOS & ANDROID GESTURES

In this section of the thesis the current gestures used by each operating system will be analyzed and compared in order to see where similarities exist. As stated in the last chapter (3.3.2) the original iPhone was released in 2007, with the first Android powered HTC Dream being released in September 2008 (Wikipedia n.d.). Over that period of time a lot of changes and best practices have emerged, these two mobile devices the iPhone and HTC Dream were vastly different at a time where this new technology was just starting to form into what users expect from a mobile device today. The original iPhone is the mobile device that closest resembles the current devices with a large screen dominating the design. Whilst the HTC Dream was a touch device, it still had a lot of mechanical components. In 2020 Smart devices look more and more similar.

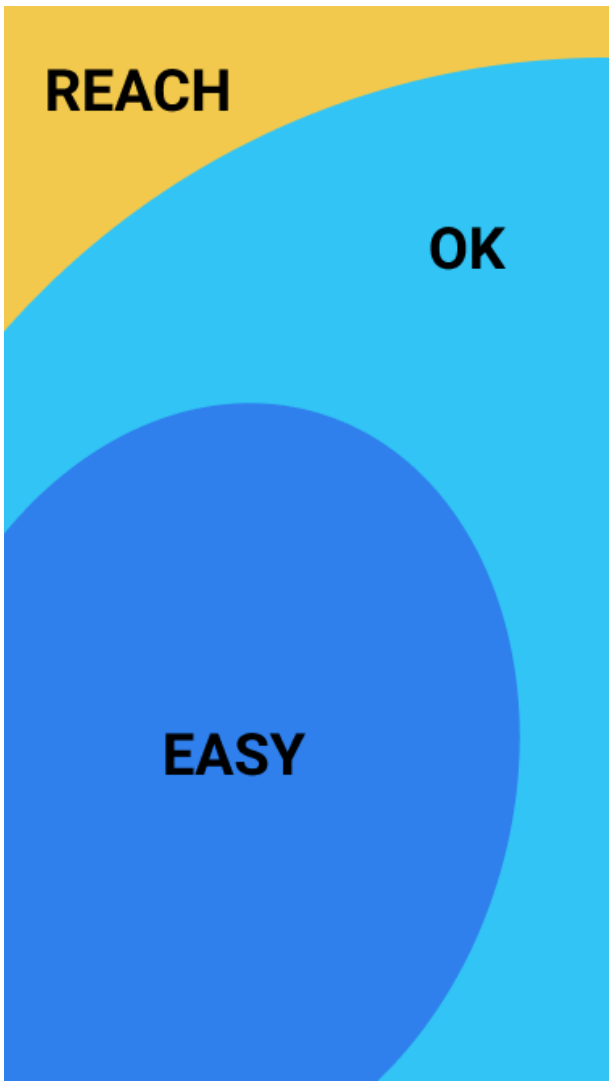
PICTURE 4. iPhone X 2017 and the Android 9 pie 2018 (Duino 2018)

As picture 4 shows, there are minor differences and design decisions that differentiate these devices. This paper will not go into too much technical details as it is irrelevant in terms of what is being discussed, in regards of a universal gestural design system. During the analysis of the gestures both platforms present, this thesis will remain bias neutral, as choosing a so-called best option is subjective and does not have a purpose in this discussion.

By looking at the definition of a gesture from Merriam Webster (n.d.), a gesture is a movement usually of the body or limbs that expresses or emphasizes an idea, sentiment, or attitude. A gesture in regard to interaction design is a movement that initializes an action within an interface (Wroblewski 2011.) This is especially true when dealing with touch-based gestures on a flat surface, this type of gesture is one of the most common gestures used with mobile devices. Although speech and kinetic gestures are becoming more common.

Both operating systems have guidelines that allow for best practices to be observed and the user's experience to be as intuitive as possible. It is important to remember that single application gestures such as those used in games will not be talked about in this paper, they are used to complete complex tasks and have been designed with an exact purpose in mind. Most gestures are designed to be used with only one hand as mobile devices are used in a multitude of environments and situations (Hoober & Berkman 2011.) Also, with current phones most of the primary navigation is designed that a user can use their thumb to complete the interaction with the phone being held in the same hand.

When looking at picture 5, if the user is using their right hand this is a visual representation of the areas in which their thumb can touch. This is a redrawn version of a diagram from the book Mobile First by Luke Wroblewski (2011), which gives a great example of why the majority of navigational gestures are located in the lower half of the screen space. Since approximately 70-90% of users are right-handed, picture 5 showcases why a lot of navigational choices are based within this model from left to right (Wroblewski 2011).



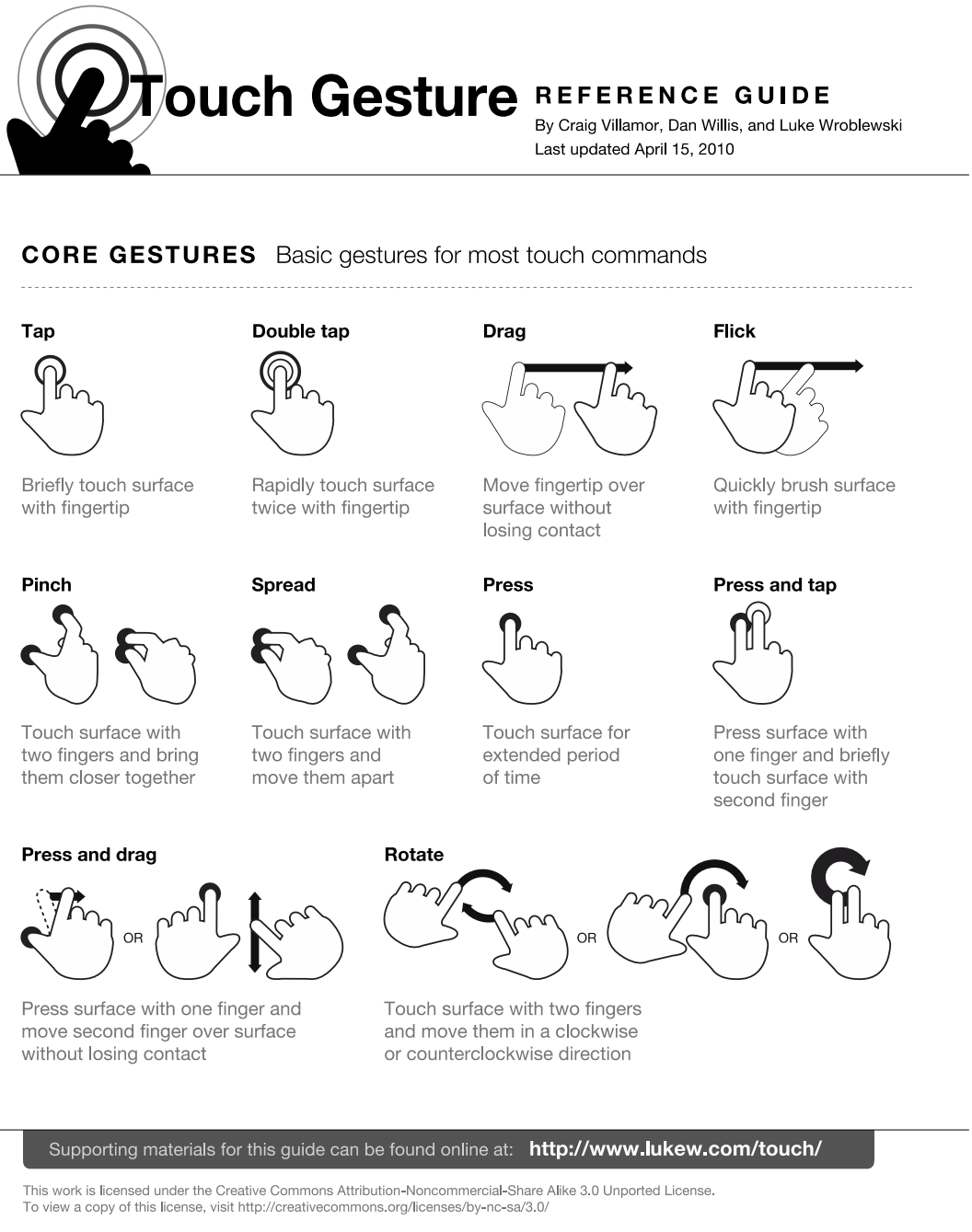
PICTURE 5. Touch area of phone. For a right-handed user. (Wroblewski 2011 - Redrawn Keogh 2020)

With newer devices and accessibility settings left-handed switching is available so in that use case the touch zones would be reflected. Accessibility plays a huge role in the potential application of gestures to help people with any sort of disabilities, allowing for imprecise movements to be used in precise instances (WCAG 2.1 2018). This links back to what was discussed in the accessibility section of the UX honeycomb (2.1).

4.1 Standard touch gestures

In this section of the thesis, a comparison between iOS and Android gestures will be conducted in order to find similarities and possible problems when proposing

a unified system. As the technology for mobile devices begin to plateau, common standards are created as best practice. These gestures have been adopted by all operating systems as a baseline for user experience.



PICTURE 6. Touch gesture reference guide. (Wroblewski 2010)

Picture 6 is a sample size of the core gestures for touch screen devices from 2010. The basic gestures used in 2020 are almost exactly the same. In this time

a lot of these gestures are now performed automatically without the user's consciousness. This refers back to automatic interactions (3.3.2) and shows how gestures have become part of a user's expected interaction principles.

Looking at the gestures in (picture 6) what can be seen is a lot of these gestures resemble real world interactions. Turning fingers whilst on the screen to rotate mirrors what you would do if you were interacting with a piece of paper on a table. This type of interactions allows the user to feel knowledgeable and are definitely the easiest gestures to learn. The tap gesture has replaced a 'click' or button press and is often the main selector gesture. By tapping on any element within a user interface, users expect some sort of response.

Users have become familiar with standard gestures since the emergence of the current mobile touch-based climate. Both operating systems state in their guidelines (IOS n.d.; Android n.d.) that gestures let users interact with screens via touch, in an intuitive way creating a close personal connection with content, enhancing the sense of direct manipulation of on-screen elements. Gestures as a whole, attempt to circumvent the previous state of the art where the controls are somewhat arbitrarily "mapped" to actions (Hoober & Berkman 2011).

It's important to note that gestures are not to be used to replace interface-based navigation or actions. Hypothetically if a user is about to check out from an online store a button element should be used not a swipe gesture. This allows the user to get power in the decision-making process and lead to a confirmation or error page. Navigation bars that use taps to navigate interfaces are a very common way of adding non gesture actions to any interface (Hoober & Berkman 2011).

Standard gestures should also not be used to perform non-standard actions as this can lead to user confusion and complexity (IOS n.d.) Referring back to the UX honeycomb (2.1) and ease of use, this is something that can really define a user's experience with a service or product. The fact that a standard list of gestures exists, gives a lot of value to end users as they can learn and know what to expect from a touch device regardless of the OS or manufacturer.

4.1.1 IOS standard gestures

All of this information is taken from the Developer site (IOS n.d.) as it is the most current and updated information source.

- Tap – Activates a control or selects an item.
- Drag – Moves an element from side to side or drags an element across the screen.
- Flick – Scrolls or pans quickly.
- Swipe – When performed with one finger returns to the previous screen. Reveals a Delete button in a table-view row.
- Double Tap – Zooms in and centres content or an image, zooms out if already zoomed in.
- Pinch – Zooms in when pinching outward, zooms out when pinching inward.
- Three-finger pinch – Copies selected text when pinching inward, pastes copied text when pinching outward.
- Three-finger swipe – Initiates undo when swiping left, initiates redo when swiping right.
- Touch and hold – When performed in editable or selectable text, highlights the text under the fingertip and displays an edit menu.
- Rotate – Rotates an image or view.
- Shake – Initiates undo or redo.

In this list I would argue that shake is not a touch-based gesture rather it is a kinesthetic gesture (4.3). Animations are available for the gestures mentioned above for free online by visiting the reference (IOS n.d), as well as all other design best practices.

4.1.2 Android standard gestures

All of this information is taken from Material.io (Android n.d.) this again is to allow for the most up to date information. Android breaks the gestures into three categories Navigational, Action and Transform.

- Tap – Users can navigate to destinations by touching elements.
- Scroll & Pan – Users can slide surfaces vertically, horizontally or omnidirectionally to move continuously through content.
- Drag – Users can slide through surfaces to bring them in and out of view.
- Swipe – Users can move surfaces horizontally to navigate between peers, like tabs.
- Pinch – Users can scale surfaces to navigate between screens.
- Long-press – long presses reveal additional modes, features, but are not easily discoverable.
- Double-tap – Allows users to zoom into content, or toggle between zoom levels.
- Pinches – Allows users to zoom into and out of content along a gradient of zoom levels.
- Compound gestures – Users can fluidly transition between various gestures.
- Pick up and move – A long press and drag users to reorder content.

Android do a really good job on this page showing how these gestures should react when in use often by using a bad use case to show how not to implement the gestures. Animations are available for the gestures mentioned above for free online by visiting the reference (Android n.d), as well as all other design best practices.

4.1.3 Comparison of the OS

Picture 6 presents a standardized reference guide, the standard gestures from both systems follow this guideline to around 80% with only naming conventions

differing form the actual interaction. Tap, double tap, scroll and flick all used consistently within both systems. Long press and tap and hold are the same with the name being different and from what can be seen from the gestures, the other gestures are slightly different based on the design of the OS, with Apple using panes and Android using sectioned parts of the screen.

Both operating systems clearly think of the end user within their own ecosystem. Even though this standardized system does reflect design decisions the end result is still varied based on the OS architecture. iOS use of three finger gestures in the use of text and manipulating information, these are examples of non-natural gestures that do not reflect real world actions.

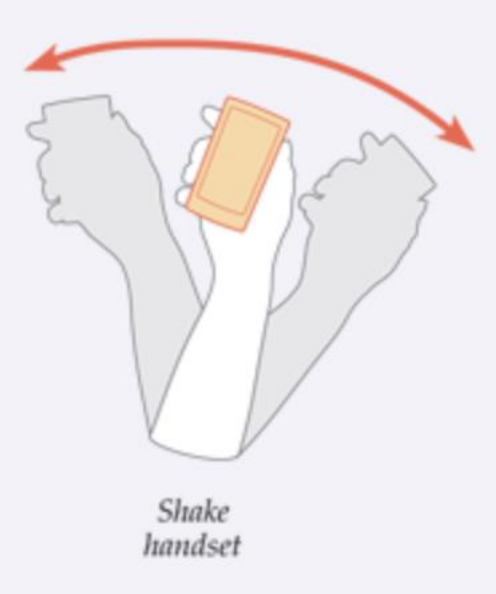
All gestures presented in both OS provide the end user with feedback whilst and after the interaction has occurred. Taking the pinch gesture from both operating systems as an example, the real time feedback can be seen when interacting with the device. Without feedback the user may believe the action never took place, leading to frustration and repetitive input attempts. The idea that a simple task should have a simple gesture is one way of creating a more intuitive and enjoyable experience (Krug 2014).

What this means in regard to the research question, is that a universal gesture system is forming with the use of standardization within the interaction design space. This is similar to western conventions on writing where writing from left to right top to bottom is normal.

4.2 Kinesthetic gestures

Kinesthetics is the ability to detect movement of the body; although usually applied in a self of self-awareness of your body, here it refers to the mobile device using sensors to detect and react to proximity, action, and orientation (Hoober & Berkman 2012). This subset of on-screen gestures is what allow the screen to react to the speed, movement and orientation of a mobile device.

The shake gesture mentioned in the IOS gesture list (4.1.1), is one of these gestures. It uses an accelerometer in the handset to detect the movement and react with the screen accordingly.



PICTURE 7. Shaking of handset (Hoober & Berkman 2012)

By shaking the device as seen in picture 7, IOS devices will activate the undo redo action as mentioned in (4.1.1). This type of gesture is also why when we rotate our devices whilst watching YouTube for example, the video should rotate to match the orientation of the screen. On some devices if you place the phone face down it will switch to meeting mode. These are also shared gesture patterns, but some devices do not have the correct hardware to support kinesthetic gestures.

4.3 The effect gestures have had on the small screen

The standard gestures explained in this thesis, have also changed the way information is presented to an end user. Before gestures, directional controls would have had to be placed on the screen to allow for directional navigation (Hoober & Berkman 2011). This would take up more space within the screen and would often clutter the design space. Gestures have allowed for information to be presented with clarity and accessibility in mind. Other interaction design materials such as buttons and tabs are now designed so that the touch area is large enough

for a tap gesture (WCAG 2018). These are not the only changes that have occurred, but this is a clearest example.

5 METHODS OF RESEARCH

The research strategy of this thesis is a survey. A survey is quantitative analysis in trying to figure out causal connections and frequency with the help of numbers (Koppa 2015a). A survey's purpose is to get a largish amount of people's answers to the survey questions and that will give a sample, which should present the universal opinions. (Koppa 2015b)

A survey was chosen for multiple reasons. The first of which is that of anonymity, in the survey no personal data other than age will be collected. This is to try and gather 'true' information, allowing respondents to answer how they want with no fear of prejudice. Using the survey as a strategy also allowed for people to answer remotely, without the need for face-to-face interviews, which is important to mention, since due Covid-19 crisis face-to-face interviews would not have been possible. The survey was conducted through Google Forms and questions were designed so that the answers will be quantitative. The survey allowed multiple questions to be asked in relation to different aspects of gestural interactions in a short amount of time. The survey was piloted couple of times before posting it to public. The aim before sending the inquiry was to get at least 25 replies. Research has shown that surveys should take 5 minutes or less to complete. Although 6-10 mins is acceptable, those longer than 11 minutes will likely result in a lower response rate (Fryrear 2015).

Validity and reliability were important aspects when designing the survey questions. In case the repliers do not understand the questions, the validity of the research will be weak. If the questions are understood differently depending from the replier, if the survey participants do not answer honestly or if the answer is mistakenly answered the reliability of the survey is weak. (Taanila 2019) Through piloting and opening the questions up a bit, it is hoped to avoid the validity and reliability issues.

The survey was designed to gather information on users' views on gestures, interaction habits and opinions. It consisted of 19 multiple choice questions that allowed for the respondents to respond quickly and easily. The questions were structured so, that the answers would provide information about end user's

knowledge of gestures within the mobile space as much as possible. The survey also collected information related to repliers' thoughts on learnability, usability and current knowledge of gestures. A conscious decision was made to not ask the respondents the question that this thesis is trying to answer. Instead opting for questions that allow for discussion to take place in regard to the given subject. During the piloting phase more detailed explanations were added below the questions to avoid the reliability issues. The intended goal is to present discussion based on the survey responses and the theoretical background, to make an informed assessment on the research question.

The survey was posted on multiple social media services; LinkedIn, Facebook and slack channel of software developers. This decision was made on the basis that through these three different channels there would be a possibility to get answers from multiple different backgrounds and from different fields of business. For example, the slack channel is one company's private channel for their personnel and there are many interaction designers working in this company. Facebook and LinkedIn were chosen to get more answers from people with business background and all over the world.

A disclaimer was produced to let the respondents know how the data was to be used. The survey was posted for 8 days, after that the survey was closed to responses. The reason eight days was chosen as the length of time, was to allow a full work week and two weekends to be covered in the time. A declining interest curve was also taken into account and best used the understanding that internet-based platforms are generally sorted by newest first so my posting would eventually fall out of view. After eight days 62 persons replied to the survey questions, which exceeded the estimation of replies.

See appendix 1 for full survey questions.

6 SURVEY FINDINGS

Because of declining interest curve the response return rate was affected in the last days of the survey being open. From the time of the initial posting within a couple of hours I had received 20 responses, the following days yielded another 40, with the last weekend only yielding 3 responses even with reposting for traction. In total 62 responses were gathered for the eight-day period in early April 2020. Based on the number of users that had access to my posts in all locations, a rough estimate of 600 people should have seen the posting meaning a survey response rate of about 10%. External surveys average a response rate of between 10-15% (Fryrear 2015). This would mean that even though 62 responses are not a huge amount it should be enough that the statistical confidence in the survey can be established.

6.1 General findings

It needs to be addressed that the first question gathering details on the respondents age will be considered a failure. The goal with this question was to be able to see if age has had an effect on adoption and usage rates. The online outlets used to distribute the survey didn't allow for a full spectrum of answers to be gathered.

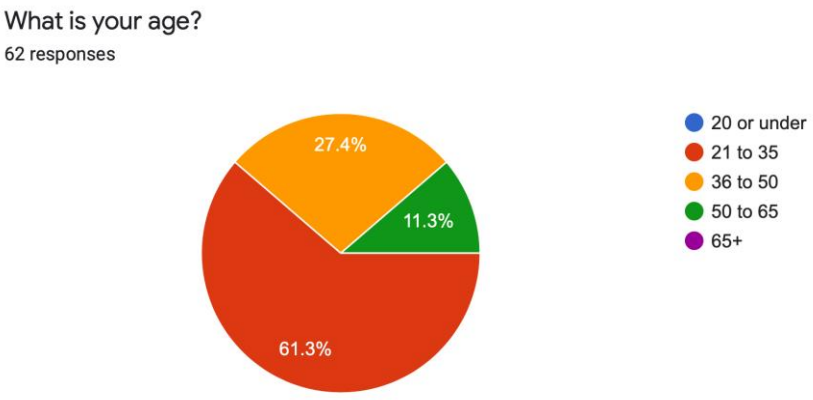


FIGURE 1. Age responses. (2020)

In figure 1, none of the respondents answered that they are 20 or under or 65+. This failure could have been avoided with more consideration on distributing the survey online. The online platforms mentioned in the beginning of chapter (5), are aimed at people within the working age group. If the survey was posted in other channels targeting the 20 or under and 65+ groups, this question could have been considered more of a success.

All respondents have had experience with interacting with gestures on mobile devices. In figure 2, this is highlighted with 98.4% of all respondents replying that gestures have been used when navigating on a phone. This is to be expected as the gesture as previously discussed in chapter (4), rose to prominence with the mass adaption of touch screen phones.

Figure 2 also highlights that even though gestures are used on all screen sizes, there seems to a bias for smaller screens that benefit from the fluid navigation gestures can provide. In chapter (4.2) the effect on small screens is discussed more.

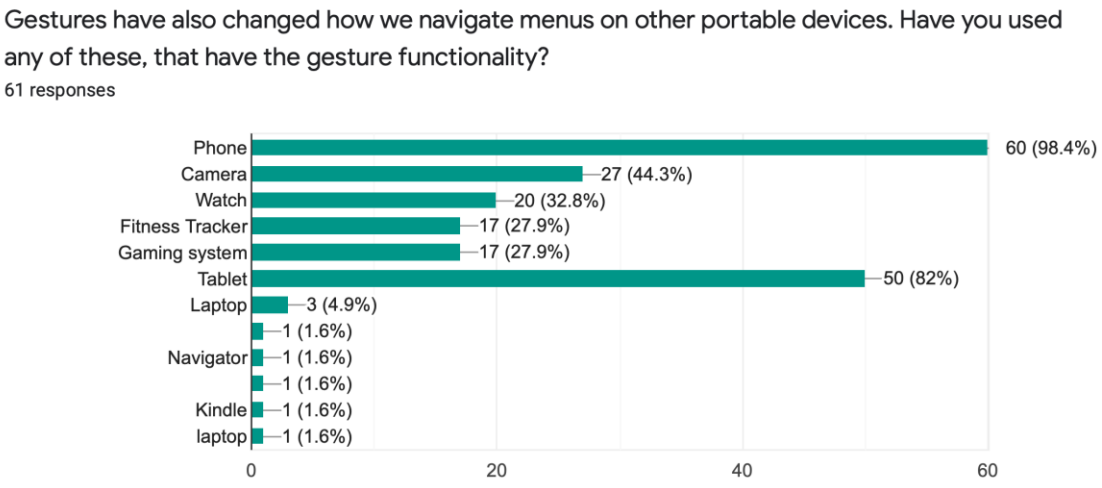


FIGURE 2. Portable devices that respondents have interacted with. (2020)

Figure 2 also represents touch screen devices becoming more and more used within daily life. Along with phones, watches, fitness trackers and tablets, (44.3%) of replies indicate that cameras using a touch screen are popular with respondents, this is an example how gesture-based interactions are becoming a standard

way of interacting with devices. This is also echoed with the responses that mention in-car navigation. Although not a mobile device in line with the other options, it does indicate a change from button-based interactions.

Most of the replies also indicated that as the number of devices that adapt touch screen technology increases, users are expected to own devices from different manufacturers and product lines. This is clearly indicated with (figure 3). With (95.2%) of those surveyed answering that they own touch screen devices from different manufacturers. Only 3 (4.8%) replies showing brand loyalty owning multiple devices from the same brand.

Figure 3 alone adds a lot to the argument for a universal design system as being able to use the same gesture set, when appropriate, on all devices would help with learnability and end user interaction.

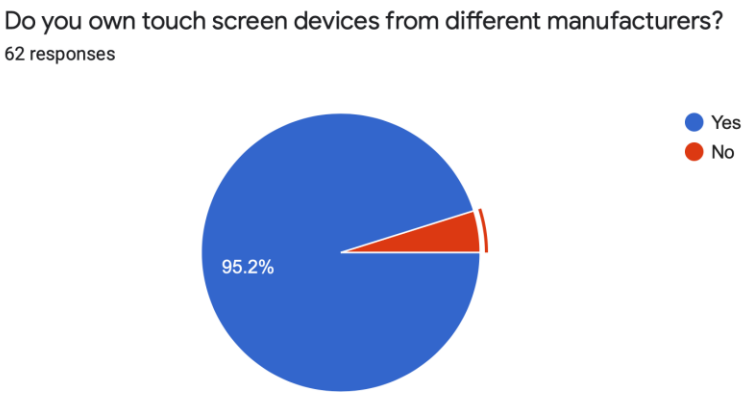


FIGURE 3. Device diversity. (2020)

Information on the number of devices was also gathered in order to understand just how many design systems could be present in a user's environment. Figure 4 indicates that of 61 responses, 48 (78.7%) replied that they own more than 1 device and less than 5. Excluding the one response of 10 devices and the empty data, the data presents an average of 3.1 devices per user. This could mean a total of 3 design systems per user have to learnt at any one time.

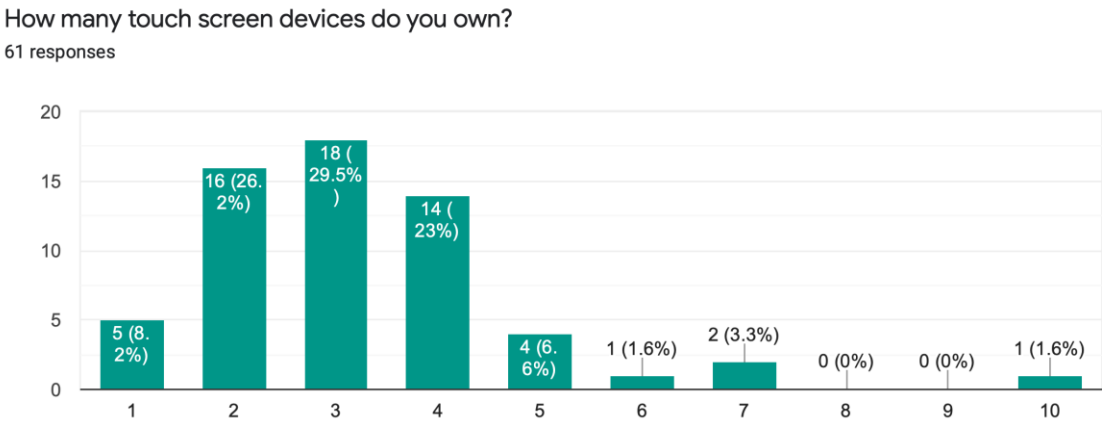


FIGURE 4. Number of devices. (2020)

This also allows us to read into the data presented that some of the screens presented in (figure 4) can be larger than mobile devices. The data presented in (figure 5) shows that most respondents have interacted with gestures to a multitude of screen sizes. Of course, this could be interpreted as simply a phone and tablet, the tablet often been seen as a larger touch screen. It could include in car navigation system some of which are quite large. The takeaway from this is that gestures are transitioning from mobile to other devices be it a camera or car, gestures are becoming expected within touch surfaces.

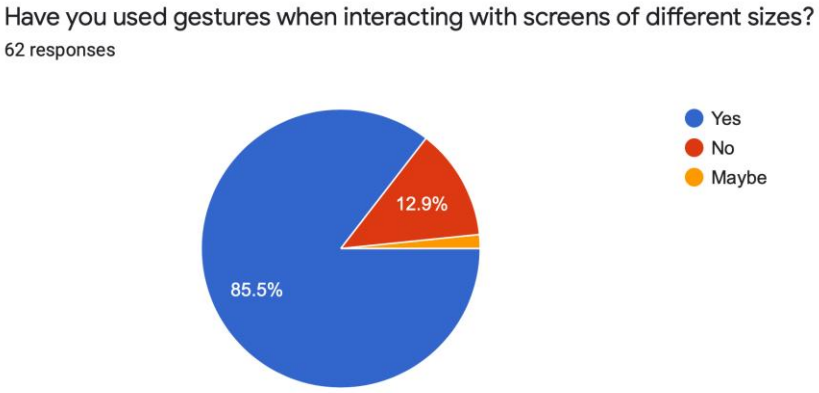


FIGURE 5. Different screen sizes. (2020)

6.2 Learnability findings

The survey produced a lot of data to support the idea that a lot of gestures have become intuitive. Moving from system 2 to system 1 processes (3.3.2). Although some newer devices are taking advantage of larger screens and more accurate response from user interaction. The data suggests that the standard gestures such as those presented earlier in the thesis (4.1) have indeed become standard, and that users expect these interactions to be present when using a device.

Most of the survey responses when asked if gestures are easy to learn (figure 6) responded with a score on a linear scale above the middle point. Only one user answered less than a 3 out of 5 with an answer of 2. This is with the scale that 1 is hard and 5 is easy. (57.4%) thought that gestures are easier than not to learn with a rating of 4 within the scale. Furthermore (29.5%) thought gestures are easy to learn with a score of 5.

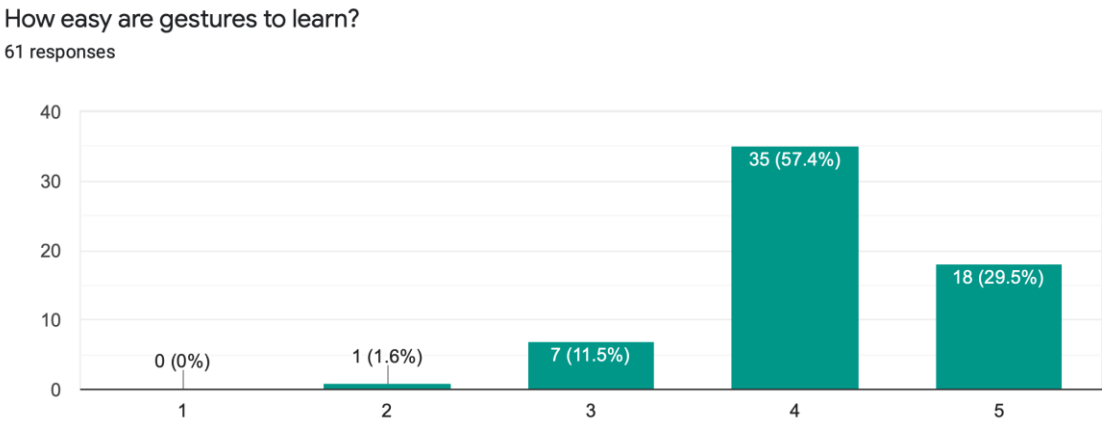


FIGURE 6. Responses based on how easy gestures are to learn. 1 being hard, 5 being easy. (2020)

The lopsided visual representation presented in figure 6, could be an indication of the systematic learning that has taken place throughout years, it could also indicate that interactions that involve gestural recognition have now been designed to be intuitive and accessible.

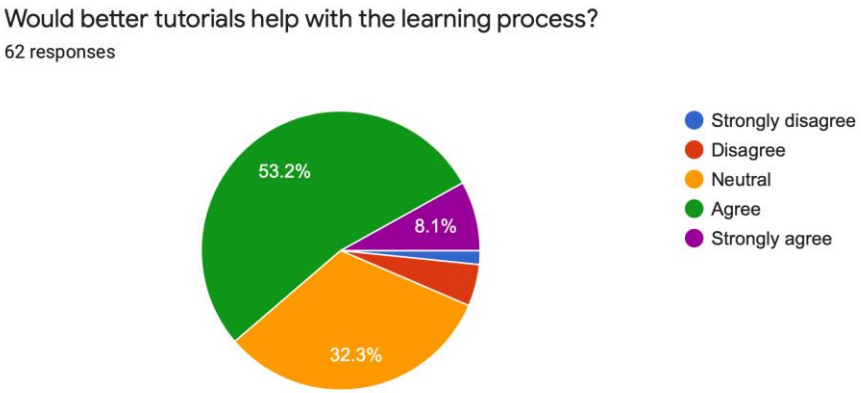


FIGURE 7. The role of tutorials in the learning process. (2020)

In figure 7, shows the role of tutorials in the learning process could be improved. This is an indication that newer interactions designed with more specific goals in mind may not be as intuitive, as that of standard gestures that should be not be used in non-standard interactions (4.1). This is subject to change as these newer gestures eventually go through the same learning curve users have been through in the creation of the standard gestures (4.1).

Of the respondents to this question presented in figure 7. 1 (1.6%) strongly disagreed that tutorials help with the learning process with a further 3 (4.8%) disagreeing. This can be analysed in three ways that they have achieved mastery and now find tutorials annoying or bothersome, or that gestures are a type of interaction that they find hard to use. Finally, that they think that the interactions should be designed to be intuitive and therefore should work as expected.

In the book, Thinking Fast and Slow, by Daniel Kahneman, the author presents the idea that when a user reaches a level of competence with a skill or subject it is at that point they realize they actually know very little on that skill or subject (Kahneman 2011). This methodology implies that most of the respondents are open to the idea of better tutorials to improve their own experience and knowledge of gesture usage. Seen in figure 7, (53.2%) agree that tutorials would help in the learning process with (8.1%) strongly agreeing. Interestingly (32.3%) 20 people when asked the question about tutorials neither agreed nor disagreed.

This is interesting as It proposes an issue within judging interactions. Is the purpose of good interaction design, that of the user being aware of the interaction, or simply being able to complete the task the interaction enables?

A final question answered in this learnability section was, has a user ever tried an interaction on a new device and it not worked as expected? (Figure 8). This question was to judge development of devices since the first mass market device was made available. Different interactions were tested, some failed some became what we use today. Chapter (4.1.3) presents the similarities that exist within operating systems and how this should only occur on either device specific gestures or gestures with specific applications.

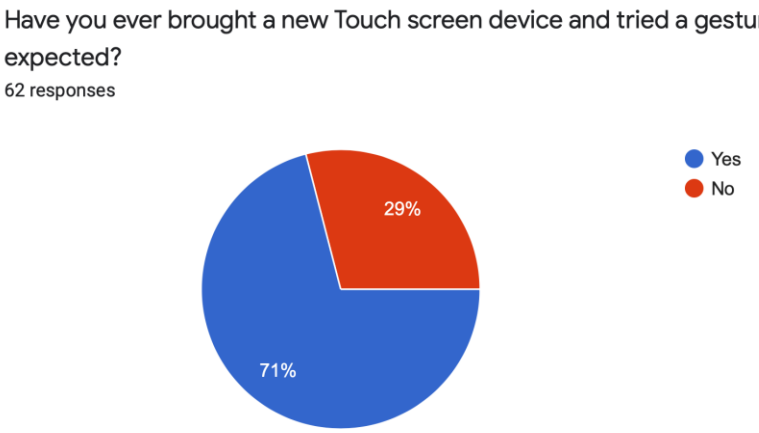


FIGURE 8. Expected gestures not working as expected. (2020)

A final thought within this topic of learnability findings would be that end users are willing to learn new gestures that may arise with technology pushing forward and with processes being refined. If standard gestures are used as a consistent benchmark for usage, then new gestures can be added over time to an end user's gestural memory bank.

6.3 Usability findings

Understanding in which context users use gestures and in what manner they would like gestures to be used, is crucial to using this data to assess desirability and if gestures are a benefit to the end user. Most respondents in the survey

answered that the gestures they use depend on the application (Figure 9.) with 50 out of 62 people (80.6%) answering yes to the question. This high amount of responses indicating that gestures are used only used within certain applications, may mean that gestures used in games and when browsing the web are taken into consideration when answering this question. The standard gestures such as tap, and scroll may not be seen as gestures anymore and that they have become so intuitive as to go un-noticed. Gestures that are less natural such as pinch and rotate used for example with a camera may also rise above standard gestures that a user no longer perceives.

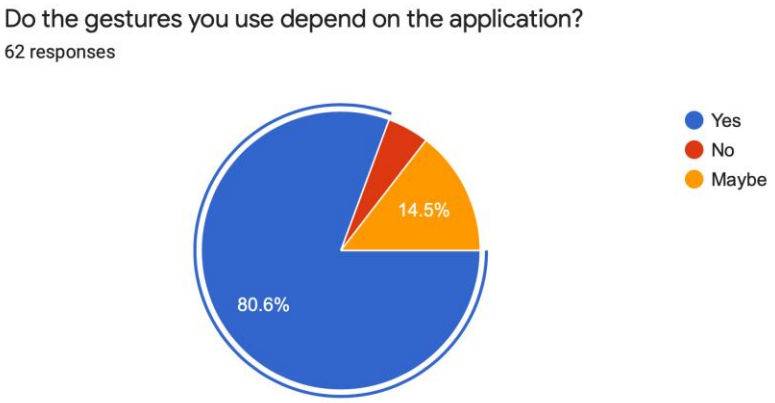


FIGURE 9. Users usage of gestures. (2020)

Within this section the question was posed about motion control in order to compare the user's intuitive responses to other questions and to create discussion on the use cases of for example Kinesthetic gestures (4.3).

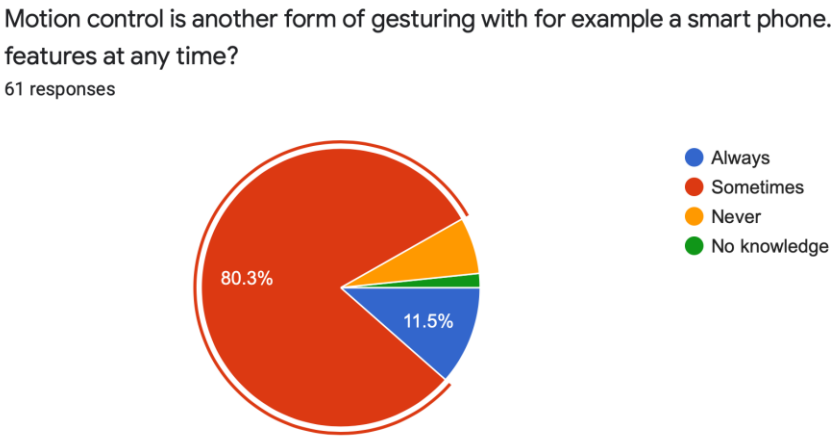


FIGURE 10. Motion control usage. (2020)

The data seen in figure 10, shows a difference in the way users interact with devices. As mentioned before (4.3) some devices do not support these kinds of gestures and therefore they are less ingrained in a user's library of known gestures. In the pie chart we can see that (80.3%) 49 people answered sometimes with the next largest data set being that of 'always' at (11.5%) 7 people. Interestingly in this data set 1 user (1.6%) said they had no knowledge of motion gestures and had never used one. This is relevant information as it shows that in the future motion-based gestures will need to be thought about if a universal design system is to be seriously thought about.

6.4 User's Perception

Understanding the view of gestures from the end user perspective is important in determining if there is even a need or want for a universal gestural design system. In this section the end user's knowledge of gestures is explored. With the first question, do you know how many gestures your phone can perform? (Figure 11).

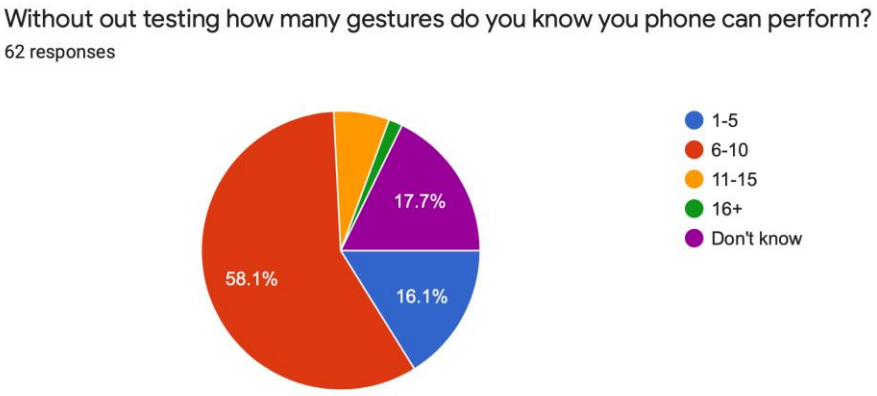


FIGURE 11. Users knowledge of gestures. (2020)

This question was placed in the survey in order to see if a user understands the different interactions that they are asked to perform when using a touch screen. There is no wrong answer here as of course people personal devices may vary wildly, the only way to see precise data would have been gather the make and model of all devices and that was not the point of the question. As we have seen (4.1.1, 4.1.2) both iOS and Android, have roughly 10 standard gestures used in most circumstances. In figure 11 we can see that 36 people (58.1.%) guessed correctly not counting the non-standard gestures that may exist on that phone's apps. The next largest data from this chart is that of 11 people (17.7%) just not knowing enough to answer the question with certainty, not due to a lack of knowledge. Understanding people use cases for the device is a varied as the functions you can now perform with a modern smart phone. If a user uses the phone purely as a telephone 1-5 gestures may be known. This is reflected in the 10 people (16.1%) that indeed answered 1-5. Understanding what the purpose of the device is, is crucial in designing the correct interactions.

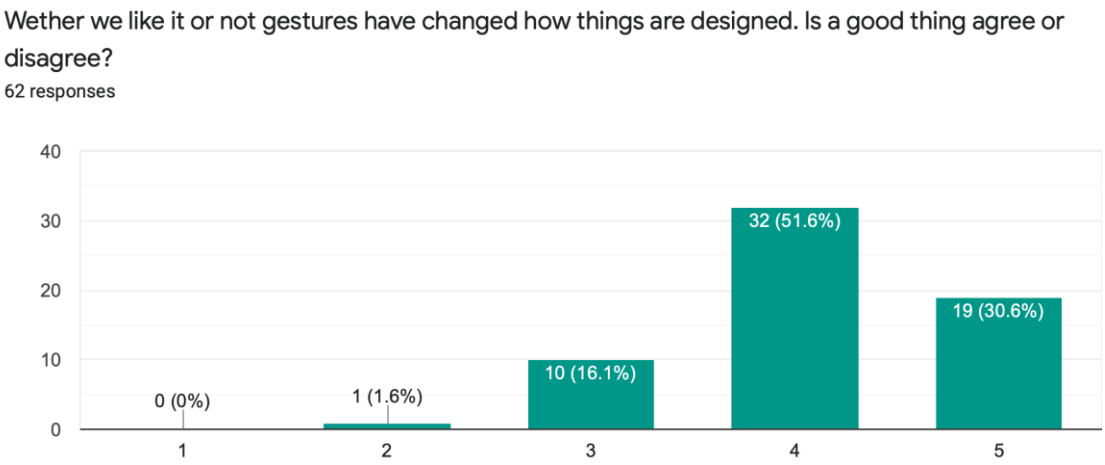


FIGURE 12. Users views on gestures changing the way things are designed. In this question 1 is disagree and 5 is agree. (2020)

In figure 12 it can be seen again that the people surveyed believe that gestures have indeed changed the way things are designed. Mostly believing that it is a good thing. With the two largest data groups being 32 (51.6%) giving a score of 4, and 19 (30.6%) scoring 5.

As with the other bar charts generally end users seem to be open to gestural navigation and interaction practices in general. With this in mind most users do think that most gestures make things easier (Figure 13). In figure 13 again, a pattern of mostly agreeing with the question can be seen. With 36 (59%) of people scoring 4 and 12 (19.4%) scoring 5. By comparing this chart to the others visually there is a tiny difference in the number of people that disagree. With 2 (3.3%) user disagreeing that gestures make things easier. This raises again understanding what the user wants to achieve and making that the focus of the interaction. If a user finds something hard, they will go elsewhere to complete that given task (2.2.1).

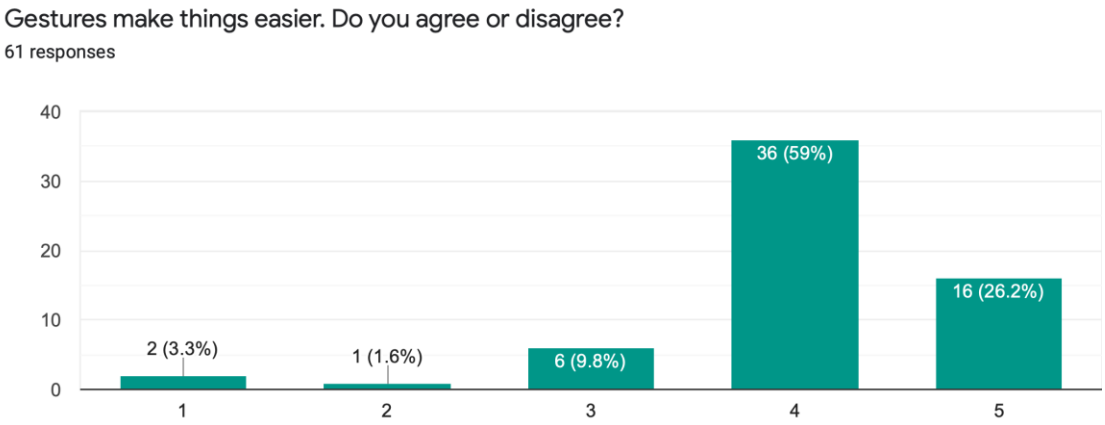


FIGURE 13. Do gestures make it easier to perform interactions? (2020)

When asked if users think that gestures allow for more interactions to be completed at once, respondents generally agreed that they do. Once again on a linear scale from agree to disagree 1-5, 28 (45.2%) selected 4, with a score of 3 being the second largest at 15 (24.2%). This shows that users are more unsure about the question, and that even though a positive approach can be seen its more reserved. This shows how often gestures go unnoticed, interactions that need a user to interact with should be simple and intuitive. By definition a gesture should be simple, by adding functions that can be performed at the same time the simplicity is diluted, this is bad based on the previous research (4). The full chart is shown below (Figure 14).

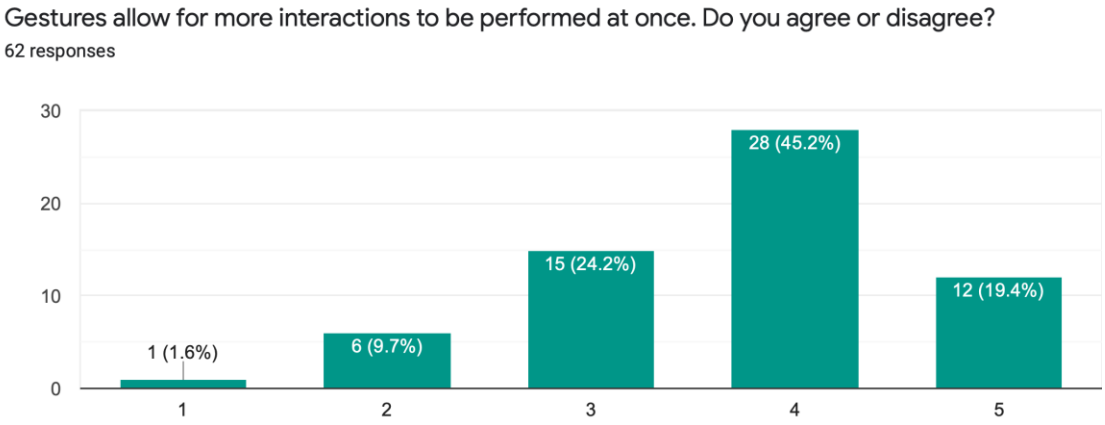


FIGURE 14. The amount of interactions performed at one time. (2020)

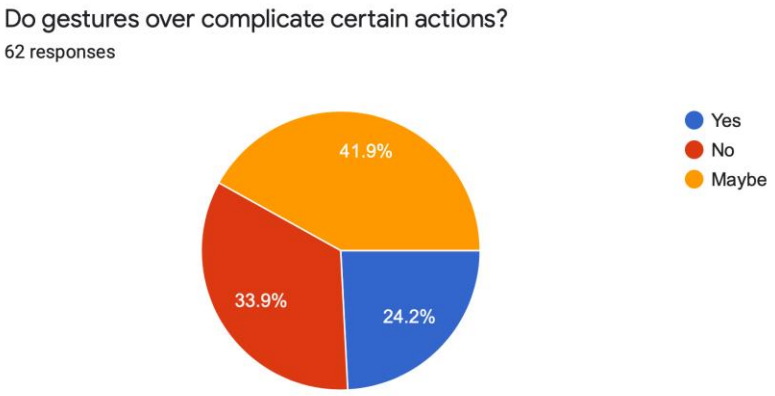


FIGURE 15. Do gestures over complicate certain actions?

Figure 15 was the first question to really divide responses. This could be due to the question being worded poorly, an example would have given respondents a better understanding of the question and therefore allowed them to answer with more certainty.

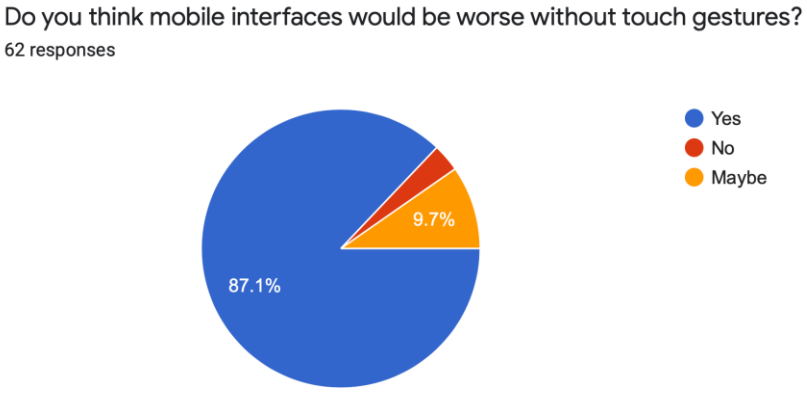


FIGURE 16. Would touch devices be worse without gestures?

The people surveyed were asked if mobile interfaces would suffer without touch gestures. Overall 54 (87.1%) of respondents answered yes. People do not want to be pressing buttons on a screen, this can be seen as an adaption to the touch interface. In a previous chapter (2.1) the idea of fun is introduced as a gesture allows for a more creative and fun way to interact.

Most users have used touch screens that are static with touch areas and Tap the only gesture used for example when using an ATM. These services that require precise interaction would not benefit from gestures but as phones get faster and input lag and touch sensitivity improves, gestures are becoming more accurate. In the near future these screens that once were designed to be fancy button blocks may adapt to use more gestures.

Finally, at the end of the survey respondents were asked if they were more intrigued about gestures and the possibilities they present (Figure 17).

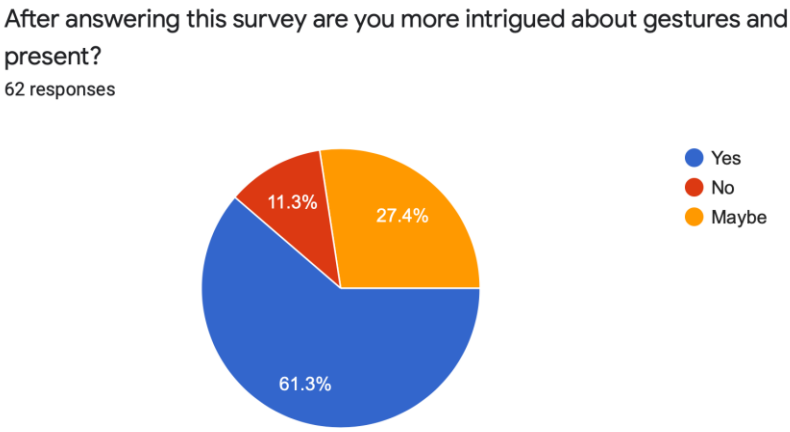


FIGURE 17. Users intrigue after the survey. (2020)

This was question that was used to see if discussing gestures did the participants, learn anything or gain interest. (61.3%) 38 stated that they were now more intrigued, with 17 (27.4%) responding maybe and finally 7 (11.3%) answering no. This response was a continuation of positive attitudes towards gestures within this survey, showing an overall interest from the end user.

7 DISCUSSION AND CONCLUSION

The aim of this thesis was establishing an argument for a universal gestural design system. By establishing what UX and UI practices can bring to the end user in terms of value, and then exploring the existing similarities that are present with the two major OS, a strong argument can be made that for the end user it would be hugely beneficial to have such a gestural system. The results from the survey indicated that users owned on average 3.1 devices and if a single design system was available, it would mean a more unified usage across all products and services. The most learnable gestures are the ones that are intuitive and based on real world experiences. Gestures allow us to connect with technology in a way that feels far more intuitive and natural.

In relation to the fact that the average number of devices a user owns is 3.1, currently means that they may need to learn three sets of gestures. An interesting fact is that over 61.3% wish to have better tutorials to help with the learning process, but at the same time the same people feel gestures are easy to learn. This dilemma could be solved with a universal system, as it would allow for a single gesture tutorial to be used across all devices. Most users have tried gestures on a new device that did not work as expected, with a universal system this problem would not occur.

Most users are not aware of all the available gestures their devices have, with improved tutorials and more consistency within gestural design, users would be able to interact with the devices more effectively and simply. This is backed up by idea that the best gestures are simple and intuitive to use. A single gesture system would also benefit the user with gestures becoming automatic to use. If devices adapted the universal gestural system, it would mean users would be able to use different operating systems proficiently. In relation to the UX honeycomb having one system would allow the usability to always be consistent, this would add value to the end user. As currently gesture systems differ, lots of user often find that some gesture over complicate certain actions.

A side effect of a universal gestural design would be the cost to the companies that own and develop mobile devices. It’s very unlikely that Apple and Android

would agree to a universal system as it would dilute the USP (Unique Selling point) and brand identity. As mentioned above if the end user doesn't have to learn new gestures when swapping between OS, this could lead to a lack of brand loyalty that companies do not want. There are many tech magazines and web-sites that exist to compare software and new devices, to give potential buyers the most information so that they can make an informed choice. Competition is not a bad thing as it often leads to innovation and refinement of systems (Krasny 2019).

A new system could definitely benefit smaller developers, but the Android system is already open source. Without going into patents and intellectual property rights there is too much for companies like Apple to lose in implementing a shared de-sign system.

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APPENDICES

Appendix 1. Survey questions

Mobile-Interaction design (Thesis) Survey

This is a survey to help understand people's knowledge of gestures with touch screen device.
The following survey will be used to present arguments within my thesis. No individual survey responses will be used and or shown within the thesis. The data gathered here is for the thesis only and will not be shared or sold. Emails from the survey will NOT be collected.
* Required
1.

What is your age? *
This is to determine if technological advances in a period of time influenced your experiences.
Mark only one oval.
[ ]20 or under
[ ]21 to 35
[ ]36 to 50
[ ]50 to 65
[ ]65+

2.

Have you ever considered yourself an early adopter to new technologies? This could mean you changed or upgraded a certain device based on any new technological advancements. e.g. New phone (Touch screen etc.)
Mark only one oval.
[ ]Yes
[ ]No
[ ]Maybe

3.

Do you own touch screen devices from different manufacturers?
Or devices that use touch screen technology
Mark only one oval.
[ ]Yes
[ ]No

4.

How many touch screen devices do you own?
Mark only one oval.
[ ]1
[ ]2
[ ]3
[ ]4
[ ]5
[ ]6
[ ]7
[ ]8
[ ]9
[ ]10

5.

How easy are gestures to learn?
A gesture can be as simple as a tap, swipe, or pinch to zoom on any touch screen
Mark only one oval.
Hard
[ ]1
[ ]2
[ ]3
[ ]4
[ ]5
Easy

6.

Would better tutorials help with the learning process?
Mark only one oval.
[] Strongly disagree
[] Disagree
[] Neutral
[] Agree
[] Strongly agree

7.

Have you used gestures when interacting with screens of different sizes? Television, Laptop, Tablet etc
Mark only one oval.
[ ]Yes
[ ]No
[ ]Maybe

8.

Do the gestures you use depend on the application?
Social media, gaming, browsing the web, camera controls etc
Mark only one oval.
[ ]Yes
[ ]No
[ ]Maybe

9.

Have you ever brought a new Touch screen device and tried a gesture that didn't work as you expected?
Mark only one oval.
[ ]Yes
[ ]No

10.

Do you think mobile interfaces would be worse without touch gestures?
So motions like swiping scrolling and pinch zoom etc
Mark only one oval.
[ ]Yes
[ ]No
[ ]Maybe

11.

Without out testing how many gestures do you know you phone can perform?
Mark only one oval.
[ ]1-5
[ ]6-10
[ ]11-15
[ ]16+
[ ]Don't know

12.

Gestures have also changed how we navigate menus on other portable devices. Have you used any of these, that have the gesture functionality?
Check all that apply.
[] Phone
[] Camera
[] Watch
[] Fitness Tracker
[] Gaming system
[ ]Tablet
[ ]Other:

13.

Motion control is another form of gesturing with for example a smart phone. Have you used these features at any time?
Turn to rotate video, tilt scrolling for websites, Moving the phone to your ear to pick up a call.
Mark only one oval.
[ ]Always
[ ]Sometimes
[ ]Never
[ ]No knowledge

14.

Are there any devices or services you think would benefit from gesture integration?
Mark only one oval.
[ ]Yes
[ ]No
[ ]Unsure

15.

Whether we like it or not gestures have changed how things are designed. Is a good thing agree or disagree?
Mark only one oval.
Disagree
[ ]1
[ ]2
[ ]3
[ ]4
[ ]5
Agree

16.

Gestures allow for more interactions to be performed at once. Do you agree or disagree?
Mark only one oval.
Disagree
[ ]1
[ ]2
[ ]3
[ ]4
[ ]5
Agree

17.

Gestures make things easier. Do you agree or disagree?
Mark only one oval.
Disagree
[ ]1
[ ]2
[ ]3
[ ]4
[ ]5
Agree

18.

Do gestures over complicate certain actions?
Mark only one oval.
[ ]Yes
[ ]No
[ ]Maybe

19.

After answering this survey are you more intrigued about gestures and the possibilities they present?
Mark only one oval.
[ ]Yes
[ ]No
[ ]Maybe