OAMK
OULUN AMMATTIKORKEAKOULU

Jenna Kemilä

COMMUNICATION WITH MOTION IN USER INTERFACE

Jenna Kemilä

COMMUNICATION WITH MOTION IN USER INTERFACE

ABSTRACT

Oulu University of Applied Sciences

Degree programme of Media and Communication, Visual communication

Author:	Jenna Kemilä
Title of thesis:	Communication with motion in user interface
Supervisor(s):	Tuukka Uusitalo
Term and year when the thesis was submitted:	October 2016
Number of pages:	37

Abstract:

Motion communication makes better user experiences. Animations in user interfaces are not just a visual experience. Motion has a lot of power over where the user is looking and it should be used to guide the user. This thesis is for graphic designers or anyone who wants to understand the user and therefore make better design and communication. This thesis includes topics like human computer interaction, user psychology, user experience and animation that form the basis of motion communication. The last chapter shows examples of how to use motion communication in the user interface.

Keywords: Animation, communication, user interface, user experience, motion, computer

TIIVISTELMÄ

Oulun ammattikorkeakoulu

Viestinnän koulutusohjelma, Kuvallinen viestintä

Tekijä:	Jenna Kemilä
Opinnäytetyön nimi:	Communication with motion in user interface
Työn ohjaaja:	Tuukka Uusitalo
Työn valmistumiskuukausi- ja vuosi:	Lokakuu 2016
Sivumäärä:	37

Tiivistelmä:

Liikkeellä kommunikointi parantaa käyttäjäkokemusta. Käyttöliittymässä olevat animaatiot eivät ole vain visuaalinen kokemus. Liikkeellä on ennen kaikkea suuri vaikutus siihen, mihin käyttäjä kiinnittää huomiota. Liikkeen tarkoitus on ohjata käyttäjää käyttöliittymissä. Tämä tutkielma on suunnattu graafisen alan suunnittelijoille tai niille, jotka haluavat ymmärtää paremmin käyttäjää ja lisäksi samalla tehdä parempia kommunikaatioratkaisuja. Tämän tutkielman sisältöön kuuluvat myös ihmisen ja koneen välinen kommunikointi, käyttäjäpsykologia, käyttäjäkokemus sekä animaatio. Nämä aiheet ovat liikekommunikaation pohja-aineistoa. Viimeinen kappale sisältää esimerkkejä siitä, kuinka liikkeellä kommunikointi tapahtuu käyttöliittymässä.

Asiasanat:	Animaatio, kommunikaatio, käyttöliittymä, käyttökokemus, liike, tietokone

TABLE OF CONTENTS

ABSTRACT

TIIVISTELMÄ

TABLE OF CONTENTS

1   INTRODUCTION

Using motion in interfaces makes better user experiences. Motion is not only just a visual element, it is very powerful communication tool. With motion, designers can create visually beautiful effects but also smart interactions. Motion catches the user's attention easily because humans naturally look at things that move.

User interface is the communication tool between a person and a computer. Computer can mean any human operated machine, but this thesis it is about mobile interfaces and smart phones. Interfaces translate technical language to more user friendly language making communication feel as natural as talking to another person. Bad communication leads to frustration and bad experience. The job of the user interface is simply to guide the user to finish their task. The task can be a simple one like reading email.

Animations make the interface feel more natural and responsive. If the interface reacts to the user's every touch, it makes the user feel that they are not just tapping a piece of glass, but really interacting with the elements. When the user uses the product seamlessly they will get a feeling of flow while using it. The role of animation is to fill the gaps between the actions the user takes and, therefore, make the interaction more seamless.

2   HUMAN COMPUTER INTERACTION

2.1   Communication with a computer

To be able to design interfaces for humans we have to understand our limitations and abilities. Designers have to understand how communication between the user and a computer works. The need of user psychology in user interface design is crucial. Humans are not computers, and to be able to design for humans, designers have to understand what the user feels, thinks or what actions they will take. (Dix et al 2003, 70-73.)

Design is creating non-random effect for the user to solve a problem. It makes users purposely feel, think and do stuff. Understanding all the factors that might affect how a user behaves physically and psychologically is part of user interface design. (Marsh, 2014.)

Human-Computer interaction is communication between a human and a computer. It studies the user's psychological and physiological aspects, computer science and design, basically the communication between the user and the computer. User interface is the communication tool between the user and the computer. The user can mean multiple users, not just a single user on their home desktop or mobile device. The computer can mean software or hardware or a combination of that, devices like scales at your grocery shop, microwave, ATM or smartphone. (Dix et al 2003, 70-73.)

Our senses convey information about our surroundings. The information is passed to our brains where it is interpreted and built to sensory images. Humans have five major senses; sight, hearing, touch, taste and smell. All these senses together build our overall view of the world. Taste and smell don't have a big role in interaction with computers. When using computers, information is primarily received by sight but also by ear. Sounds draw our attention, for example when making an error the computer beeps or just hearing the keys when typing. The role of touch is feeling the keys moving or the phone vibrating. They are good ways to give user feedback from what they have done and make the user interface feel more responsive. There is no manual for how people operate. Every person is an individual. Humans are driven by emotions, and that makes designing interfaces for humans hard. Our capability to process information is limited. In that process, we use memory and our senses. Understanding how humans behave and the basic human nature helps to anticipate some of the behaviors and start the design based on them. (Dix et al 2003, 70-73.)

Humans interact with the outside world by sending information and received it with our output and input channels. By using hands by hitting the keys, moving a mouse or tapping the smartphones, the user sends information to the computer. When the user interacts with the computer, he receives information that is output by the computer and the user's output becomes the computer's input and vice versa. The senses are human's main input and motor controls are main output. (Dix et al 2003, 13.)

The user operates the computer through the user interface (UI). User interface is the communication between user and the computer. The computer can't work without the user. Computers are made to make our lives easier in many ways, but they only work if designed properly. Poorly designed user interface can lead to misunderstandings, user's frustration and worst-case scenario accidents. The reason for misunderstandings might be that the user doesn't understand the interface or communication is not clear. User interface can be both hardware and software. Hardware means all the physical buttons or for example, the mouse. If computers are made for humans, the communication between a human and a computer should feel as fluent as talking to another person. You might communicate with computers and not even notice it. Even cars nowadays can have software, and they run on code. A user rarely pays any attention to the user interface design, often only when they bump into an error. It is harder to spot good design, because it feels natural to use. (Norman 1988; Saariluoma 2004, 15; Dix et al 2003, 3-4.)

In 2007, the 1st generation of *iPhone* was released. Back then all the smartphones had hardware keys in them. *Apple* removed most of the hardware and replaced it with a bigger screen. The new design and technology made it possible to replace hardware with software. Software is easier to update so the product's lifespan can be longer and design possibilities are unlimited. (Jobs 2007.)

Designing for humans involves the cycle of designing, prototyping and evaluation of the interface. Prototyping is fast, cheap and a crucial part of user interface design and it can be just wireframe paper models. The design needs to be prepared in theory before developers start building the software. It is cheaper and faster to test the product while it is still a paper model. An important rule is to fail fast and learn from it. Wireframe models are very easy to change if needed and to test immediately. Prototyping is the way to understand your users and their needs. Sometimes it is hard to put yourself in user's position. For designers, the interface is very familiar, but not for the user who sees it for the first time. Everything makes sense to the designer, because they built it and have been working on it for a long time. (Dix et al. 2003, 195-201.)
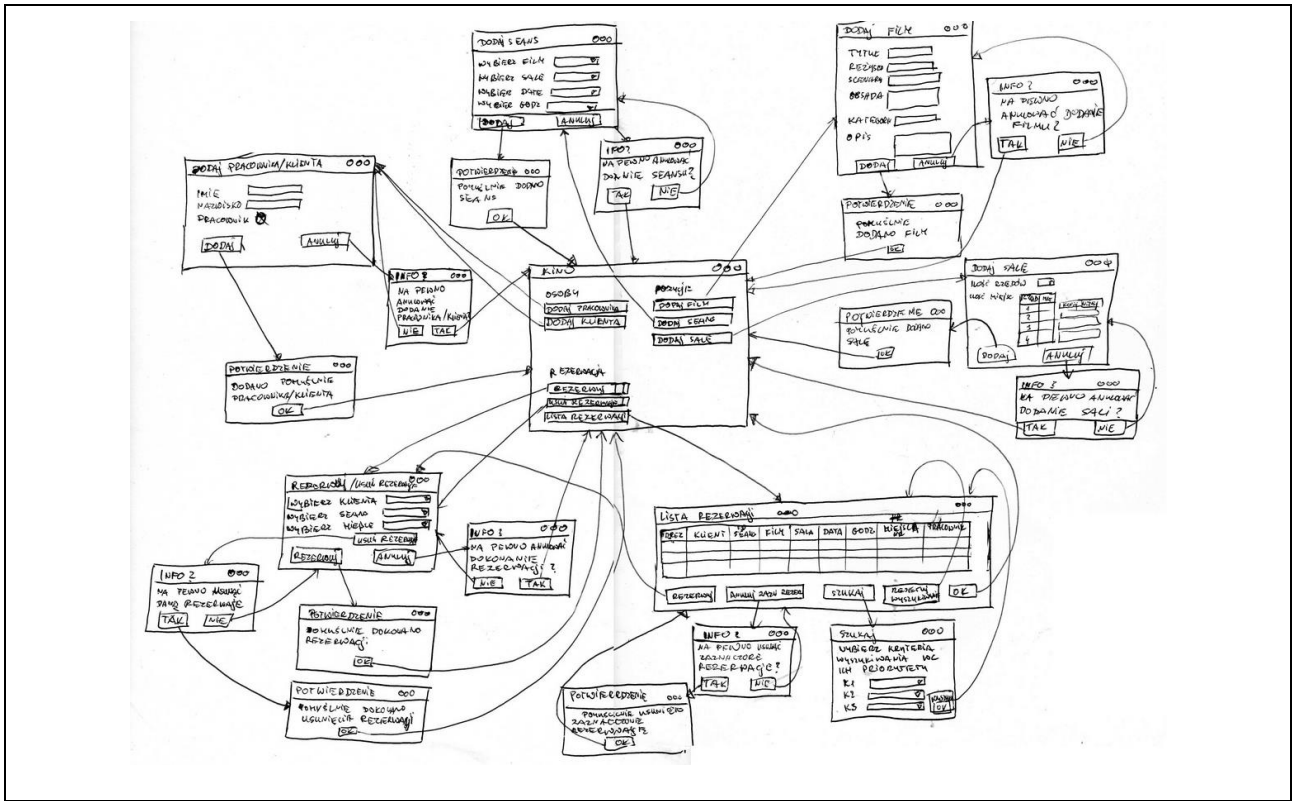
Figure 1. Example of wireframe design 2016 Reference: http://zasoby.open.agh.edu.pl/~12skbilski/indexad5b.html?tag=ui-flow

Figure 2. Example of paper prototype 2016. Figure 2. Reference: Example of paper prototype. https://madebymany.com/blog/the-alphabet-porridge-idea

2.2   Usability psychology

Humans react with emotions and feelings. Moods have huge impact on how we behave. Our emotions and moods change all the time and they have an impact on our problem-solving, thinking, perceiving, how we memorize things and how effective we are. Emotions can be categorized under positive and negative categories. Any feeling that has a positive impact falls under the positive category and any negative impact falls under the negative category. A positive feeling has a positive effect on a human. We operate better if we feel positive. Humans feel more creative and find better solutions for problems when they feel good. Humans do not think only in this moment, here and now, we think in time. We can plan and anticipate the future and remember the past. Our past experiences affect how we see the future and live in this moment. Time affects our mood. If we want or expect something, but we can't get it, that will make us frustrated or maybe even mad towards whatever is stopping us. There are two types of feelings: motivation and emotion. Motivation is what we want, and emotion is want we feel. (Sinkkonen et al. 2006, 250-256; Marsh 2014.)

The user needs to have a goal to use the product. The goal can be simple, like reading the email. The user needs motivation to reach this goal. Motivations are psychological or physical needs. The user can be aware or unaware of being motivated so motivation can be a conscious or subconscious experience. Motivation is easy to lose but also easy to gain. In user interface designers should try to keep users motivated. (Sinkkonen et al 2006, 263-268; Marsh 2014.)

To process information, humans need memory. Making plans and further developing them is only possible because of memory. Human memory can be divided into three parts; sensory register, short-term memory and long-term memory. Sensory memory just registers all the information and forgets it in a couple of seconds. Short-term memory, also called working memory, is where the information can be stored up to 30 seconds and afterwards the information is either forgotten or stored (for days to years) in the long-term memory. The information can disappear or be forgotten in any stage. Forgetting information is very important to be able to function effectively. Forgetting is seen as a negative thing but if humans could store all information, they would live in information chaos. It would be really hard to categorize information, connect it together and learn. Forgetting is one of the most important parts of remembering. Memory enables us to learn. The information has to be processed and understood in the working memory so that it can be stored in the long-term memory, so it can be used later if necessary. Repeating the information and connecting it to already learned information will make remembering easier. Putting information in categories helps to connect it together and understand it better. Categorizing and connecting information is called *schema*. Schema doesn't hold details of the subject but more like concept descriptions of it. It also holds supposition of the subject and the relationship with other subjects. The schema is wireframing information in our minds. The content of the schema depends on the individual. (Sinkkonen et al 2006, 167-170.)

Learning is storing information in the memory. It is a process where the learner forms a mental model or an idea of a skill, and can use and apply it to a new situation or practice the skill as long as they can repeat the action purely. Learning for humans is a feature that doesn't disappear in any point of active life. (Sinkkonen et al 2006, 227-229.)

In order to use the product, a user has to perceive all the elements in the user interface that are essential for the task. The user has to be able to follow how their actions have an impact on the user interface. If the user doesn't notice essential parts to finish the task in the interface, either something else is taking the user's attention or the user perceives it wrong. Perceiving is not just sensing, it's not enough that the essential parts are in the user interface, but the user has to be able to recognize them and perceives them as something before they can use the information.

Humans use their preconception to decode what they see and hear. Previous experiences, learned information, prejudices and moods affect how people decode. Perception is also comparing what the user senses and what they expect to sense. A person can't notice everything in the user interface. Designers can't see the interface like the new user does. Understanding the user is the most important part when it comes to designing interfaces. When the user is looking at the product, the past experiences affect how and why he sees and understands the way he does. A human's ability to recognize familiar shapes and characters is very accurate and active. The ability to identify shapes for humans is fast if the shapes have purpose. If the user has past experiences with menu bars, they know what the menu bar is. They also know to look for information where the menu bar is and they expect to find information and navigate through it. (Sinkkonen et al 2006, 67-69.)

Using familiar symbols speeds up the user's learning process. When most of the products have similar symbol language, it is more pleasant for the user. They don't have to learn the whole product again, they can just start using it. A user will also feel smarter because they remember and recognize the symbol. Certain symbols and shapes have become standard in mobile user interfaces. The burger (or three lines) symbol for menu has become a standard. This symbol needed to be introduced, and the users had to slowly learn this new symbol. Now these three lines present the menu and no matter what application or website you open, you will see this symbol. In figure 3 we see an application in three different stages; in years 2008, 2009 and 2010, but also the evolution of the menu symbol (figure 4). This symbol becomes simpler due to limited space in mobile interfaces and visual clarity. The way this symbol got so popular and became the new standard is simply because users learned the meaning of this symbol and it is visually pleasing. Alone and without introduction the burger symbol did not really tell anything, but in the right place in the interface, it is recognizable as a menu bar symbol. (Zumbrunnen 2015, Jensen 2013.)

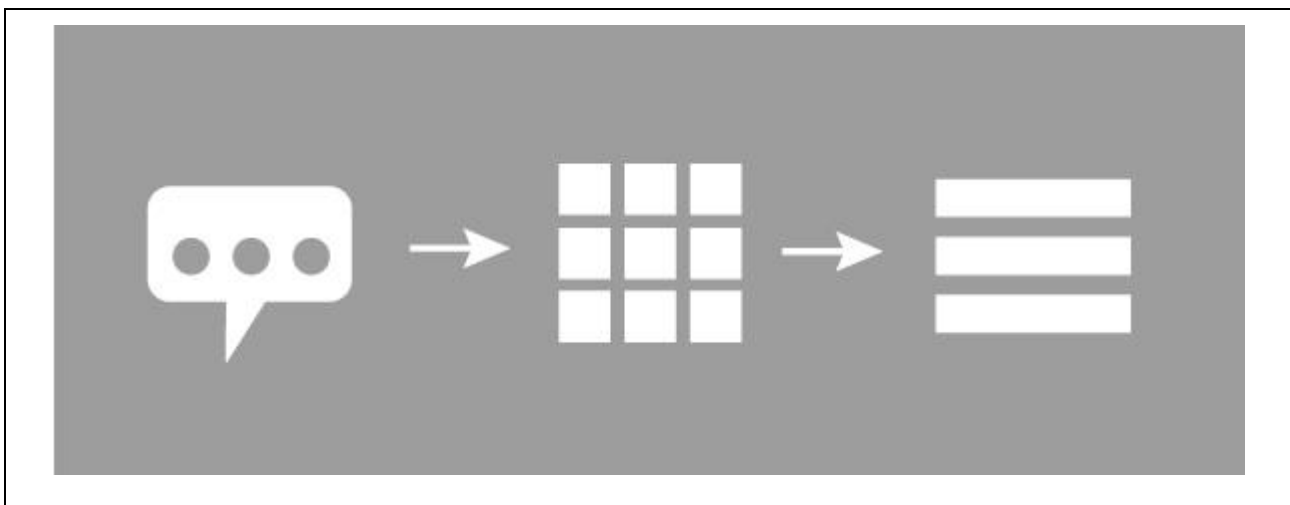Figure 3. Mobile application in years 2008, 2009 and 2010. Reference: http://moovweb.com/blog/hamburger-menu-handy-tool-or-useless-icon

Figure 4. Close-up of the evolution of menu button. Kemilä, 2016.

2.3   Influence of culture

Culture is all human heritage that is not biological. Humans' behavior is tied to culture and biological inheritance. Biological features like memory structure and color vision are very similar with every human, but features like content of a memory and color perception are culturally defined. For example, color symbolism is different in different cultures. In Western cultures white is the color of peace, doctors, brides, angel, purity and

cleanliness, but in Eastern cultures it means death, mourning, sadness and funerals. Biological inheritance is standard for an individual. The individual gets their genes at once and they won't change during their lifetime. The genetics slowly change over generations by natural selection. Cultural heritage is only possible to learn slowly. In the modern world, Culture changes drastically even during a lifetime of the individual. (Sinkkonen et al 2006, 37.)

Humans are able to storage large amounts of cultural traditions and features and pass them to the next generations. The reason why mankind is so advanced is that we pass cultural and social information and experiences to next generations. This information passes through education, language and parents as well as society, culture and habits. We learn culture by using tools that are part of our culture and social interaction. Every human has memory components and schemas, but the content of them depends on the culture. These experiences and schemas make every individual react differently and see things from a different point of view. It is based on the individual's memory, beliefs, skills and, of course, culture. (Sinkkonen et al 2006, 38.)

Cultural differences are not just limited to different cities or countries, but cultural differences are also found inside the same culture. These subcultures can be social stratum, taste of music or neighborhoods. Culture is not tied to a city or a country anymore. Because of social media and the internet these cultures are shared around the world. (Sinkkonen et al 2006, 42.)

Generations also differ culturally from each other. New generations learns from the old generation's experiences but also from their own experiences. Stereotypically young people learn how to use technology but old people do not. Age doesn't affect how humans learn, but in which cultural generation you were born in and an individual's personal experiences and schemas do. (Sinkkonen et al 2006, 40-41.)

There is a lot of variation in culture. Not all cultural elements vary or change, some are relatively constant. Languages and laws don't vary, but, for example, fashion varies very often, it is never finished. Even though fashion is continually changing, it has a big role in shaping the culture. For example, now simple flat design is very popular and fashionable, but before that realistic and complex was fashionable. Some standards won't change, for example in 2016 we still know that blue underlined text is a hyperlink. (Sinkkonen et al 2006, 42.)

Sometimes breaking the standard is good. In terms of usability standards, standards are not always the best choice. If, for example, the standard was less distinctive and the non-standard one was more distinctive, using the standard would freeze the usability development. The standard can also break the harmony of the whole product in graphical terms. Sometimes the reason for breaking the norm is just fashion and being trendy. (Sinkkonen et al 2006, 43.)

How do you know when to break the standards and when not to? The service or the product should be the one changing and everything else should be as standard as possible. The meaning and purpose of the product is defined by users. If the purpose of a website is to deliver news, the user interface and graphics should support that. A good example of standards is navigation. Navigation is a very important part of user interface. It is not a part of the product most of the time, but a way to the product. Navigation is built only with usability in mind. (Sinkkonen et al 2006, 46.)

3   ANIMATION

Animation is still images that, when changed fast enough, produce the optical illusion of appearing as a single moving image in the human mind. This phenomenon is called persistence of vision. These successive images have to reach the same speed at which our brain processes the present to create the illusion of motion. The standard speed is 24 fps (frames per second) in which the images are changing fast enough so that they appear moving smoothly. For animation, it is more important what happens between each frame than what exists on each frame. In order for an object to appear in motion, it has to change positions over time. If the position doesn't change when time passes, the object appears to be still. The way to create the illusion of life is to manipulate the speed and amount of change between the frames. (TED Ed, 2013.)

Timing and spacing are the key principles for creating animations. Timing means the speed or tempo at which an action takes place. The speed can be determined by how many pictures or frames it takes to happen. The more frames an action takes to happen, the more screen time it requires and the slower the action is. Naturally, then, less frames equals less screen time and faster action. The timing of an action has to match the context of the scene and what the animation is trying to communicate. It can give characteristic differences and can communicate the personality and nature of an animation. Physical properties of the object or character are the reason why they behave the way they do. How momentum and gravity make the objects and characters behave is defined by their physical properties. (Becker 2015; Johnston et al 1995, 61; TED Ed, 2014.)
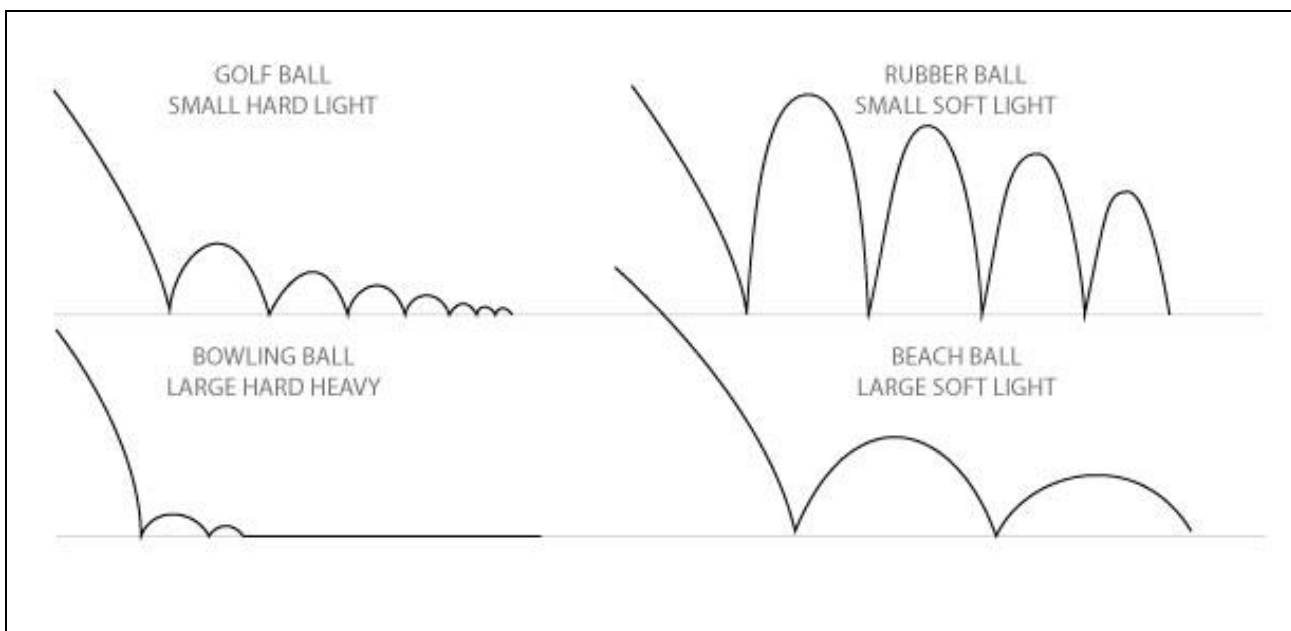

Figure 5. Balls with different physical properties. Kemilä, 2016.

A bouncing ball is a good example to study these physical forces (Figure 5). Balls with different physical properties will behave very differently according to their properties. Each ball takes a different amount of time to do

the action and they have different rhythms. The rhythm of the ball comes from every time the ball hits the floor and the time between each hit. This rhythm and time tells us something about the ball.
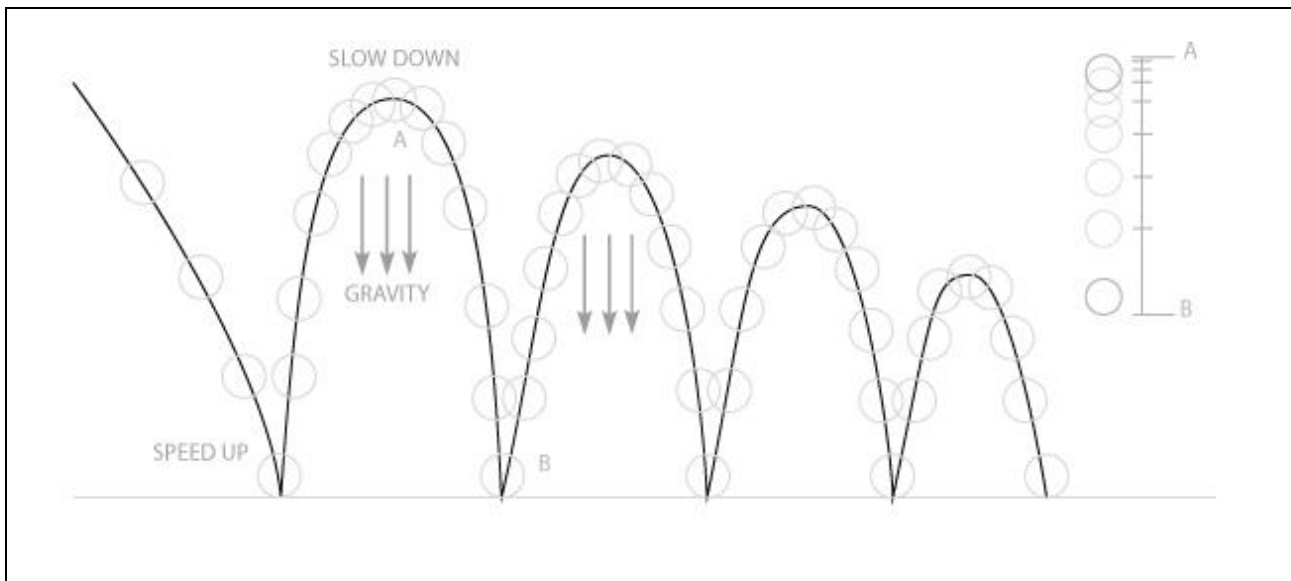

Figure 6. Mass and gravity create the objects rhythm. Kemilä, 2016.

Here is an example of spacing (Figure 6). When the ball is on the highest point (A) it will eventually be overcome by gravity. This point is also the slowest and, therefore, it has more frames. When the gravity pulls the ball back to the floor, it speeds up so that the frames are further apart and the action appears faster (B) (TED Ed, 2014.)

Disney animators Ollie Johnston and Frank Thomas wrote a book called "*Illusion of life"* about animation. The book presented twelve different animation principles. With these principles, they created animations that felt alive and not just moving images. The animators who worked at Disney at that time basically created animation the way we know it nowadays. Disney and other animators still use these principles. This thesis is going to go through the principles that are convenient in user interface animation. The three principles of pose to pose, appeal and solid drawings are left out as they are more actual animation principles that don't really apply to user interface animation.

Disney animation principles are a great example for animators, but when animating user interface designers have to keep in mind the product's professional level. Back in the day, Disney was all about rubbery looking animated characters that could stretch and bend infinitely. There is a time for using these kinds of animations. Fully following the Disney principles could works if the interface is targeted for kids. (Johnston et al 1995, 47-49; Zumbrunnen 2015.)

Time and spacing are not always enough to tell what the physical properties of an object are. Animating an object by adding squash and stretch tells about the object's mass and weight. The squash and stretch tech-

nique is not just adding mass and weight, but also speed and momentum for the object. The way this principle works is that if the ball is flexible or soft enough when it hits the floor or is in fast motion, the ball will squash and stretch. The ball will squash and stretch so that the mass and the size of an object stay the same, only the shape will shift. Squash and stretch can also be used on characters to, for example, express surprise or other expressions or character's preparation for a jump. This principle should only be used on objects that are flexible and soft. A bowling ball can't squash and stretch, like the ball in Figure 7. (Becker 2015; Johnston et al 1995, 47-49.)
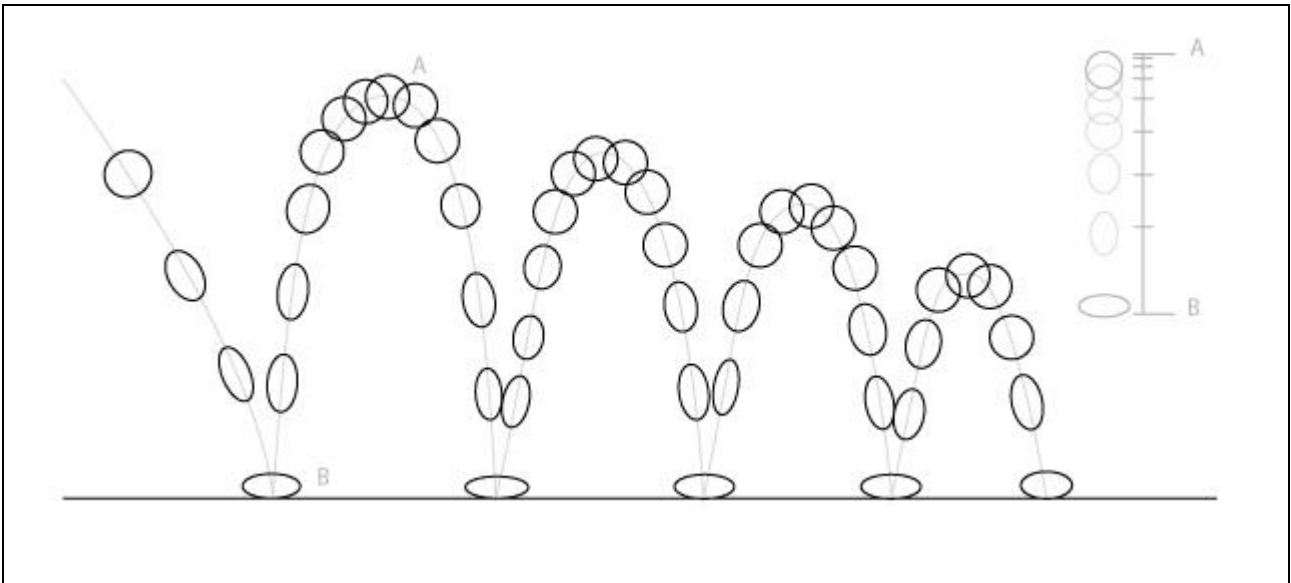
Figure 7. Bouncing ball animation with squash and stretch. Kemilä, 2016.

Animation should not look robotic. When objects or characters are moving, they need time to start the action. Actions can start slow, speed up and slow down again or start with speed and then slow down like in figure 8. This is also one of the Disney's principles but it is also used a lot in simple motion graphics to make them look smoother. This slow in or out principle is created by putting more frames in the start and the end of the animation and fewer in between. (Becker 2015; Johnston et al 1995, 59.)
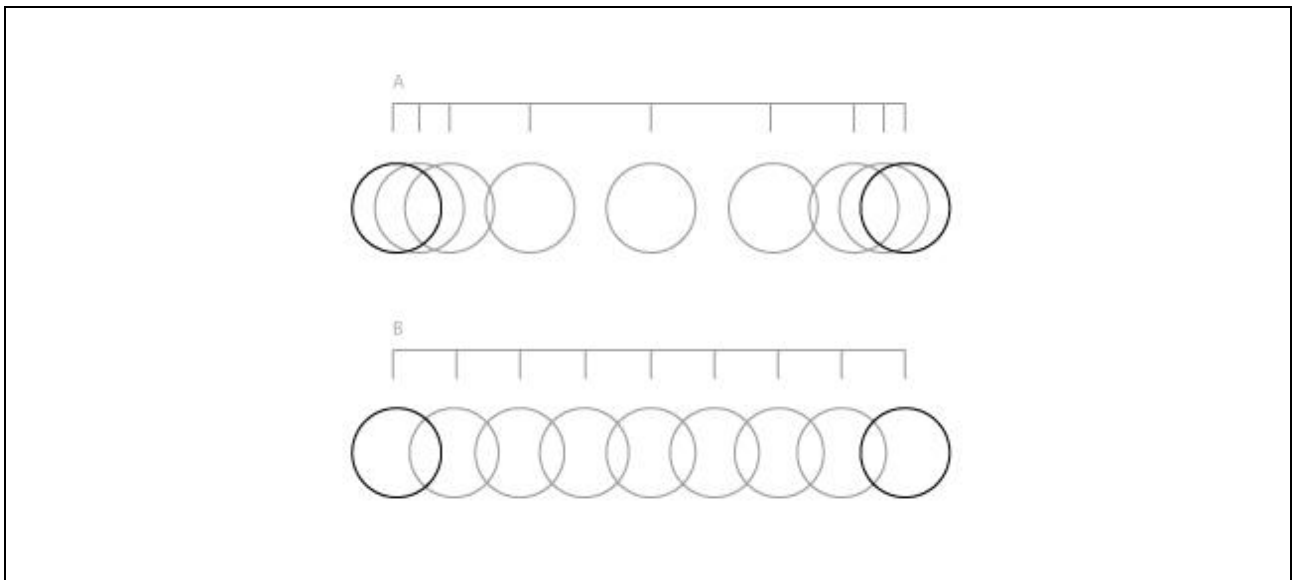
Figure 8. Ball in motion with slow in & out (A) and without slow in & out (B). Kemilä, 2016.

Follow through and overlapping action and secondary action seem like the same principle and are often mixed. Secondary action means gestures that make more dimensions for the character by supporting the main action. A walking animation is good example. The legs are the main action and everything else is secondary action. The hands, head and facial movement create the character's personality and communicate what the nature of the action is. Follow through and overlapping action is a technique in which the character's body parts and other appendages drag behind the rest of the body and continue to move after the body stops moving. This principle adds a lot of realism to the object or character. When the body moves, the tip of the appendage should be the last to catch up and when the body stops moving, the tip should follow through the furthest. This principle can also tell something about the object's mass by how much they have drag. Objects that don't have a lot of drag are very stiff. (Becker 2015; Johnston et al 1995, 54-61.)

Anticipation or preparing the audience for the action gives the viewer a clue of what is happening next and makes the action appear more realistic. Actions like jumping need preparing and build up the energy. Very often actions without anticipation look unrealistic and the energy to do the action comes out of nowhere. The important thing is to make it as easy as possible for the audience to understand what is going on and follow the actions. Controlling where the audience is looking is important. If the audience is looking at the wrong thing at the wrong time the communication is not clear. That principle is called *staging*. This principle uses multiple other principles to be in full control of where the audience is looking. (Becker 2015; Johnston et al 1995, 49-51.)

Exaggeration is taking actions, poses and expressions to a next level to increase the impact on the viewer. The point of this principle is to make the idea or essence of the action apparent and real. It doesn't mean more distortion, but more convincing. Exaggeration can be created by just adding one over the top frame to give it

that impact. Giving the animation just one extra frame can also make the movement feel more realistic. When living things move, they are imperfect and taking that action with one extra frame can mimic that imperfection. (Becker 2015; Johnston et al 1995, 52.)
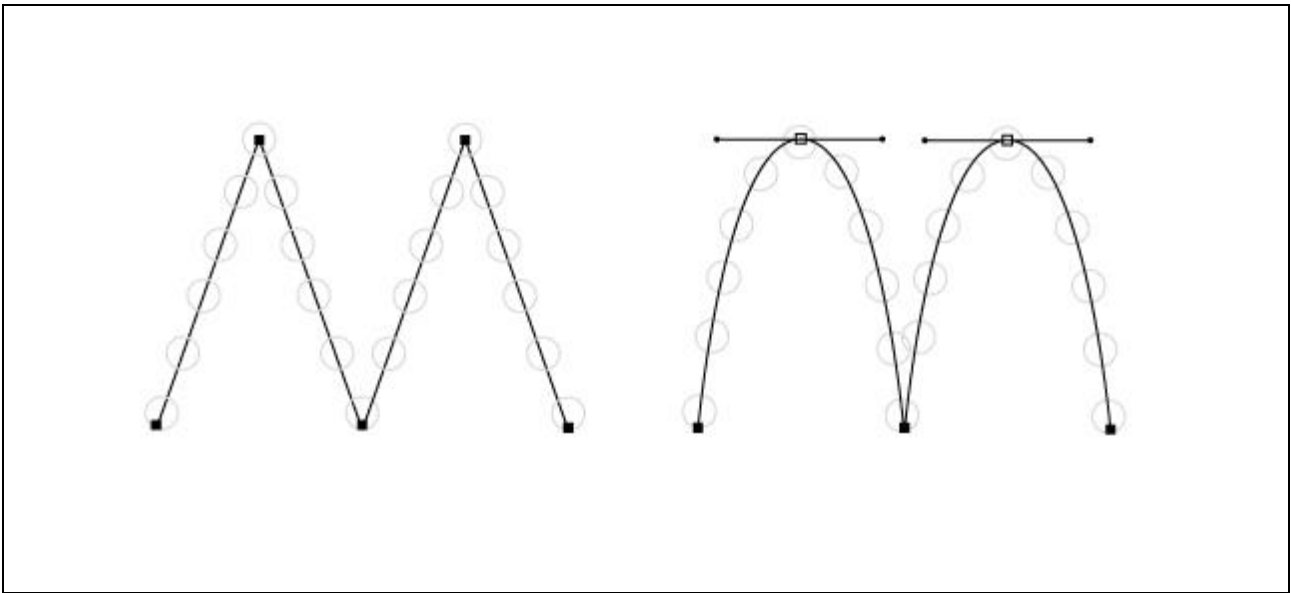

Figure 9. Path without an arc and with an arc. Kemilä, 2016.

Living things don't move in mechanically straight lines. When mimicking the real world and the movement, using arcs make the action feel and look more real. When living things move, they follow a circular path or arc. When animating, the movement should be imagined? In arced paths. Straight paths will make the animation appear very robotlike and unreal, because it is impossible for living creatures to move like that. (Becker 2015; Johnston et al 1995, 59.)

4 USER INTERFACE

4.1 User experience

User experience (UX) is everything from how the packaging feels and looks to communication between user and the product. If the packaging is visually good looking, if it is easy to get home from the store and how easy it is to unpack also create user experience. Good design is a combination of good looks and smart interaction. User experience designers create the interaction between the product and the user. User interface is where this interaction is happening. The goal for user experience design is to make the user interface feel like a conversation between two humans. The communication should not be cold and technical like between two robots. The language should be respectful and intelligent. Technical language should be translated so that it is understandable for users. The aim should be to make sure that users get to their goals while using the product, basically getting the user from point A to point B and finishing the task without frustration. The User experience design process involves a lot of user research, prototyping and testing the product with users. Prototyping and testing is used to find out how the user feels about the user interface. Working and prototyping with the user is the only way to get into the user's mind and to design for the user. Targeting the product for a specific user is also an important part of communication with the user. When the product is not designed with every possible user in mind the communication with the target user is easier. (McKay 2013; Norman 2016; Ussai 2015; Zumbrunnen 2015.)

Brand and personality of the product are also a big part of communication. Branding is picking the target audience. Thinking about the brand in the product's design process is important for picturing the target user and even making up the target users. The products shouldn't be for everyone, they should be designed for very specific users. This makes it feel more personal for the user and helps the communication between the user and the interface. Giving the product personality and tailoring it for a specific target audience makes it more memorable. This makes the designer's job easier, not just the user experience design, but also the visual design. Things like the user's age, sex, education, location, occupation, interests and the task affect the design. This way it is easier to speak the user's language. (Jensen 2013; Puri 2014, Ussai 2015; Zumbrunnen 2015.)

User experience is not just the app or the user interface. It is everything tied to that and the user's experience with the product even including the shopping experience and the package. Everything affects how the user feels about the product, even the user's mood and the surroundings. If the product is an app, which hardware (in this case a smartphone) the user uses affects the experience. *Apple* is known for their good user experience from easy packaging, sleek hardware and smart software. The experience is good from you picking the product from the store to using it daily. Apple is successful because of their good user experience design. Apple starts the designing from the experience, not from the technology. The positive feeling users get from their

products is worth ~~of~~ paying a bit extra money for. What makes Apple so great is that they know what the user wants. Apple doesn't give the user all the freedom and possibility to modify like PC and Android does. Some users might need the freedom to modify, but regular users don't really know what they want and need. Designers have to know the user. Limitless possibilities to modify product might just confuse the user. The designer has to have empathy, the skill of putting themselves in the user's view. You truly understand a problem when it becomes your problem. (Jobs 1997; Marsh 2014; Norman 2016.)
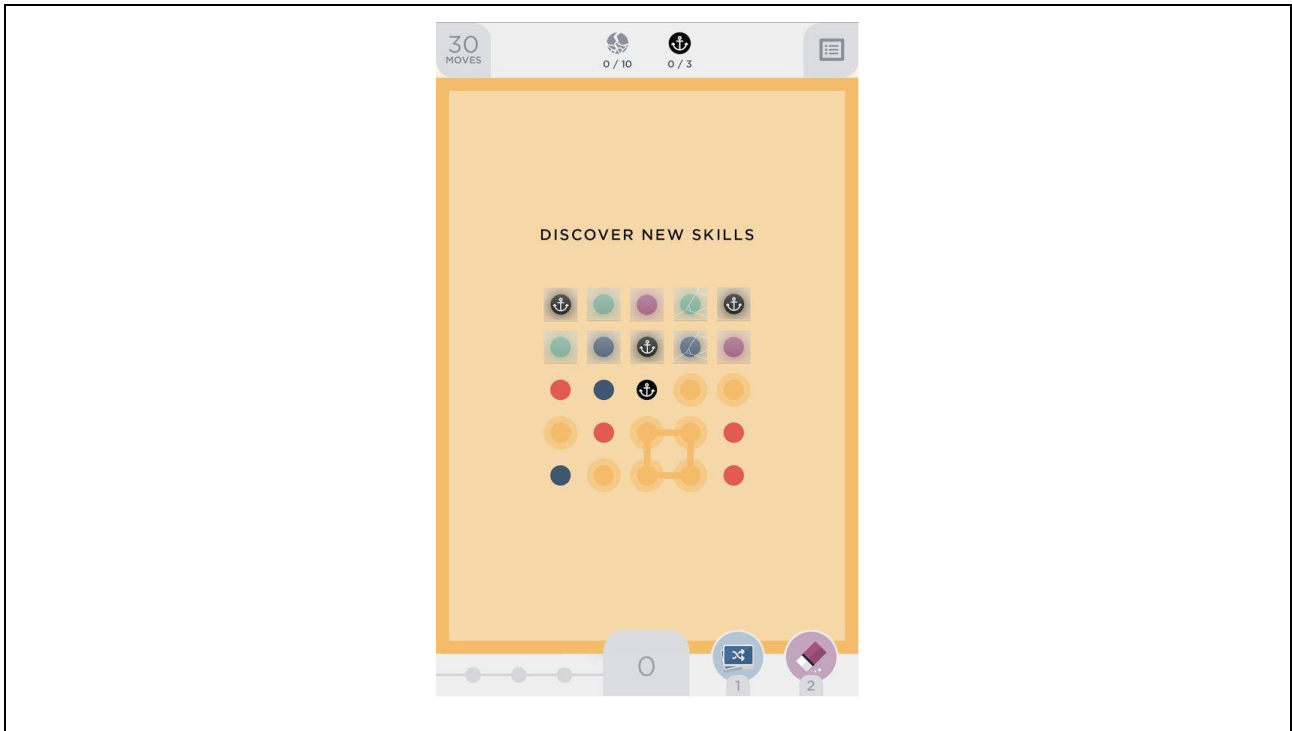
Figure 10. Game *Twodots*. Google Play, 2016.

Feedback is an important part of the user's communication with the computer. It is a demonstration of the user's interaction with the product and if it was successful or not, and why. Feedback is mostly shown when something is incorrect or correct, loading or if a selection is made. Feedback also means that the user interface responses for the user at all times. Responsive interaction makes the element feel real and gives satisfaction to the user when they can see that their actions have an impact. Feedback can be given with smart graphics or motion, sound or vibration. The mobile game *Twodots* is very good example for excellent feedback. If you connect the same colored dots into a square, all those dots will explode. The whole screen will fill with color; the phone will vibrate and give a happy sound. This action will also get you through the level easier. All this feedback makes it more satisfying for the user. The user should get feedback about everything related to the task they are doing. For example, if something is loading, it should be told somehow. Otherwise it might seem like the computer or the program crashed. This can be very frustrating for the user. Errors and problems should be explained to the user with their language, not in engineering language. The error message should

have the problem and the solution to the problem, not ones and zeros or other technical language. (Ussai 2015; Zumbrunnen 2015; Jensen 2013.)

Figure 11. "Which one is salt shaker?" Reference: http://www.imagetabletop.com/salt-pepper-p-114.html

Make the user feel smart. Information is the most important thing for the user that is why they are using the product. It should not be hidden under graphics or complex design. Form follows function; the product becomes beautiful because it has a purpose. Cool design does not mean good usability. Every essential part should be visible for the user. There is a 50% chance that user picks the right shaker (Figure 10). Users will pick the one with three holes if they are used to eating saltier foods. (Norman 2011; Rohan Puri 2014; Smith 2009.)
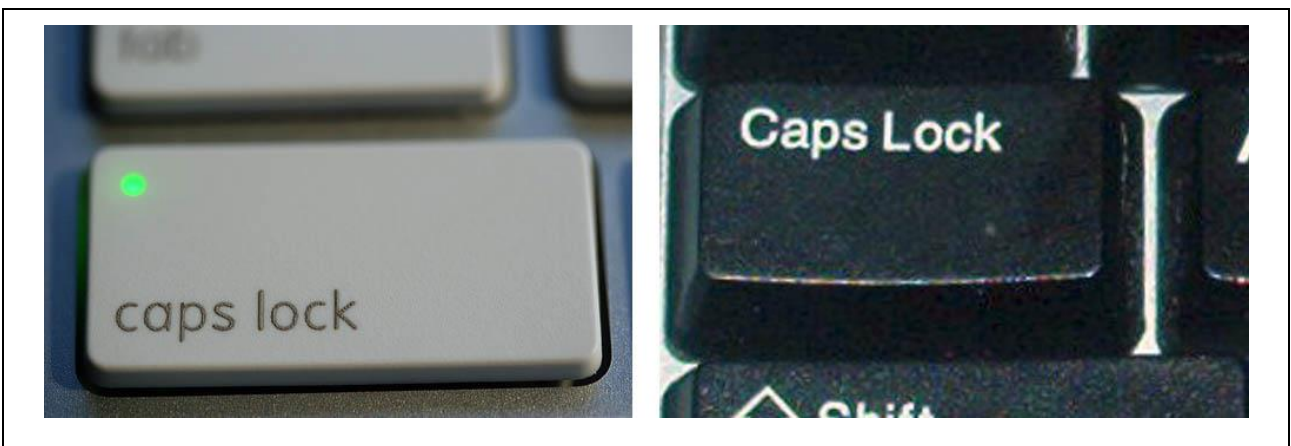
Figure 12. Two caps lock buttons. One communicates clearly that if it's on. Reference: http://superuser.com/questions/285103/is-it-possible-to-control-the-caps-lock-led-on-os-x and https://en.wikipedia.org/wiki/Caps_lock

Keeping the user focused on every part of the task is important. Designers show the user the right way, help them through the task and keep them focused on the right things. They give the users hints of anticipation so they know to expect the next step. One good example is how ATM's work. ATM's handle your money, so this interaction has to be very carefully designed. From when the user goes to get money from an ATM to after they are finished with the task and are waiting to get the money. The computer will not give the users money before they take their credit card out. If users got their money first, there is a bigger possibility that they would leave their credit card behind. For user the task is over when they receive the money and then the credit card is easily forgotten. (Saariluoma 2004, 22.)

This can be applied to mobile user interfaces too. By helping the user notice possible actions and understand better how these actions fit and work together. As well as keeping the user focused on the right things, giving obvious hints and bringing the right element to the foreground. Giving the space and putting it to the foreground is a sure way to get the user's attention. In (Figure 12) the Pinterest application a long press on the picture gives the user the possibility to post the picture to their feed. A long press opens a new, almost transparent layer on top of the feed with all the commands that the user can use on the picture. The almost transparent plane separates the two layers, the feed and the posting control. (Ussai 2015; Zumbrunnen 2015; Jensen 2013.)
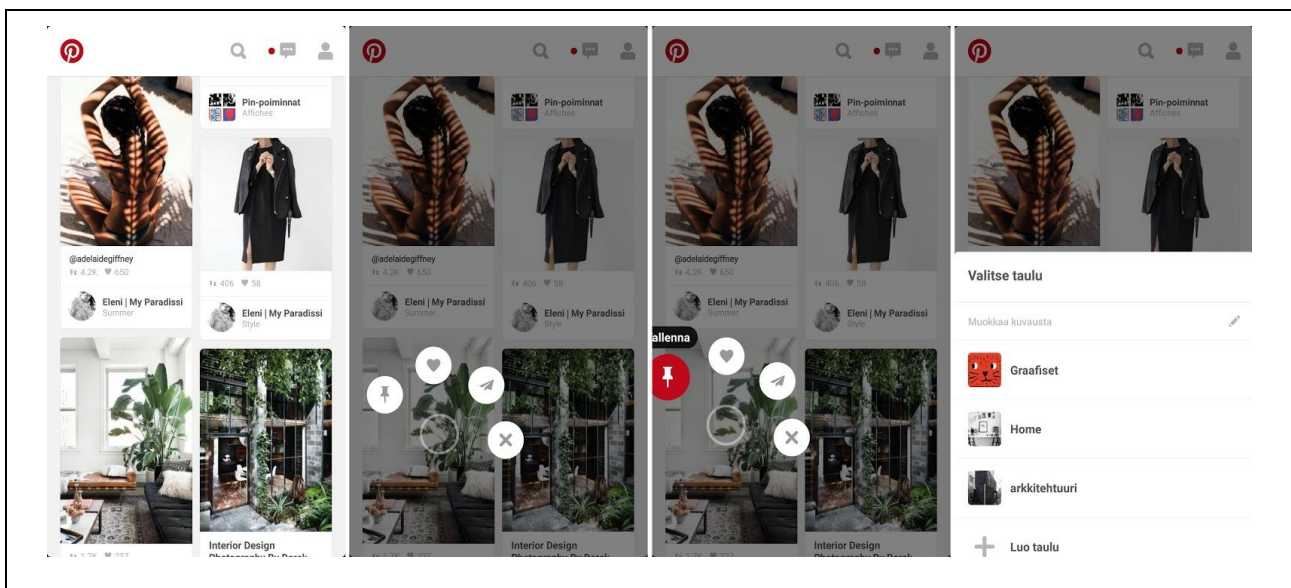
Figure 13. Pinterest mobile application. Pinterest, 2016.

4.2   Communication with visuals

Visuality is very important part of mobile user interfaces, but there are cases in which the user interface doesn't have to be visual. When the computer is used as a tool, the design is more important than visuality. Visually beautiful interfaces are more pleasant to use and more logical when the space is designed well and

thought through. User interface can't overpower the contents of the interface, it has to support the content and bring it out. Attention should first go to the content, if the user interface is designed well it's something that users won't even notice. Good design is harder to spot than bad one. (Norman 1988, 12.)

Figure 14. Instagram's old logo and new logo are a good example for skeuomorphism and flat design. Reference: http://www.pupututami.com/2016/05/the-new-instagram.html

When mobile graphics just started coming up everybody used realistic looking graphics or skeuomorphism design. This was overcome by completely flat design just using colors and shapes. And later *Google* brought up material design in 2014. It is also called quantum paper; it uses the flat design but adds some dimension to it. Basically it is flat planes in 3D space. Even though the elements are in 3D, space the design still looks flat because it is viewed from the top and the drop shadow adds more dimensions. Google's material design is visual language. It is design principles for typography, grids, space, scale, color, motion and use of imagery. The inspiration came from real paper and the goal was to have more liberal use of grid-based layouts, responsive animations and transitions, padding, and depth effects such as lighting and shadows. (Google material design 2016.)

"Unlike real paper, our digital material can expand and reform intelligently. Material has physical surfaces and edges. Seams and shadows provide meaning about what you can touch."

(Matias Duarte 2015)
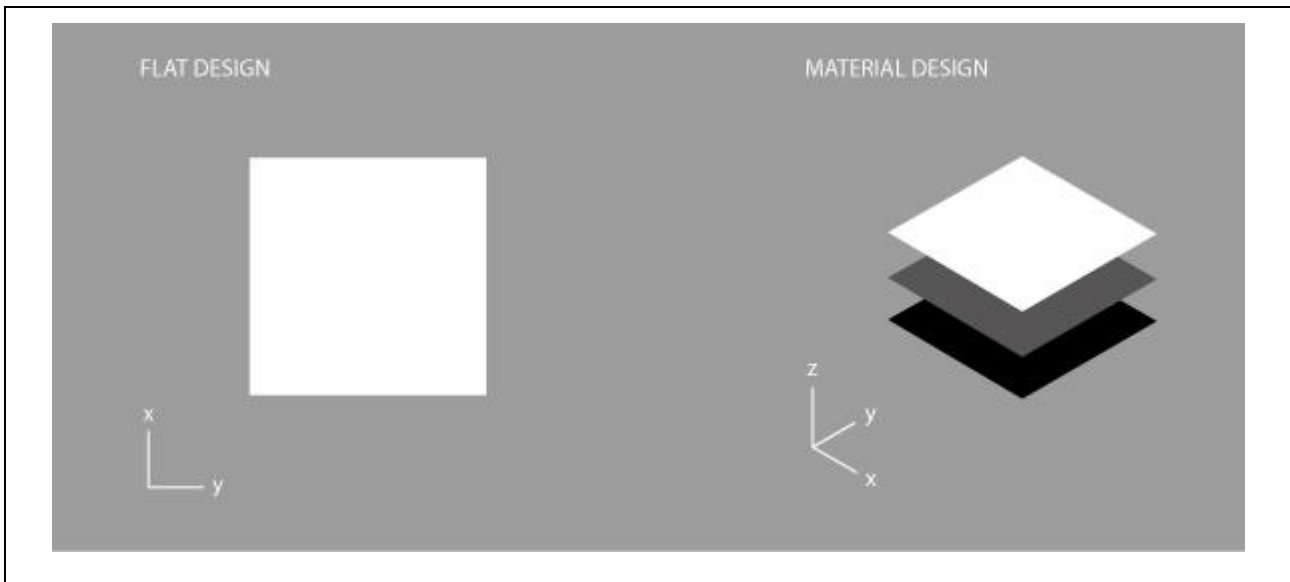
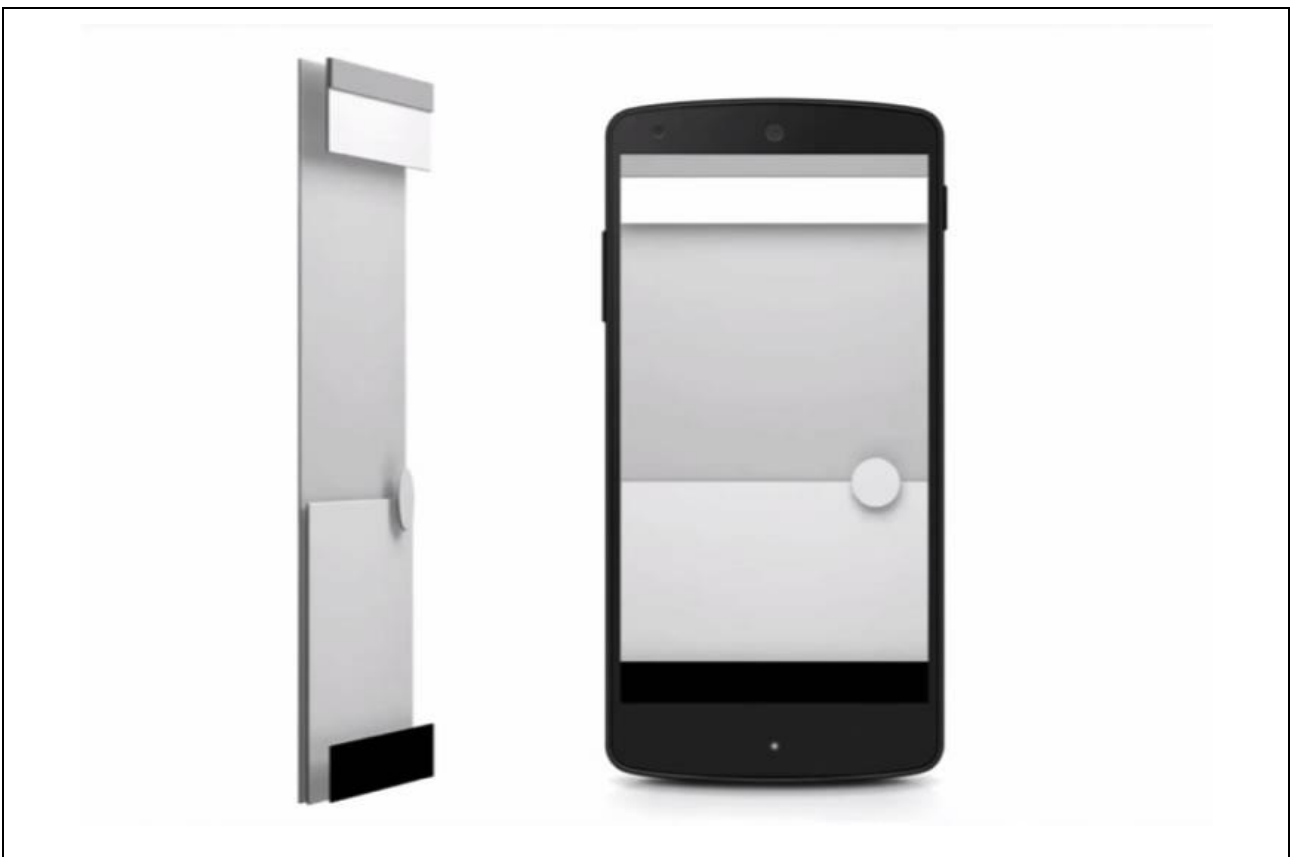Figure 15. The difference between flat and material design. Kemilä, 2016.

Figure 16. How material design 3D elements work. Reference: http://uxmag.com/articles/the-top-ux-predictions-for-2015

Motion is a very big part of Google's material design. It is part of the communication and it uses Disney's animation principles. Motion clarifies all the commands and steps that the user is taking and helps them navigate where they are. This spatial awareness makes it easier to get into the flow of using the user interface. Motion

connects the dots between every action and makes it easier for the user to see the relationship between information. To make navigation easier for the user, the information should also be divided into a smaller district so it is easier to manage. (Google material design 2016.)

In order to use motion, the graphics should be very simple so that the user will not get sidetracked by all the detail, color or other abundance. If there is motion communication in user interface, it should be as minimal as possible because user interface is only there to support the content so that the user gets to the information that they are looking for.

Instagram's application is a good example of a minimalistic user interface. In spring 2016, Instagram published the new updates for overall design and user interface (Figures 16 and 17). This new interface gives more space for the content, and an application like Instagram is all about the content. People should notice the content before noticing the interface, because the interface is there to support the content. Instagram's new colorless interface doesn't fight with all the user's content like colorful pictures and videos. If the user interface is designed well, there is no need for colors or other extra design. The only colors that Instagram's interface has now are in notifications, which are pinkish red and tags and links that are blue. The old interface was darker and had multiple shades of colors. The interface also took a lot of space, whereas now the top and the bottom bars are shorter giving more space.
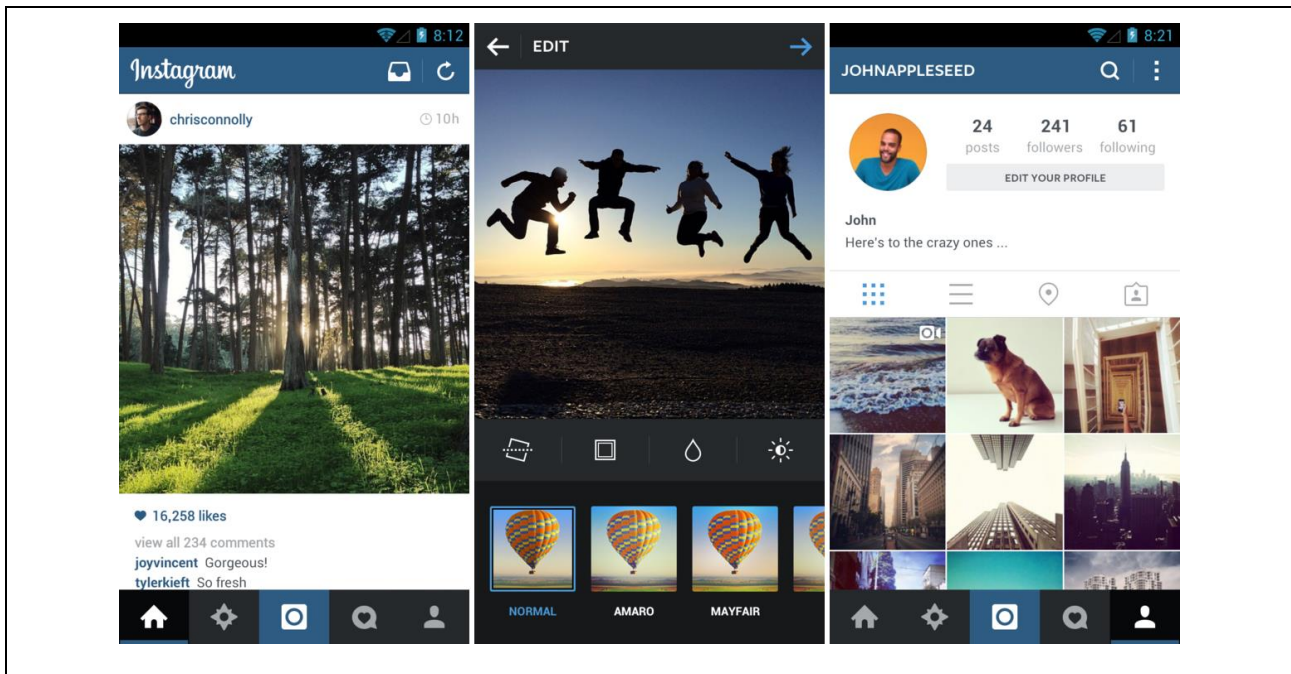

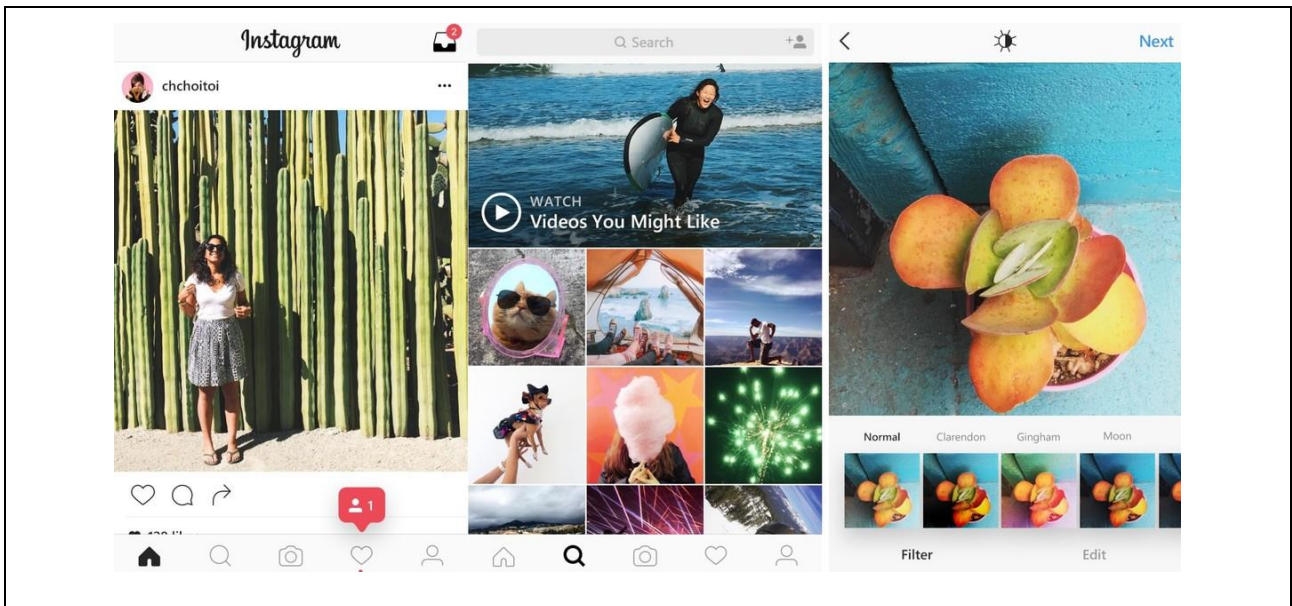Figure 17. Old Instagram user interface. Instagram, 2016.

Figure 18. Old Instagram user interface. Instagram, 2016.

5   MOTION COMMUNICATION

What is the role of animation in user interface? Is it just to make it visually interesting? Moving images catch out attention easily and humans naturally look at things that move. A moving image can guide the user through the experience or it can just confuse them if designed wrong. This is why animations should be carefully thought through. They should also be kept in mind in the early design process, because not just a visual element or the final detail. With animations you can create beautiful and interesting visuals, but also smart interactions. It can be the simplest animation and it can tell more than any still graphic. The main purpose of animation is to tell the user what is happening between every action and command they make and to make the user interface feel as natural as possible. The point of making user interface feel natural is that it feels easy and friendly for the user, not complicated and technical. When the user interface mimics the real world, the user will feel more comfortable. Animation is not the only thing that makes the interface feel natural and easy to use, but all the factors of good design, visuals, sounds, vibration, software and hardware together do. (Ussai 2015; Zumbrunnen 2015; TED Ed, 2013.)

Animations make the user interface feel responsive. The user interface should respond to user's every touch. Responsive interface shows the user's commands like opening an application (Figure 19). Even if it only takes a couple of seconds to open, the user won't get frustrated. Without this activation animation the user might think that they missclicked the icon or that the program crashed, and they starts multiclicking it. Just with this small animation the computer is telling the user that the command is received and now the user knows to wait for the application to open. The same applies to if something is loading, any notification error or success. They should be informed to the user telling them what is happening. This responsiveness makes the interface feel more alive and less like a user interface. When every action gives some kind of response, the user interface feels more natural, like a conversation with two people. (Ussai 2015; Zumbrunnen 2015.)
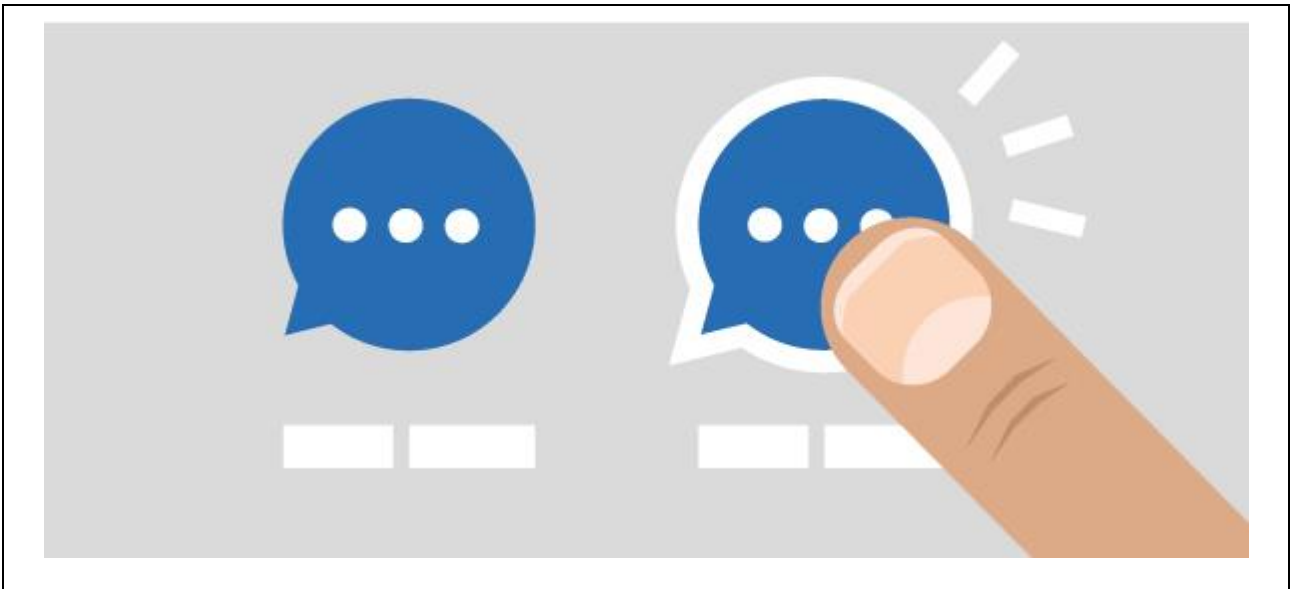
Figure 19. Responsive animation shows selected application. Kemilä, 2016.

In the real world sudden change doesn't exist. It takes time to move from one user interface element to another and this time can be used to build motion. Animation is a great way to fill the gaps between actions and to ease transitions between the actions the user takes. This is one of the main reasons to use animations in user interfaces. Easing the transition guides the user through experience. If the gap between actions is not animated or introduced to the user, they might not be aware of where the action took them and what content they might have missed by taking the action. A user should be spatially aware of the user interface environment. This awareness helps them to clarify the element's relationships. Making user interfaces logical is crucial especially in smaller screens. Users need to know how to navigate the interface by understanding where they came from and where to go next. Element should not just pop up suddenly, the action should be introduced. (Ussai 2015; Zumbrunnen 2015.)

Figure 20. Example of relationships between elements. Kemilä, 2016.

A user interface should feel natural, like how things would work in real life. It is easier for the user to under-stand the interface if it refers to the real world. For example pull to refresh function, refreshing the feed by scrolling up the feed (Figure 21). Scrolling down the feed you see the old posts, but if you are on top of the feed and you scroll up, the app refreshes the feed and you get the newest post. Logically old posts are down and new are up. This cuts down the steps to refresh the feed and keeps the user in the flow of using the prod-uct. (Ussai 2015; Zumbrunnen 2015.)
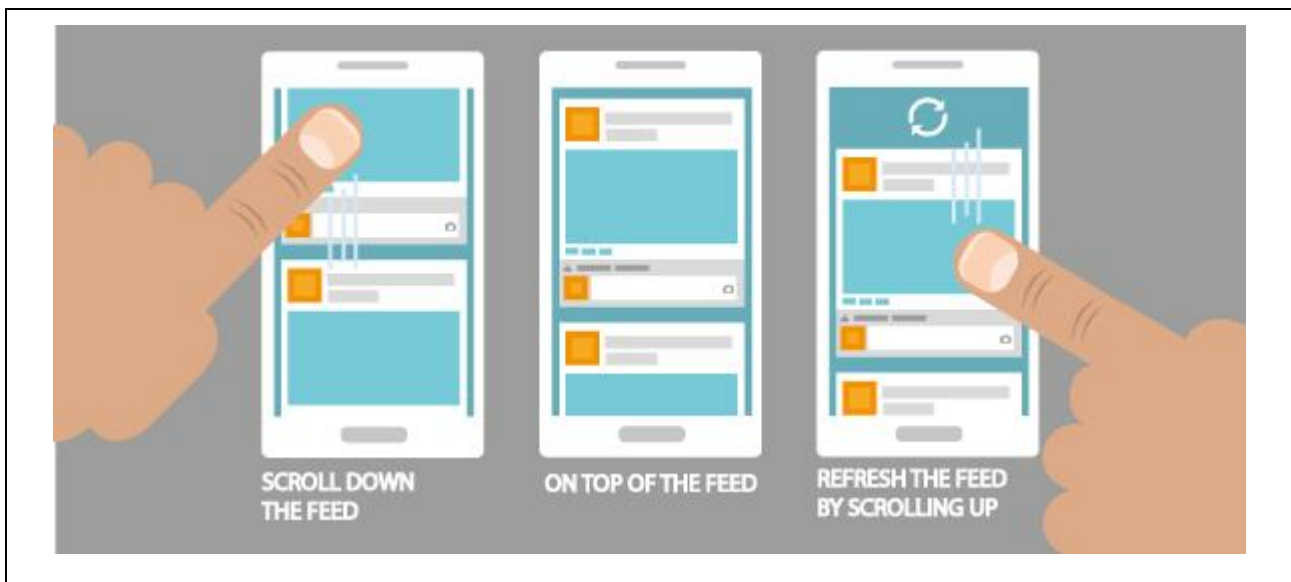
Figure 21. Pull to refresh action. Kemilä, 2016.

Even the loading time can be made to feel shorter by animation. When the loading screen is animated in the right way, it seems to the user that the loading time is shorter than it actually is. If the progress bar is animated to go the opposite way than the progress itself, it seems faster. The user should not have to wait for the user

interface. The user's flow with the product is not interrupted if there is a couple of second's delay. Of course the goal should be that there is no delay at all. Animations that enter the screen should be in their peak performance and speed so that the user doesn't have to wait for the user interface. Chat applications like *WhatsApp* pushes the messages instantly after sending them to the chat feed even though they have not technically reached the server yet. This keeps the user in the flow of using the application when they don't have to wait for the message to be sent before they can write a new one. (Ussai 2015; Zumbrunnen 2015.)
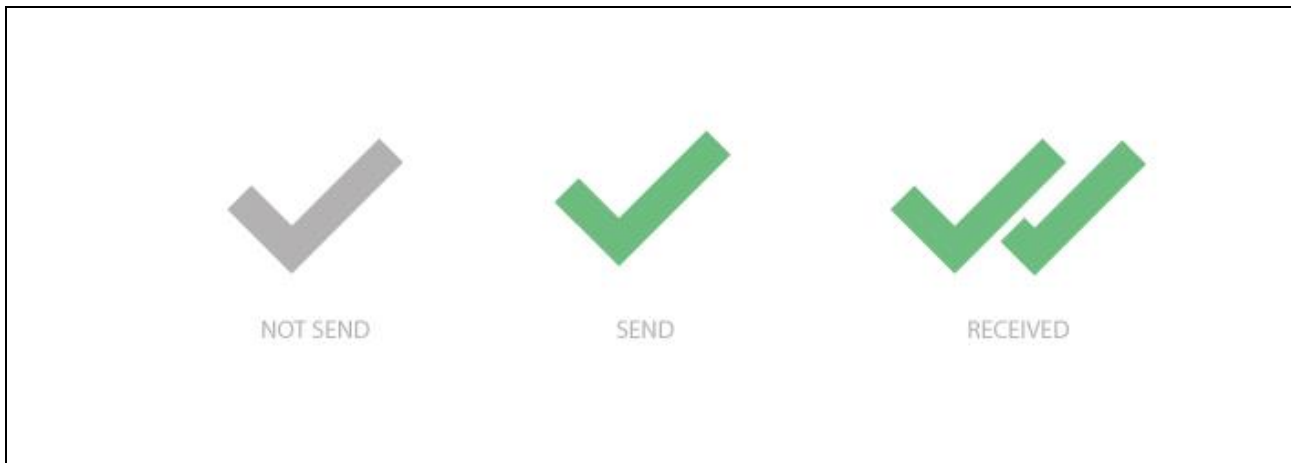
Figure 22. Stages of sending a message. Kemilä, 2016.

Actions should happen in a logical order. If the user clicks something open, it should happen instantly. The opening animation should not have anything that slows it down. The opening window or menu bar should open on top of or push away whatever content there is, and the content should not be animated away before the window or menu opens up. Complex transition animation can also be confusing when there are multiple elements moving in different directions. Overlapping animations should be avoided. Overlap creates chaos, elements should not touch each other and they should move in the same direction or curve. The movement should be consistent and logical. The speed of elements, the curve, moving direction and every movement principle of the user interface should be consistent. To separate different elements, the movement and curve should vary. If the element is moving across the screen, it should move in a curve. Elements like down or side bars should not have curve, but the movement should be eased. Using curve gives a more natural feel to the user interface. Robot like movements make the interface feel very boring and unnatural. (Ussai 2015; Zumbrunnen 2015; Google material design 2016.)

There can be communication problems because of simple design. The problem with simple design is that sometimes it becomes hard to tell if something is currently active or not. The limited space in the mobile creates problems, too. It's sometimes hard to tell if the action is currently active or if it is the next action. By changing the icon after the user activated it to whatever the action might be after (Figure 23). The user knows

what his options are, because there is only one button to click after the clicked button changes. This helps them to expect the next step and be aware where they are. (Zumbrunnen 2015.)
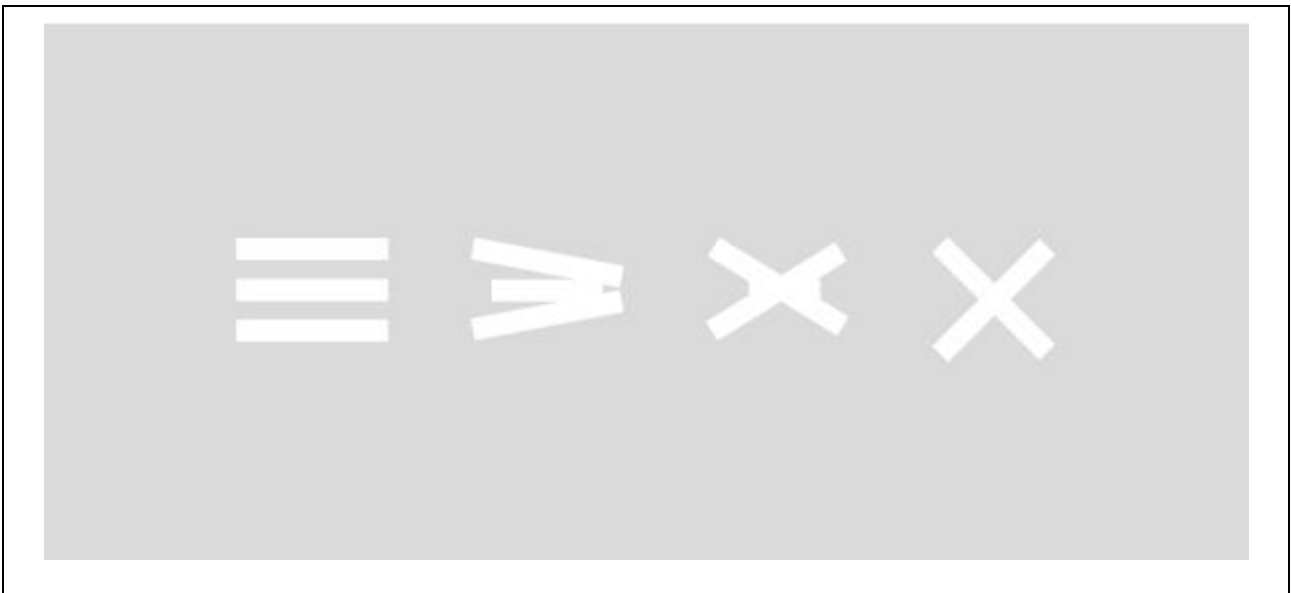

Figure 23. Menu button changing into an exit button. The user will never feel cornered and lost because of exit or back button.
Kemilä, 2016.

Because of limited space, we can't have everything at once on the screen. Actually, the fewer elements there are, the better. Fewer elements mean that the user focus is easier to control. Symbols are a good way to save space and sometimes an even better way to communicate. Morphing multiple symbol buttons together keeps the user more focused and it saves space. When you only have that one symbol that presents the user the different stages of the action, focus is easier to keep. It is easier to follow if the start action button turns into a progress bar and then turns either into an error or a success confirmation in the same button without leaving the environment. The user's focus is already there and it is harder to lose when everything happens in the same space. (Zumbrunnen 2015.)
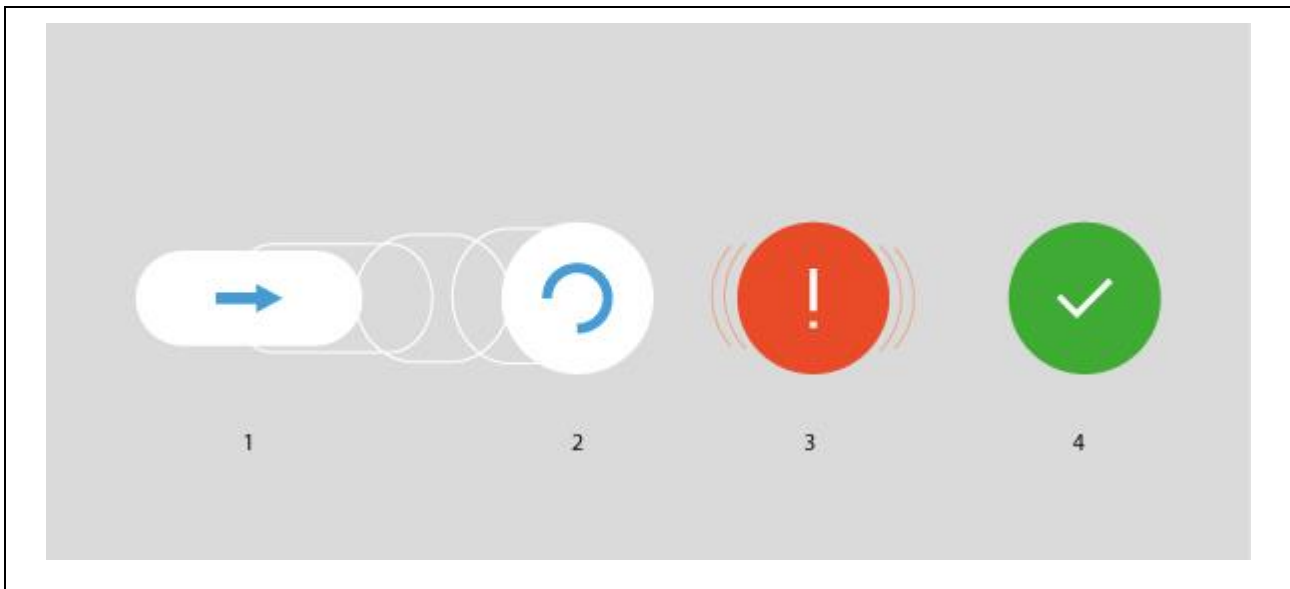
Figure 24. Stages of button changing. Kemilä, 2016.

Figure 25. When user scrolls up they enter read mode. Kemilä, 2016.

Unneeded information should always make room for the more important information. When the screen size is limited, users should only have the most important information on their screen at once (Figure 23). Read mode is when the user interface makes space for the content. The user interface disappears on the screen when scrolling down (B) and appears back when the user scrolls down (C & D). This information should support their task and make it easier for them to follow. Hidden information should also be easy to find again. (Ussai 2015; Zumbrunnen 2015.)

Expanding the spatial elements keeps the user focused by telling how the old space and the new space are related. Expanding the clicked element and pushing other elements away communicates the relationship between these elements. If the new element just appears out of nowhere, it seems like a whole new layer which has no relationship with the old elements. If these elements are related it should be shown. This also works the other way around; if the elements are not related it should be communicated.
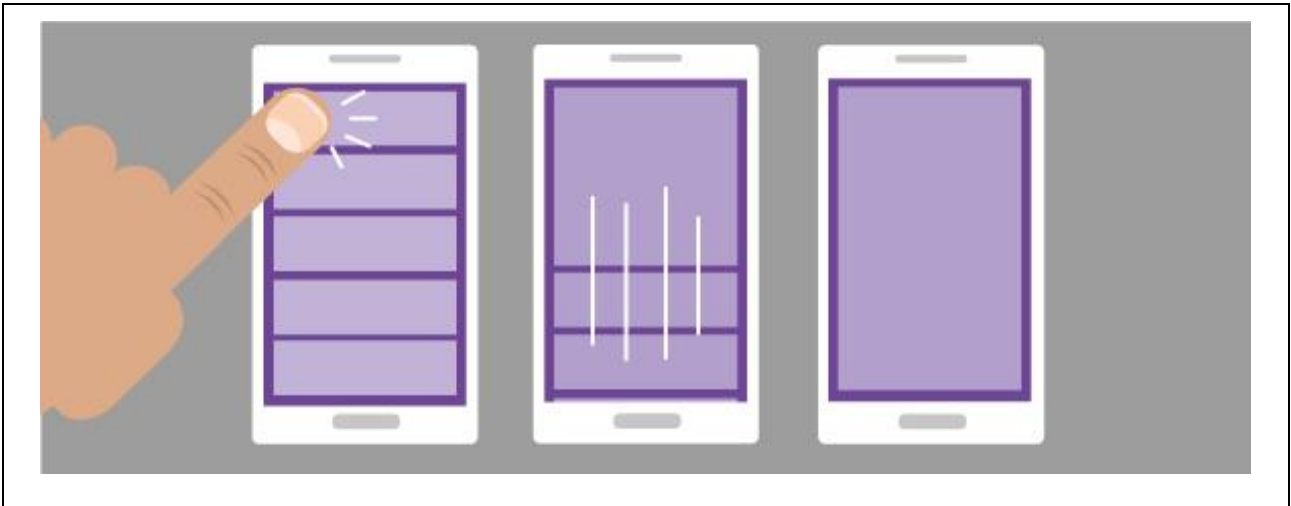
Figure 26. Clear relationship between elements. Kemilä, 2016.

Figure 27. A gap between element's relationship. Kemilä, 2016.

Natural feeling animations feel more responsive. A robotlike computer animation feels unnatural and boring. Using animation principles in user interface design makes the animations feel more real and gives the illusion of realism. In the real world, movement doesn't just stop, there is ease before the stop. (Ussai 2015; Zumbrunnen 2015.)

5.1 Future of motion communication

In the future the goal is to create powerful experiences and even more operative computers that enable work make working easier and more effective. Virtual reality is a technology that is going to become even more known and used in couple of years. In terms of user interface, there is still a lot to uncover. VR interfaces are not going to be like the ones in the movies; full of flickering lights, with a lot of elements and small animations.

Why is VR the future? As mentioned earlier about software and hardware, there are more possibilities to modify virtual reality desktop view than a normal computer's view. The hardware, like the screen, is replaced with virtual reality glasses. VR desktop is software and it can be modified however the user likes it. VR can be used for great experiences but also for very effective work. (Alger 2015.)

User interface in virtual reality creates a lot more studying of the user and there are a lot more restrictions in VR interface design. The user will now be in this world created with a computer. A human factor like motion sickness are possible. Ergonomics are also demanding more attention now. Motion communication in VR interfaces is almost mandatory. Now when VR is still very new, technology users can feel hectic using it. Same user interface principles still apply to virtual reality, but the biggest principle is not to make the user feel lost. The user interface in VR plays a very big role in how the user experience is going to be. (Alger 2015; Brady 2015.)

With this technology, understanding motion communication becomes even more essential. When using virtual reality, the elements are not just on the screen that is in front of you, but around you. The Placement of the user interface elements and the motion is very important in virtual reality. Virtual reality is not only just for jumping into a game or to another 3D experience, it is also for everyday use like browsing the internet. There can be problems using VR for everyday use, with, for example, like how easy it is to chance the website or how pleasant it is to read. Reading in VR is not the same as reading from the screen. If you put a wall of text infront of the user like it is on websites, reading it will be extremely laborious. Websites have to have a VR version of the site. Using a website straight from web with VR is going to cause problems. These problems are going to be similar as what using the internet with your mobile phone caused a couple of years ago, as most websites did not yet have mobile versions of the site. (Alger 2015; Brady 2015.)

DISCUSSION

Motion communication might seem like the last step of design, the finishing details. These little details tie everything together and make the experience of using the product. Animations communicate the relationship between every element. This brings clarity for the user.

Using animations in user interface is not just for esthetic reasons. Motion is a very powerful way to communicate. This is why animations should be carefully thought through in the design process and not used not because they looked nice. Motion communication makes communication better and makes the user interface feel more responsive. Animations increase the user's feel of flow by making the user interface feel natural. The human eye naturally follows movement. Therefore, getting the user to look at the things the designer wants is easier when using animation. The main reason to use animation is to ease the transition between actions so they are easier to follow.

To be able to implement animation to user interface, the designer has to know about the user, understand basic human behavior and user psychology and apply that to the communication between a human and a computer. Knowing the user is the foundation of design. Studying the user is necessary. Basic psychology can only cover the start because every human is an individual. That's why prototyping and testing the interface with the target user is so important.

Puri (2014) has said that *"Beauty comes second".* Visuality is a very important tool with which to communicate. Visuality is as important as the rest of the design. Both design and visuality are part of communication. Visuality doesn't necessary mean graphics but more like the design of the space and the orientation of elements. In user interface the design of the interface content is more important than the interface itself. A Visually pleasing interface helps the user get to the information. It clarifies the environment. When all the information is in the right place and easy for the user to see, it guides the user. The user will not even pay any attention to the interface unless something feels off. Louis Sullivan (1930) has said that *"form follows function".* Beauty comes when the design is working. Bringing motion to a well-designed interface with clean graphics reduces the possibility of chaos.

6   CONCLUSION

The idea for this thesis came from Adrian Zumbrunnen's lecture about designing motion that I found from *YouTube* in spring 2016. I was already hooked on motion graphics but this lecture made me want to learn more about user interfaces. The more I looked into it, the more I realized that mixing motion and user interface meant better user experience.

I mostly used video lectures as my source of information. I was unable to find books about this subject, but the practical examples that I got from these videos gave me a wider view on this topic. Technology develops so quickly today that the freshest information is found online from experts that are working and developing the field.

Communication between the user and the computer is the basis of this thesis. The base topics were the only thing that books provided information on. Most of the books were already outdated so I had to keep that in mind when I was studying them. But before doing that, I had to discover the base topics. I decided to narrow my base topics to HCI, user psychology, animation and user interface. I left hardcore technical topics out altogether, because I was still viewing this from a graphic designer's point of view. That is also the reason why this thesis contains a lot of visual aspects. I saw animations as a visual element, but while I was researching, I found out that they are way more powerful than that. It also made me realize how much research should be done before designing.

Understanding the user was a pretty obvious thing. Because humans are individuals it made designing harder. So to cover the user psychology topic, I wrote about the common factors humans share, the possible differences between people and why prototyping is so important. I feel that you don't really need user psychology to design if you do prototyping, but it can make things easier and faster. User psychology can also make you look at things in a different way. Culture plays a very important role in how people view things. Studying the culture before designing is mandatory.

Animation is an illusion of realism. Exaggerating the movement is mandatory to make it seem natural. I watched animator Ross Plaistow's *"How to make a cartoon in after effects"* – series from YouTube. He advised to take the actions to the extreme with one extra frame to make it look more interesting. Humans (or any living thing) don't move perfectly.

I gathered user experience and visuality under the topic of user interface. I strongly think that the user interface should not stand out and its purpose is just to get the user to the next step, especially if the content is pictures, videos or something else that needs the user's full attention. Good examples are YouTube and Insta-

gram. Both have very simple UI which supports the content. Very simply colored and all around simple design animations add-tone and personality.

The last chapter of this thesis was motion communication. In that chapter I went through more practical stuff and gave examples of motion communication. Motion communication animations don't need to be anything big or revolutionary, but these little animations make the experience with that product better. Seamless interaction with the product creates flow.

The last topic was the future of motion communication. That paragraph was about virtual reality. I think good user interface is an extremely big part of the user experience in VR. Users are hooked into a VR headset (the glasses and headphones) and they have no idea what is happening around them. If the interface is not clear, the user might have to take the glasses off multiple times during the use. VR is still so new that the professionals in this field are still figuring out the design rules for VR interfaces.

REFERENCES

Abowd, G. D., Dix, A., Finlay, J. E., Beale, R. 2003. Human-Computer Interaction (3rd Edition). Harlow: Pearson / Prentice Hall.

Alger, M. 2015. VR Interface Design Manifesto. Retrieved 14.9.2016: https://www.youtube.com/watch?v=n3b8hZ5NV2E

Alger, M. 2015. VR Interface Design Pre-Visualisation Methods. Retrieved 21.9.2016: https://www.youtube.com/watch?v=id86HeV-Vb8

Becker, A. 2015. 12 Principles of Animation -video series. Retrieved 31.8.2016: https://www.youtube.com/watch?v=haa7n3UGyDc&list=PL-bOh8btec4CXd2ya1NmSKpi92U_l6ZJd

Brady, K., Emms, R. 2015. Oculus Connect 2: Navigating New Worlds: Designing UI and UX in VR. Retrieved 14.9.2016: https://www.youtube.com/watch?v=braV_c4M8oI

Norman, D. A. 1988. The design of everyday things. New York: Basic Books.

Hartmann, B. 2012. Computer Science 10–Lecture 13: Human-Computer Interaction. Retrieved 31.8.2016: https://www.youtube.com/watch?v=6Vt7YVtEqT4

Jensen, J. J. 2013. User Interface (UX) Techniques, Retrieved 31.8.2016: https://www.youtube.com/watch?v=7OSkB4BCx00

Jobs, S. 1997. Steve Jobs on Apple Customer Experience and Innovation. Retrieved 07.09.2016: https://www.youtube.com/watch?v=1SIeTmORl0E

Jobs, S. 2007. Steve Jobs iPhone 2007 Presentation. Retrieved 10.9.2016: https://www.youtube.com/watch?v=vN4U5FqrOdQ

Johnston, O. & Thomas, F. 1995. The Illusion of Life: Disney Animation. United States of America: Abbeville Press.

Kuoppala, H., Parkkinen, J., Sinkkonen, I., Vastamäki, R. 2006. Käytettävyyden psykologia. Helsinki: Edita, IT Press.

Marsh, J. 2014. UX crash course: user psychology. Retrieved 31.8.2016: http://thehipperelement.com/post/87574750438/ux-crash-course-user-psychology

Norman, D. 2011. Living With Complexity. Retrieved 7.9.2016: https://www.youtube.com/watch?v=flRuSn0df8Q

Norman, D. 2016. The term "UX". Retrieved 31.8.2016: https://www.youtube.com/watch?v=9BdtGjoIN4E

Plaskow, R. 2013. Character Animation–Aftereffects tutorial Retrieved. 15.9.2016: https://www.youtube.com/watch?v=ifCQYRF_c3k

Plaskow, R. 2016. How to make a cartoon aftereffects animation tutorial video series. Retrieved 15.9.2016: https://www.youtube.com/watch?v=fXL9bVnX8fU&list=PLRckK2qRXQPHsjJ34c6ppLNuKBEQt0MYx

Puri, R. 2014. Why You´re Over-Thinking Your UI/UX. Retrieved 31.8.2016: https://www.youtube.com/watch?v=Is2O666qDPs

Google, 2016. Retrieved 19.9.2016: Material Design https://material.google.com/

Saariluoma, P. 2004. Käyttäjäpsykologia ihmisen ja koneen vuorovaikutuksen uusi ajattelutapa. Helsinki: WSOY.

Smith, R. 2009. GDC: Helping Your Players Feel Smart: Puzzles as User Interface. Retrieved 31.8.2016: http://www.gdcvault.com/play/1333/

TED-Ed, 2013. Animation basics: The optical illusion of motion. Retrieved 31.8. 2016: https://www.youtube.com/watch?v=V8A4qudmsX0

TED-Ed, 2014. Animation basics: The art of timing and spacing. Retrieved 31.8.2016: https://www.youtube.com/watch?v=KRVhtMxQWRs

Thomas, F., Johnston, O. 1995. The illusion of life, Disney animation. Disney Editions; Rev Sub edition.

Ussai, R. 2015. The Principles of UX Choreography. Retrieved 31.8.2016: https://medium.com/@becca_u/the-principles-of-ux-choreography-69c91c2cbc2a#.rihl9w6ug

Zumbrunnen, A. 2015. Designing Motion: Smart Transitions in UI Design, Retrieved 31.8.2016: https://www.youtube.com/watch?v=NaqKjp14Xbg

36

FIGURES