Audience engagement for presentations via interactive methods

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Abstract

Keeping the audience engaged when presenting a topic in a conventional setting (a class presentation or a keynote in a conference) can be challenging. Often, presentations tend to be linear and non-engaging. It was my intention to research how the experience can be improved by using different methods to engage the audience.

In this thesis the reader will find the results of my exploration and research on how to make presentations more engaging for the audience via interactive methods.

After some background information, I go through the process of developing concepts that could improve the presenting experience. I describe different contexts where people deliver presentations and research about these environments to discuss the context of the thesis. I also discuss the concept of audience engagement.

After selecting one of these concepts I describe the development of a prototype that illustrates the concept and discuss it after a series of user testing procedures.

Finally some conclusions and comments are discussed in the final part of the document.
Research questions

Questions

This is the main research question that I tried to address within this thesis. It was formulated at the beginning of the process and left quite general and developed further through the course of my work.

“How can we increase audience engagement through interactive methods during a presentation?”

Definitions

Audience engagement: By audience engagement we mean how much the audience is actively following the presentation. Attention is an important aspect of it but also the ability of the audience to retain and remember the main message of the presentation.

Presentation: we consider a regular presentation set up with a main speaker conducting the talk. We would focus on groups of audience of 20 up to 100 people.
Background and motivation

Motivation

People often have to deliver presentations. The engagement of the audience is an important factor. It is a challenge for presenters to keep the audience interested for various reasons. With no engagement it is quite difficult to communicate the intended message to the audience.

Complicated or abstract topics for a presentation can be difficult to present to the audience.

Lack of preparation by the presenter can also cause the message to fall short. Presenting in public requires some degree of ability to speak correctly, modulate your voice and use body language effectively.

Even with these difficulties it is a communication form that is getting more important every year and it is likely to keep growing. Because of this I have decided to research on how to make interactive presentations that engage the audience and help the presenter to communicate effectively.

Having experience myself with the difficulty of keeping your audience engaged, I have decided to research more on this specific topic. I think that the presenter holds the main responsibility to keep his or her audience engaged but the methods and technologies used in presenting can help.

Background and Context exploration

In order to get a deeper knowledge of the contexts where people do presentations I have used my personal experience as participant and speaker along with two interviews and long conversations with two other friends of mine that have relevant experience as conference organizers and speakers as well.

My experience comes from 7 years of being an active member of one of the biggest student organizations in Europe, the Erasmus Student Network. ESN works in the field of European education and promotes and support student mobility. Thought this experience I had the chance to deliver more than 50 presentations within a variety of audiences, ranging from tens to hundreds of people about education and communication related topics. I have also attended multiple conferences as a participant and participated in the organization of some of them, from the logistics part to the content scheduling and moderating.

To complete my experience I also share some time with two other friends of mine to contrast my views with their experience. Emanuel Alfranseder has also experience within ESN but he has also attended many more conferences on a higher level. Some of these conferences featured talks of EU politicians and other officers in much more serious settings. He also had the chance to be the chair of the Annual General Meeting of the Erasmus Student Network on 2014 in Milano where he had to take care of the agenda and the content part of the meeting of more than 500 people. His view was very interesting as an organizer.

The other person I interviewed was Victor Alonso. Victor is a young entrepreneur based in Valladolid, Spain. He has been running different projects in the last years such a musical on-line magazine, the urban music initiative Acordes Urbanos and has also organized various theater plays and music shows under the label Movimiento Subterraneo where he acts as Art director. He also is one of the founders of 1300gr, a marketing and communication agency where he develops his professional career. He has also been an active speaker TEDx Valladolid.
Common characteristics

There are some characteristics that define a canonical environment for delivering presentations. Then a variety of contexts can be defined with its particularities that make them different one from the others. In this section I will describe the common characteristics and in the following ones I will discuss the different contexts that I have considered common. I end up the section talking about the conference context in detail.

There are some characteristics that are common to almost any kind of presentation set up.

It is common in any presentation set up that the presenter is in front of an audience. In most of the times the audience has somewhere to sit during the presentation while the presenter might be standing most of the times. The presenter might be on top of a stage or at ground level but normally in a position that allows him to fully address the audience. It is common that everything takes place indoors.

The normal equipment available includes some sort of sound/speaker system if the room and audience are big and a visual support device. This could be a beamer/projector or other visual representation such as a blackboard or posters, being the first option the most common nowadays. Some speakers do not use any form of visual support.

Normally the time allocated for the presentation is know in advance by the presenters. The duration of the presentation varies a lot from one topic to the other or from setting to setting. From the experience of the people that I interviewed and my own experience I would say that the average length is around 15 minutes for short presentations up to one hour for a longer format. It is quite uncommon to see presentations that are longer than 90 minutes.

Contexts for presentations and specific characteristics

Academic context

Presentations are widely used in academic contexts, mainly for classes but also for academic conferences. Academic conferences are best described in the later section, Conference context.

In the class teachers normally use some sort of visual support while lecturing. This helps them to explain complex concepts and as a guide for themselves. In this context is common that the presenter and the audience know each other from other classes. Normally these presentations are longer than the average 15 minutes and tend to be more participative, allowing comments and questions in real time. This helps students to follow the topic. Also the presentation could be a part of a series within the same topic. This means that if the audience has not been following the former presentations they could find themselves lost.

The relationship between the teacher and the audience could be somehow formal which might also discourage some participation due social constrains.

Professional/corporate context

This context has some particularities regarding the audience-presenter relationship. There is a professional relationship between all the participants. It could be a team leader presenting a new project to the rest of the team or an executive reporting to the board of Directors. This makes the situation more formal and less flexible for innovation.

The audience in these meetings is normally small, ranging between 5 to 15 people and the length of the presentations also tends to be short as people’s time is valuable for the company.
Entertainment context

This context is quite different to the other contexts. In this context the audience is mostly there to have an enjoyable experience rather than getting information or learning something. Most of the times they are attending by his or her own will and that also makes them more willing to be engaged with the experience and what the presenter has to say. There is a general sense of informality associated with this context. The format of these presentations is more diverse and could be mixed with other performance arts such as dance or acting.

This context can be contained in another one, for example an entertainment presentation within a conference context, used as a break.

Conference context

In this context the presentations take place in a rather big venue such as a big class or a conference hall. Normally all the presentations and topics revolve around a common theme, the theme of the conference. These conferences can be professional oriented or more mass or general public oriented.

It is common that these conferences last for a couple of days. The presentations are normally quite specific and last for around 30 to 60 minutes. It is also common that there are presentations all the time even at the same time at different rooms. The audience then is able to choose which presentation they want to attend. It is also common that hundreds of people attend to the presentations.

In conferences it is quite common to find professional speakers or experts that are used to present their work in public. They normally have experience in public speaking and are able to deliver a presentation that is well made and well prepared.

Depending on the conference there would be some equipment available for the presenters. Most of the times big screens will be available and a powerful sound/microphone system as the venues tend to be big.

Normally the presenter would not know the audience personally as this is normally quite big. On the other hand a good share of the audience would know the presenter, maybe not personally, but more on his or her works and his or her role as an expert.

It is worth mentioning that also within conferences there are other formats used for delivering content. Round tables are a common set up where experts discuss about a topic in the presence of a moderator. These tables might have an introductory presentation to put the discussion in context.

Conference context in detail

Why I choose this context over the others?

I decided to focus on the conference context due to a few reasons. The first one is that it is the most challenging one due to it size and other factors. This means that in this context is more challenging for presenters to engage their audience. Also the tight agenda of the meetings means that the audience might also be tired or not willing to focus much on the presenter and his or her presentation.

Also because the large size of the audience in a conference presentation there are bigger chances that there is equipment available and a large room for a deploying a design solution.

Also I think it is the context that is more open to innovation and new methods. The academic and professional context are much more strict and have their own internal rules that are not easy to bend. On the other hand the entertainment context is normally engaging per se as people are willing to get entertained when they attend this kind of set ups. This makes the conference context the most adequate to introduce new methods and solutions to deal with audience engagement.
Broader analysis of characteristics

The conference context has quite a few particularities that make it special and challenging.

The venues tend to be big fairs or complexes. They normally have different areas including the main conference room, some other side rooms for smaller presentations, a relaxing on mingling zone and other service type of rooms. The fact that the rooms are that big influences on the experience that the audience will have leaning more towards a theater play or a performance, which is something it does not happen in other contexts.

The participants of in the conference share a common interest but most likely would not know each other personally. Also the presenters do not know all the audience but they might know other presenters from previews conferences or from the professional world.

Another important thing of this context is that there is normally a common topic or theme throughout all the presentations or activities. This might be more specific or broad but it normally exists and that creates a feeling of continuity. The presentations are not isolated elements.

In the conference context most of the presenters they are professionals or semi-professionals. They are experts in their respective fields and they are used to do presentations of either their specific work or their expertise field. This means that they are much more reliable in their results when presenting and they are also used to some standard when presenting when it comes to the set up and conditions.

The equipment available might differ from one conference set up to another one but it would consist almost always of a beamer or projector with the corresponding screen. It most cases the presenter would have an extra screen to control the presentation and also sometimes there would be extra screens on the floor in front of the presenter or at the very back of the room, so the presenter can see the screen without having to turn his or her back to the audience. The sound system would be according to the size of the room and normally would include a microphone system for the presenter with some other microphone points in the audience for questions or some assistants would be moving with a wireless microphone when needed.

It is worth mentioning that in conferences there are also frequent other formats such as round tales, live interviews and others. These are normally used to introduce some variation in the sessions. Also for some topics these formats are more adequate than a regular presentation.

The organizer perspective

In order to complete my knowledge and vision about conferences and presentations in this context I conducted an interview with Mr. Emanuel Alfranseder, who was introduced previously in this chapter. He provided me with good insights from the perspective of a conference or meeting organizer due his personal experience. I would sum up the key points that I could extract from the interview and an informal conversation.

One important aspect of organizing a conference or a meeting is to fix the agenda, which involves contacting multiple parties can be challenging. Finding the right spot for everybody can be difficult. Also allocating the needed amount of time for every presenter is sometimes complicated. The more participants and speakers the earlier this has to be done, normally 5 or 6 weeks in advance but might be more for bigger events.

Long days are quite common in this context. When people meet they normally want to use the most time possible so the agenda tends to be packed. This leads to a tired audience sometimes and therefor a lower engagement.

Regarding the equipment it was surprising to hear that sometimes WiFi is not available in some conferences or meetings. Unless they are in a very well prepared venue charac-
es are that connectivity is limited due the high number of people wanting to get online. Also if it is an international event it is quite common that the audience does not have mobile Internet access as they are out of their respective countries.

Regarding the presenters he noted that although there are a lot of great speakers out there it is still quite common in some conferences to find presenters that still have a hard time presenting. Some presenters are good in their fields but they might not be that used to present. This happens a lot with bureaucrats and some public officers.

We also commented the issue of getting feedback from the audience. Emanuel noted that this is quite difficult. Sometimes surveys are run after the event but not a lot of people from the audience end up filling them up.

Regarding how the people in the audience can intervene and ask the presenter he pointed out that there is not such a golden rule here. Sometimes presenters do not mind taking questions while they are presenter and some other times the questions are only taken at the end.

The speaker perspective

In order to get the perspective of a presenter or speaker I conducted an interview and small talk with Victor Alonso, who is an experienced speaker and was introduced at the beginning of this section.

Victor pointed out a few things that he had learned though his experience. He told me that he used to take the preparations of the talks very seriously and he rehearses a lot before each talk, especially when it is one he has never done before. He also tries to keep them up to date using the feedback got from previews times.

He tries to have a plan B for the situations when he has no connectivity, so he has offline material ready.

He pointed out stage fear and getting people’s attention as the biggest challenges he faces. The first one has got a lot better with experience.

Regarding feedback Victor shared that for him the most valuable one is the feeling that he gets from the audience. It is relatively easy to see the general feeling that people had about the presentation. Also the number of questions that he gets it is a good indicator of how engaging the presentation was. Sometimes the event organizers provide them with survey results after the event but this does not happen very frequently.

Context within the research community

It is my intention to frame my research within the field of Audience engagement. There has been an interest in the community. For example Webster and Ho (Webster J, & Ho, H 1997) have researched about audience engagement during multimedia presentations. On a more recent time, 2011, Latulipe et al (Latulipe, C, Carroll, E, Lottridge, D 2011) have researched about how to measure audience engagement in the context of dance and theater and if experts in the field of these arts would find it useful and could interpret these readings. They also serve as a theoretical background for several related concepts such as valence, arousal, engagement and others discussed in the next chapter. Aigner et al. (Aigner, W, Tomitsch, M, Stroe, M & Rzepa, R 2004) have research on audience engagement for sport events with mass voting devices in their paper “Be a judge – Werable motion sensors for audience participation”.

L. Barkhuus and T. Jørgensen (Barkhuus, Jørgensen 2008) have researched on audience-performer interaction in the context of music events. They gathered findings and observations in a set of musical shows that would match some of the ones found by others, such as Lupyan and Rifkin (Lupyan, G. and Rifkin, I. 2003) that focused on concerts and speeches. This showed up that the context of each type of performance matters, not being the same at a classical music concert than at a rap show.
In the context of aggregated audience interaction Maynes-Aminzade, D, Pausch, R and Seitz, S. have conducted various experiments (Maynes-Aminzade, D, Pausch, R and Seitz, S 2002). They used computer vision and movement tracking to create interactive games for movie theaters. In one of them they used the audience position to control a video game. If the audience would lean towards the one side the game will do the same. They also used a beach ball for the audience to play, casting a shadow on the screen that would be then used as a pointer for other type of games. Finally they also used laser pointer tracking to allow the audience to play with the screen in a painter like game or to cast their votes in a multiple answer question game.

In my case I focused in a different setup where the audience is normally focused into the content for purposes other than recreation.

The research revolves around social experiences. A presentation is a communicative act that involves always an audience, which interacts with and modifies the result of the experience. The same presentation never comes up the same way; the audience might react differently and have different questions for the presenter, for example.

Mobile technologies and wearable devices have also been taken into account for the research. The fact that nowadays everybody has a mobile device with good connecting capabilities opens the possibility to use this for audience engagement. Some experiments have been conducted already in the past in the mobile phone era. For example there are various systems where people can respond to polls presented to them in a presentation though SMS messages. Some examples of existing research projects, technologies and systems will be described in the next section.

Examples of related work

Mosio

A few companies offer commercial systems for SMS voting in conferences. Mosio [6] offers one of these systems, that includes also alerts and notification for conference participants. The system also collects questions from participants for a Q&A session after the presentation. The questions moderated and then posted on the screens and also saved in case there is not enough time so they can be answer later. The system works fully on SMS so more devices are supported. This system revolves around a conference set up helping in both the presentation time as well as in the time in between presentations.

SMSpoll

SMSpoll [7] offers a commercial service that focuses on real time polls. The results are collected in real time and displayed within a MS PowerPoint presentation. The audience can vote through SMS, though a mobile friendly web or though a desktop website.

Poll Everywhere

Another web service worth noting is Poll Everywhere [8]. This commercial service allows real time polling during presentations. The audience can use Twitter, SMS or a web interface to vote and the results are displayed in a web or in a MS PowerPoint presentation. This system is the most flexible as it allows a wide range of voting options that would suit almost any device no matter how old it is.
Be a Judge!

A very relevant example is the one presented by W. Aigner, M. Tomitsch, M. Stroe and R. Rzepa in 2004 for the student competition of CHI 2004. The paper is called “Be a judge! – Wearable wireless motion sensors for audience participation” (Aigner, Tomitsch, Stroe & Rzepa 2004). In their paper they deal with issues such as Audience participation and voting.

In the paper they present an audience voting system that utilizes the natural behavior of sports spectators: clapping and cheering. The system is tailored to sports events but shows a lot of characteristics that are very relevant to the research that I carried out.

Their system features wireless motion sensors to detect the clapping frequency of each participant and microphones to monitor how loud the audience is at a given time. This enables the spectators to vote in real time. The scoring is shown in real time on wall side screens and might be contrasted with the official event judges’ scores to foster audience engagement.

This fits as a good example although the kind of audience is different to the case that I would be dealing with. While sport spectators are mostly motivated for pure joy, people that attend a presentation normally do that in another kind of environment. This environment might range from a class, a professional conference or another communication event.
Engaging the crowd – Studies of audience-performer interaction

Another example is the one by L. Barkhuus and T. Jørgensen (Barkhuus, Jørgensen 2008). In this research paper the authors discuss and research the interaction between the audience and performers in musical concerts. First they observe multiple concerts to understand the context better and its particularities compared to other previews research. After this they develop a prototype of a cheering meter to increase the sense of audience participation and test it in different rap concerts before drawing their conclusion.

The meter that they developed uses a noise meter to measure the excitement of the crowd so it could be used in turns to vote in rap competitions. The system had a display that would show the cheer level and it is portable so it can be deployed and adjusted to work in multiple places.

Techniques for interactive audience participation

In this paper the authors Maynes-Aminzade, D, Pausch, R and Seitz, S show different ways for an audience to interact collectively. They developed three experiments that allowed a movie theater audience to play collective controlled video games before the movie would start.

In their first experiment they tracked the audience movement (leaning to right or left) to control a driving like videogame shown on screen. In the second one they would use a beach ball that the audience was supposed to bounce around to track its shadow. Then the shadow would be used as a pointer device on screen to play another video game. In the last experiment they used laser pointers used by members of the audience. The laser points on the screen would be tracked to be used in a paint like collaborative video game and in a multiple questions game for voting.

In their paper they also draw some conclusions in the form of design principles for interactive audience participation environments. They would cluster them in system design, game design and social factors.
Method and academic practice

Method

My approach was to first research about the general topics that I wanted to address in my thesis to see what had been done before, exploring different relevant examples and research studies about the audience engagement. Also I would spend time reflecting about the context though my own experience and also with interviews with relevant actors.

Once this is done I would start an exploration phase to explore different technologies and concepts in a broad way. Then I would select once of these concepts and start an iterative process to develop it and test it.

I decided to follow an iterative process where I would develop a quick prototype, test it and then improve it to get a second prototype with the feedback gathered from the test. Afterwards I would analyze the results and draw my conclusions.

Questions for the exploration phase

For the exploration phase I set up a few questions to guide myself to dive into the topic. This also helped to discard some possibilities in case that they were too ambitious technologically or too costly.

I came up with these questions through my reflections and findings about the context presented in the previews chapter. These questions were aimed to find out what was technologically possible to do for my concepts. Being able to locate the speaker or to use gesture interactions to control elements during the presentations would open paths for different concepts.

- **How can we micro-locate the speaker?**
  - With Bluetooth Low Energy™ it is possible to locate how far are two compatible devices so it would be possible to micro locate a user into different zones, although the precision might not be better than 2 meters.
  - *Kinect™* can detect when a human shape is on its view range. Therefore it could know at a given time if the user is at some location (a few meters) or not. With more units working at the same it could be possible to have multiple detection zones, if this is possible.

- **How can *Kinect™* be used to control presentations?**
  - *Kinect™* can be used for gesture recognition and therefore simple arm gestures could be recognized to control presentations.

- **How can micro-gestures be detected during a presentation?**
  - I research a little bit on the capabilities of some IMU (Inertial Measurement Unit) that could be used to detect gestures with high precision. In this tutorial [1] one of these units is used to track the movement of a small device.
Exploration papers

For the exploration phase I tried to find research papers that would be relevant to audience engagement and other presentation related concepts such as gestural and natural interaction. I will list some the most relevant ones summing up their contribution and aspects that I consider important.

**Audience engagement in multimedia presentations**

This paper (Webster J, & Ho, H 1997) served as my basis for the concept of engagement. I discuss most of it in the Engagement section.

**Rhetorical considerations for innovative approaches to performance and audience engagement**

In this paper Bonner and Pebbles (Bonner, J. VH & D. Pebbles, D 2013) take an interesting approach on presentations introducing into them a performance perspective. They research on how the use of new technology media can be introduced into a presentation to add a performance aspect to it. They also devised a framework to that would act as an instrument for evolving presentations into performances.

**Love, Hate, Arousal and Engagement: Exploring Audience Responses to Performing Arts**

This paper (Latulipe, C, Carroll, E, Lottridge, D 2011) helps to define some concepts about audience engagement. It is divided in the three parts. In the first one a theoretical background is given and other relevant papers are mentioned. They also discuss here different measure techniques and concepts related to them such as implicit or explicit engagement measurements.
The second part describes an exploratory study with art experts of the field of dance and theater. In it they show various experts a system that displays a dance performance and a theatre performance along with data measurements from GSR (Galvanic Skin Response) from different individuals of an audience that viewed the video-performances before. The experts can then play with the information given and try to extract conclusions of the possible use of it to interpret audience engagement. After getting a positive response from the experts they continue with an empirical test to establish how valid was this GSR data for measure audience engagement.

In the last part they set up four hypotheses to be tested in an empirical audience response study where the audience is shown a dance video while they wear a GSR sensor and they use one explicit self-report device. This last self-report device was a slider but the scales on them were different. Half of them used a slider that would have a “Love” label on one end and a “Hate” label on the other side to show a positive/negative feeling. They could use any middle position to show indifference or mild feelings. The other half would use a slider that would have “No emotion” on one end and “Strong emotion” on the other one to indicate when they would feel a strong emotion or not regardless of its valence (good or bad) to indicate some kind of “sleepy/activated” state. By comparing the GSR responses with the responses from the self-report devices they provided support, with strong correlation, to the interpretation of GSR as a valid representation of audience engagement.

Engagement and related concepts

J. Webster and H. Ho in their paper “Audience engagement in Multimedia Presentations” (Webster, J & Ho, H 1997) try to explain theatrically the concept of Engagement. He uses the definition by Laurel (Laurel, B. 1991, pp. 113-114) that describes engagement as:

“The state of mind that we must attain in order to enjoy a representation of an action...engagement entails a kind of playfulness - that ability to fool around, to spin out ‘what if’ scenarios. Such ‘playful’ behavior is easy to see in the way that people use spreadsheets and word processors.”

This definition also goes with the lines of the definition used by Latulipe et al. (Latulipe, C, Carroll, E, Lottridge, D 2011) that thinks of engagement as related to attention and interest but makes an interesting point extracting the positive valence out of the concept meaning that a negative experience can also be considered engaging as well as a positive one as long as it is interesting.

Latulipe et al. also relates engagement to arousal more than to valence. They understand arousal as excitement or intensity of the emotion whereas valence refers to a positive or a negative emotion.

Webster and Ho also say that according to other education researchers engagement is central to learning. Although the scope that I would like to research about in this thesis does not only cover educational presentations I think it is obvious that there is an education component in most presentations such as the ones that occur in a professional conference.

He also revolves around the concept of playfulness and states that it is an appropriate lens to study engagement during presentations.

Implicit and explicit measurement methods

Latulipe et al. (Latulipe, C, Carroll, E, Lottridge, D 2011) also describe different approaches to measure engagement. They talk about explicit and implicit methods. The explicit methods include clapping and other post-performance self-reporting methods such as surveys or interviews. They also note the problem of the offset time from the actual performance time and the ‘peak-end’ factor that says that the measurements or emotional
experience is greatly influenced by the last moments of the performance. These two factors should be taken into account when interpreting these measurements.

About direct implicit methods the mention various biometric parameters that could be captured through various sensors such as heart rate, blood pressure, galvanic skin response (GSR) or respiration. These methods are hard to implement for a whole audience in terms of cost and also because they might interfere with the experience itself. Some other methods might be indirect, but still implicit, such as the use of cameras to detect facial expressions or Body Posture Measurement Systems (BPMS) with sensors on the seats.

A combination of one implicit and an explicit method might provide continuous information regarding the attention of the audience to the explicit method.

Regarding both measurement methods they note that the use of a stimulus-response approach for the interpretation might not be the best one as some pieces they have a structure with different parts that build emotion up and down in an organized structure.

Factors that influence in audience engagement

Webster and Ho (Webster, J & Ho, H 1997) propose that: multimedia designed to provide more challenge, feedback, presenter control, and variety will engage learners more than multimedia designed to provide fewer of these features. In their research they provide some support for this thesis but the most interesting part for me is that it provides a framework for my research, as I will try to provide a concept that revolves around these aspects.

Challenge refers to the level of difficulty and challenge that every activity has for a person. Webster refers to some theories that say that humans are normally sub optimally aroused. If the presentation does not suppose a challenge then it leads to boredom. If the challenge is too high then it leads to anxiety.

Feedback refers to the signals that the user perceives as a result of his or her actions on general terms. This applies also to the possibility of changing things during the presentation and observing those changes.

Control refers to the feeling that a person perceives of being able to decide on how the situation evolves to some extend. In the case of presentations in might refer to the control of the presenter over the presentation or the control of the audience. Both might the worth exploring.

Finally, variation refers to how different are the different parts of a tasks or event. In the presentation context would mean different media used and/or different presenter styles. The more variation generally means more engagement.

It is important to note that the framework presented by Webster and Ho is quite old, from 1997. The context where it was developed is quite different from the actual one. The use of technology is much more common nowadays which might have an impact. Although this is true, I have considered that the factors considered by the framework are abstract enough to be also valid now. Intuitively variation, challenge, feedback and control would be factors that boost audience engagement. Also provided that it only serves as a guide for the research I considered that it is a useful tool regardless of its antiquity. Anyway it is important to consider this limitation.

Audience interaction

In the different papers that I checked for the thesis different ways are considered for audience interaction. In the example by Aigner et al. (Aigner, Tomitsch, Stroe & Rzepa 2004) the main interaction used is audience clapping and cheering measured by microphones This involves a level of intrusion as the participants have to wear wristbands. Cheering is the main interaction measured from the audience in the research paper by
L. Barkhuus and T. Jørgensen (Barkhuus, Jørgensen 2008). This is not intrusive at all as the audience does not have to equip or use any device.

Some other interaction ways have been used and considered such as buttons or slider. That was the case of the research by Latulipe et al. (Latulipe, C, Carroll, E, Lottridge, D 2011) where they ask the audience to use two different types of sliders. All these input methods share that they do interfere with the regular audience experience, in contrast to the noise based actuators that are almost transparent as they make use of the normal activities that usually take place in the context.

The interaction of the audience might be individual or collective. Maynes-Aminzade, D, Pausch, R and Seitz, S (Maynes-Aminzade, D, Pausch, R, Seitz, S 2002) explored an approach were members of the audience would collaborate in the interaction. In one of their experiments they would use the movement of the audience to control the video game on screen but only the global movement of the audience would be considered. If one person in the audience would do something different than the rest the effect of this would be almost ignored. In the second experiment the audience would have to bounce a beach ball around to cast a shadow on the screen. This shadow would be then tracked to act as a pointer device on the screen. This interaction is collaborative but different than the previews one, as people take turns to touch the ball. Not all the members of the audience participate at the same time but they all might intervene at some point of the game. Finally in their last experiment they used laser pointers carried by the audience. The beams on the screen would be tracked and used for two different games. One would be a paint collaborative canvas, so the audience would be able to paint on the screen altogether. In the second one the beams would be used for voting different options in a multiple answers game.

The most interesting aspect of their experiments is the collaborative approach where members of the audience interact together. Also they create an extra experience that has not much to do with the initial activity that they audience was suppose to carry out. Also the fact that additional equipment is necessary makes the experience more artificial.
Design experiments and findings

Concepts explored

After diving into the theoretical background of the concepts of engagement, how it can be measured and which factors influence it, I wanted to conduct a design experiment in order to test some of these factors. In this way I could see if audience engagement for presentations can be boosted using systems or designs that exemplifies some of these factors.

In this section I will present some rough concepts that came up in the early stages of the research process. Some of them are more elaborated than others and concrete while others are less developed. This hopes to show the decision process that lead to the final concept selected to support the research process. The selected concept and its evolution are presented in the next section within this chapter.

#1 - Devices for the audience to evaluate the presentation in real time

The audience would be able to "like" a slide or moment within the presentation. Afterwards the presenter would be able to see those moments, which slides are better and the overall performance of his presentation. This concept revolves on the aspect of control as it allows the audience to have a sense of controlling the experience or evaluate it in real time.

For this concept a lot of ideas sounded feasible and interesting to explore such as using a noise meter for the audience. Also an activity meter for the audience to measure how calm or excited they are during the presentation.

This concept focuses on increasing the control of the audience and allowing them to show some feedback as well.

#2 – The audience decides the path of the presentation

In this concept the idea was that the audience would be able to interact with the presentation in a very direct way. They could choose a different path for the presentation with hand gestures. Maybe moving within the room and taking the path represented for the side of the room more populated. Physical and embodied interaction would be concepts explored within this concept.

The concept explores the factor of audience control of the presentation.

#3 – Collaborative media and social media during the presentation

The main idea for this concept would be to use social media and collaborative media in real time during the presentation. The participants would be able to add information related to the presentation in real time. Comments on the slides in real time could also be something to explore.

This concept would improve both the control of the participants but also would introduce a level of variety that might boost engagement.
#4 – Tablet presenter control

For this concept the core idea was to allow the presenter to use a tablet device and its touch capabilities to control the presentation. This will allow the presenter to do various actions. For example he or she could zoom in some parts of the slide in real time, trigger animations in a much more precise way or use his or her fingers to choose a different path for the presentation flow. This concept focuses on how to enhance the control of the presenter over the presentation in order to make the experience more rewarding and engaging for the attendees.

This concept revolves around the factor of control.

Concepts discarded

The concepts #2, #3 and #4 were finally discarded for various reasons.

The concept #2 that revolves about the audience choosing the path of the presentation was discarded because it forces the presenter to go an extra mile for it to work. The presenter would have to prepare different paths for the presentation something that sometimes might not be even possible or would require a lot of effort. I wanted that my solution or prototype would not put much of a burden on the presenter. Also it only revolves around the control factor, being it then quite limited on the factors explored.

The concept #3 about collaborative media and social media was discarded as something not very new. There are some other systems already that allow an audience to comment live on a presentation or to interact with it though social media.

The last concept #4 explored gestural interaction. In this concept the presenter controls the presentation with gestures to trigger animations and events on screen. It was discarded for similar reasons as the case of the #2 concept. It would involve the presenter adapting his presentation style to fit those available animations and controls. It also seemed quite challenging technologically wise, as it would involve interfacing with the presenter software itself.

Concept selected

I selected the first concept (#1) of the ones presented in the previous section. In this section I will describe it before talking about the first prototype and the user test.

The concept tries to work on the factors of control and feedback that have been discussed in the previews chapter "Method and Academic practice". The factors of variety and challenge have not been explored though this design because of various reasons.

For the variety factor I consider that it is something that falls more on the presenter side. He or she should keep a variety on the media used (pictures, text, video and even sound) and it is best tackled on that side. I think it would be quite complicated to design a system that would introduce variety on a presentation without intervening too much within the presentation itself and this is something that the presenters would not like. The system should not be invasive.

The factor of challenge is also something that is tightly related to the presentation itself so it is also difficult to boost without changing the presentation itself. It would be more a recommendation to presenters to keep the challenge level of the concepts presented high enough according to the audience. If the level is too high most of the audience will not follow and if it is too low the audience will be bored.

The selected concept is a device that allows the audience to give live feedback to the presenter via voting devices. The audience would be able to give three different signals to the presenter.
The first one is a “+1” or “Like” to show that they appreciate an idea that the presenter just talked about on a particular slide in the presentation. The second one is a “-1” or “Dislike” to show that they do not agree or do not like something that the presenter has said or shown in the slides presented.

The last signal is ‘I’m lost’ that lets the presenter know anonymously that someone in the audience is lost. The anonymous part is key in this signal. This enables people in the audience to show that they are lost without being scared of being judged by the others.

This has two purposes. The first one is to give a feeling of control to the audience which is one of the aspects that enhances engagement as described in the Method and Academic practice section earlier in this document. Of course the degree of control that the audience perceives is limited but it is definitely more than in a regular passive spectator experience.

The second purpose is that due to the display there is a feedback from the actions that the spectators will take. They would see on the screen that the votes are counted and displayed which also enhances the experience.

There would be a screen next to the main presentation screen that will show the overall score of the presentation. As soon as a “+1” arrives it will be added to the number on the screen. The screen will be facing the audience so they can get the feedback of the signals that they trigger. The ‘I’m lost’ signal triggers a special effect on this screen and also sets off a sound so the presenter knows about this. This is also intended as to reinforce the feeling of control over the presentation as when a user in the audience uses this option a reaction from the presenter might occur.

After the presentation the presenter would be able to see when the likes came in and which slide was active and that time. Also some statistics regarding the scoring will be shown. This would help the presenter to find the weak points or points to improve in his or her presentation.

First prototype

The first prototype was implemented as a wired solution with small voting devices for the audience. The devices have three small push buttons to trigger the signals. These wired input devices would be connected to an Arduino™ micro controller board that would receive this signals and send them to a computer that executes a Processing sketch that display the score.

The communication between the micro controller and the Processing sketch is done though serial connection though the USB cable that also serves as a power supply for the Arduino™ board. Instructions on how to get the code for both the Arduino™ and Processing sketches are included in the appendixes.

I considered other options for the communication with software. Ideally a wireless solution would have been more convenient as no wires would have to be hanging from the participants to the main computer. Also with the wired solution is more complicated to have a lot of participants at the same time due to the limitations with wire. Radio frequency systems or Wi-Fi or Bluetooth options were considered but discarded due to price and technological complexity. Also as the first test was going to be run with little users (around 5 or 6) having wired devices would not be a great issue.

Also this way I would have more time running an early test and save some budget for the next iteration for the prototype so I could improve it with the feedback gathered from the first test. Therefore the look of the devices itself was rough as I used cardboard for the structure and I did not used any labels or spend any time making them nicer or more pleasant to use.
In the picture you can see two of the voting devices with the three buttons. The blue one was the +1, the green one was the -1 and the red button was the “I’m lost” signal.
This is the output canvas of the Processing sketch. The global counter of the presentation is shown. As “likes” arrive the background of the screen would turn green to indicate it and if “dislikes” or “-1s” would arrive then the background would turn red.

First prototype user test

The first test was realized with only two persons being one of them myself. Instead of having a real presenter I used a TED Talk video about a new interfaces with computer systems. We used the main projector available in the class, which also has a sound system available. It was used as a preliminary test just to discuss the concept further with one of my fellow colleagues at the Interaction Design Masters at Malmö University.

After the test I asked some quick questions to my colleague.

1. Did the device interfere with your interaction with the presentation?
2. Do you think the use of the device provides a more engaging experience?
   a. Yes, a little.
3. Would you change something?
   a. Maybe the sound effect for the “I’m lost” signal is too much. I would also name it “Explain more” or “Elaborate more”.

Some issues were brought up after some quick questions with my colleague. We both agreed that if the idea was the scoring is related to a part of the presentation it would make no sense to display in the screen the total sum of “+1” and “-1”. The feedback is more interesting if it responds to specific parts and not as a global counter. Also if the counter is negative or very low compared to others it can produce anxiety to the presenter even though in the setup that we used only the audience could see the scoring screen. Also there are lot of relevant examples where it is only possible to express a positive reaction, like in the social network Facebook or in Tumblr, so after some deliberation I decided to drop the “-1” option.
Also we agreed that it could be interesting that instead of setting off a sound to let the presenter know that someone in the audience is lost it might be better just to note in the presentation that there was a question or issue there for later discussion after the presentation is done. In this way during the time for questions and comments the presenter can review those points in the timeline of the presentation and clarify them, even asking the audience what should he elaborate more on. In this way the flow of the presentation would not be broken.

Also my colleague had the idea that maybe the ‘I’m lost’ signal should trigger a vibration device that the presenter is wearing instead of the sound. In this way is less disturbing for the presenter and the audience and also the presenter would be able to ignore the signal more easily without disturbing the rest of the audience. This also opens the discussion of when the presenter should stop to clarify. With larger audiences the presenter might not want to do some live clarifications if only one person in the audience is lost.

Based on the suggestion of my colleague and provided that I had not put a lot of time thinking about how to name the ‘I’m lost’ option I decided to reflect on it. The label ‘I’m lost’ reflects a negative aspect for the user. I think it is common sense that people do not like to admit when they are lost or not following (for example in class is quite common for students to say that they are lost) so this could discourage users to use the feature, although the system provides privacy. “Elaborate more” offers a more precise command for the presenter and does not imply the negativity of the other label. Also the meaning behind it is more general, someone could be perfectly following but interested enough to ask for more details or elaboration on the topic.

Even though the test was rather simple and small it raised some good points to consider for the next iteration of the prototype and the concept itself.

Second prototype

New voting devices

For the second prototype I took into consideration some of the feedback that I got in the first user test. The first thing that suffered changes was the voting device used by the participants or the audience. Instead of using a cardboard structure with buttons and a wire I decided to go for a wireless solution that could work for a bigger amount of people at the same time. With the previews solution for every new person in the audience a new device would have to be made and also another wire would be adding to the mess.

I decided to use existing devices so I considered smartphones, as they are quite common nowadays. I decided to use a web app that could be visualized in a wide range of browsers. This would not only allow smartphones to be used but also tablets or even desktop computers, virtually anything that could run a modern browser could do it. The application is a Django [3] app that uses the Bootstrap [2] framework for the frontend. Django is a web app framework that uses Python. Bootstrap was used to make the web app responsive so it would look good in most of the devices. It also helps with the general styling of the web page. The application is quite simple. It displays two buttons, one for voting “+1” and another to ask the presenter to “Elaborate more”.

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In the picture you can see both buttons with the related explanations. Note the counter that shows the global score.

**New way of counting**

The main display that is in front of the audience was also changed for the second prototype. In the previews version it showed the global score but in the second one only “+1’s” are shown. When they arrive they show on the screen for a small amount of time (around 5 seconds). If another “+1” arrives within this period of time then it adds up and a “+2” is shown on the screen. This continues until no new “+1” arrives within those 5 seconds. This shows the aggregate votes for a punctual moment that represents better the idea that a concrete part of a presentation is good.

Technically this panel will be generated with Processing. The software will poll the web server where the web app is deployed to get the counter of “+1’s” and update the display.
The likes add up when they come together. This example screen shows 4 likes that came within 5 seconds one after each other.

New signal for the presenter: Vibration

In the previews prototype the audience had the option to use the button “I’m lost” to let the presenter know that they were not following the presentation or that they had not understood something. This will trigger a sound in the main computer used to run the Processing sketch that runs the display. This showed to be too intrusive according to one of my colleagues and distracting for the presenter and also for the rest of the audience. I decided based on a suggestion from a colleague to use a vibration based notification. In order to implement this in the prototype I considered a few options.

For the first one I explored a bit what it would take to develop and make a simple vibration device. Having into account that it would have to use again wireless technology for the presenter to have it in his or her wrist or pocket I anticipated that it would be again not an easy task. Then I realized that I could use a mobile phone to get a vibration notification either with an email client or another service that would have an API such as Twitter that could accessed by Processing or another software running in the computer. This would be a simple way to implement a vibration notification without having to design and make a custom device.

Statistics for the presenter

Another feature that was added to the second prototype was a small panel with statistics shown to the presenter at the end of the presentation. This feature was added to take into account the difficulties that presenters have in order to evaluate their performance, as mentioned by one of the presenters that I interviewed. In this simple screen there is a bar graph that shows the individual score for each slide in the presentation. This is useful for the presenter as he or she would know which parts of the presentation have been more engaging and which parts of the presentation might need to be changed.
But in order to get this statistics we need to know which slide is active at a given time to be able to cross it with the scores coming from the web app. The solution used is a pair of capacitive sensors attached to the left and right arrow keys in the keyboard. To control the sensors a CAP1188 8-key capacitive touch sensor breakout board was used. These sensors would be attached to an Arduino™ UNO board that will be connected to the computer. In this way the computer is able to know which slide is active at a given time. There are some limitations to this technique (slides with text animations for example) that will be discussed later in the Analysis and design discussions chapter.
On the right is the capacitive sensor breakout board. Note the LED's that light up as the touch sensor is activated.

Second prototype user test

For the second round of test I ran two rounds with one different presenter each round. The presentations were around 10 to 15 minutes long and there were 4 people in the audience. The presenter was different for each round and the previews presenter would join the audience for the round of the other presenter. We used a big TV for the presentations and a laptop computer for the scoring display and also to run all the software.

After the experience a round of interviews were conducted to both the presenters and the audience. The script of the interviews can be found in the appendix.

I had some difficulties with the Twitter™ notifications, as it seems that sometimes they take a little to arrive to the destination account. It technically works but to solve this quickly we used the instant message service Whatsapp™ to send messages to the presenter when they wanted to send the “Elaborate more” signal. This will make the presenter phone vibrate.

Also the statistics shown at the end of the presentation to the presenter were quite simple showing only the global counter of likes of the presentation.

I would describe and comment over some general observations that I saw during the test.

It was a little inconvenient for some people to use their smartphones to vote. They worked fine but the auto-lock that locks the phone and the screen if they are not used for a while messes with the ability for people to send likes quickly. This can be disabled or adjusted for longer time in most phones, which is something we did for the second run of the test.

It was good though that the responsiveness of the screen regarding to the voting devices was pretty good. People could clearly see the feedback from sending a like with the web app and seeing it on the screen.
People used the “+1” signal quite often. I seemed to be quite natural for all the people in the audience. The concept was in my opinion well understood.

From the interviews I could say that everybody felt that the system would help boost audience engagement. All of the participants in the audience used the “+1” signal or button to express their opinion on parts of the presentation, slides or ideas. Not a lot of people used the elaborate more signal. It happened a couple of times and the presenters basically asked the audience and a small and informal chat took place to find out what had to be repeated or clarified. I think that the fact that the people that participated in the test knew each other and were friends made the situation different of what I could have been in an environment where people do not know each other much. Also if the audience was larger probably the social dynamics would be much more different as well.

The main conclusions that I extracted were that the system helps with engagement and also helps foster the dialogue between the presenter and the audience. The “Elaborate more” signal lets the presenter know that he needs to stop and ask the audience or do something but lets him decide when to do it, so maybe he or she would take 20 seconds more to finish one idea before going back or asking the audience to find out what was wrong.

Second prototype user test II

The second test for the second prototype was a test in a real life environment. The test was run within the context of a presentation for an information meeting about a student organization at the University of Valladolid, Spain. The presentation was an introductory presentation about the general objectives and activities of the student organization. It lasted for around 15 minutes and there were around 34 students present.

The presenter and the audience used the prototype. There was a computer displaying the counter in front of the audience. Most of the people in the audience were able to use their mobile phones to vote, around 30 of them. After the presentation I conducted six interviews, five with people from the audience and one with the presenter. The scripts from the interviews can be found in the appendix.

I gathered some general observations during the tests. I was standing in the back of the room observing the participants. I could see that the likes slowed down as the presentation went on. This could be because and the beginning the audience is more willing to try the system but as the presentation goes on they forget about voting or they do not feel the novelty of it. I also saw that some of the participants struggled a bit again with the phones, as they had to unlock their devices before voting. This will mean that the “stimulus-response” interpretation of the votes would have to take this delay into account, if that is the case. Although I saw this annoyance in the participants all of them said that they liked the fact that it was a good idea to use phones, I quote: “Yes, I think it should be used more” and “Yes, it was easy to use”. Some said that it is good because they are widely available, “Yes, because everybody has one”.

The first conclusion that I got from the test was that the “+1” feature was well understood. This confirms my impressions from the previews test. All the presenters got the meaning of it and made good use of it.

During the test the presenter got one “Elaborate more” notification and asked the audience what was not clear. Someone in the audience asked and the presenter replied. After the presentation continued. This only happened once and in the interviews most of the people said that they did not used the feature because they did not need any clarification.

In the interviews two persons said that the system helped them to be more engaged, two others said that it did not changed anything and another one said that it does not boosts the engagement in a conscious way but that it changes the experience, “Not in a conscious ways. It changes the experience”. These results along with the ones from the
previews tests give some evidence that the audience in these three experiments feel that the system boosts audience engagement. This is a subjective matter from the audience itself that comes from the interviews conducted.

From the interview with the presenter I got some information about how invasive the system might be in a real life environment. He told me that it was a little weird at the beginning but he got used to it quite quickly. He did not think much about it. He felt once the vibration notification and stopped to solve the question. He even noted that the notification itself might be too mild. He thinks he might have got another one but he was not sure so he did not stopped.
Analysis and design discussions

Analysis of the work

The design experiments were intended to test some of the factors of engagement that were discussed in the “Method and Academic practice” section. From these four factors that Webster identified I chose to work around control and feedback on my prototype to see if they would improve audience engagement during a presentation. Webster and Ho (Webster, J & Ho, H 1997) provide some support of the thesis that multimedia that follows these factors is more engaging that the one that does not but they focus more on a learning context and also their comparison revolved around two different software programs. My intention was to be more technology independent and also the context would be different to a class. Also the experiments date from back in 1995 so newer tests could be useful having into account how technology and society has changed in the last 20 years.

Latulipe et al. (Latulipe, C, Carroll, E, Lottridge, D 2011) discussed in their paper about various ways to measure audience engagement. In their experiments they used an implicit method using the GSR (Galvanic Skin Response) of the participants as discussed in the “Method and Academic practice” section. They used as well an implicit method using a self-report measure of engagement by the audience using two different scales. By comparing the data they concluded that GSR data is a valid indicator for audience engagement.

Of course it is complicated to gather GSR data from a large audience and it also involves having to wire people and making the situation or context much more different than a normal experience. Therefore I decided to use a self-reporting method to measure to validate my prototype, based on interviews. I wanted to test in a real life environment so I wanted a system that was as less invasive as possible so the experience would not be that different.

When it comes to how invasive the system is, the approach that I decided to follow was similar to the one taken by Barkhuus, L and Jørgensen, T. After studying the context and particularities of the audiences in several concerts they decided to use the usual behavioral patterns. In their prototype they used clapping as a natural event within a concert. In this way they did not have to create an artificial situation nor use invasive devices for the audience. In the prototype that I developed I tried to keep it as less intrusive as possible but it does introduce a new minor experience, the act of voting, that is not normally present in a regular presentation or talk. The fact that devices are used presents a minor intervention as people in the audience must have one but different than using other uncommon devices. There is no need to wire things or use other sensors like in the system by Aigner et al.

On the other hand, Maynes-Aminzade et al. represent a different approach as they not only create an extra experience that is independent to the main event (the movie projection) but also make use of different devices such as laser pointers or even a beach ball for the interaction. The first of their experiments when the audience uses their own body would be the exception, as no new devices are used for the interaction. They had the approach of creating an extra experience to complement the main event, although I think there are ways to link those in ways that might create a more cohesive experience (for example using questions or games with themes related to the movie that will be shown afterwards).
It is also worth noting that in this case there is not a performer figure in the event. There is only a movie that will be shown afterwards but not an entity that we could call a performer. It is the audience interacting with a system and between each other. In mine and the other examples there is a figure that acts as a performer, the presenter in my case and the artists or sportsmen in the other two by Barkhuus et al. and Aigner et al.

The prototype that was developed for the experiment has some similarities with the LH (love-hate) scale used by Latulipe et al. in their experiments. In their experiment users would use this scale to note when they would like something and when they would not like something. In the first prototype there was the option of disliking something in the presentation but the concept was later dropped. Also the use of it is completely different, while they used the scale for their comparison with the GSR readings I used the voting system as a method to foster engagement itself, not to measure it.

The prototype has some similarities with the poll systems that were presented in the “Examples of related work” section. These systems allow the audience to vote on polls presented by the speaker. The audience is able to interact then with the presentation, which is similar to the design that I proposed but on the other hand the prototype is meant to rate parts of the presentation rather than responding to questions from the speaker.

There are also some similarities with “Be a Judge!” (Aigner, Tomitsch, Stroe & Rzepa 2004) Paper also presented before in the “Examples of related work” section. They focus on measuring audience engagement in sport events while my design uses a voting system to foster it. Still they follow an audience-centered approach that is in line with the one that I followed for my prototype. The same applies to the research by Barkhuss et al. where they revolve around music concerts with an audience-centered approach.

In the paper by Maynes-Aminzade et al. about techniques for interactive audience participation they conclude with a list of design principles that they extract from their experiments. They divided them in system design principles, game design principles and social factors. From the first group two of the principles are relevant for my prototype. They note that the focus should be on the activity not on the technology, which is applicable for my prototype. I do not think that if they activity of voting was not relevant then the use a new technology would make up for it. They also note that not everyone in the audience has to participate but enough to create the feeling that they are. The other principle talks about making the control obvious for the audience, which I do not find applicable for my case. The other principles about game design and social factors are not that relevant to my case as they are game related. They one about facilitating the collaboration between audience members could have been applicable if I would have followed a different approach with a concept that would foster this.

There is a relevant issue that some others like Barkhuss et al. have commented about. When personal devices are used for an interaction there is a technological fragmentation within the possible users or the system. This phenomenon appears because the different access to technology those members of the audience might have. Some might have the necessary devices while others might not and therefore be left out. This is a factor to consider in case it is of utmost importance that everyone in the audience has to participate. In my case this was important but if a small percentage of the audience would not be able to vote it would not be a problem, as they do not affect the experience for the others. Also the percentage of the audience without a smartphone it should be quite small and the trend is that it will diminish in quickly (by 2015 all of the western EU-5 countries plus the Nordics and the NL will have more than 50% smartphone penetration [9]).

Barkhuus et al. conclude in their paper that it was very important for their prototype that the audience would have clear feedback. They achieved this by using a few displays that would show the cheer-level. They would also calibrate the scale to the size of the audience so the values would always be in the 50% to 90% range. I also think that this was important in my prototype and used a display to show the incoming likes to the audi-
ence, also using some kind of processing for nicer formatting (aggregating the likes that would arrive together for a better visualization). This would let the audience know that the actual votes were arriving and the system was functioning properly. The system was fast enough (although it involved an internet connection) to create this feeling in the audience.

Barkhuss et al. experienced that in rap concerts there are certain patterns around applaud rounds that would take place in very specific moments during the performances. One of these moments is when the audience would experience anticipation when a well-known song or part of a song would about to start playing. Another moment would be to reward the performers after a great solo or at the end of the performance. They also noted that as in other experiments conducted before by Lupyan and Rifkin (Lupyan, G. and Rifkin, I. 2003) when 25% of the audience would start to clap then it would take around 1 second to reach 100%. This contrast with the application of my prototype where the audience would be enabled to show a positive emotion at any moment. My system therefore would allow a more in depth study of the patterns of votes during presentations although this was not the scope of my thesis.

Design discussions

First prototype

The +1 and -1 concept

The way the audience would vote the presentation has changed thought the two prototypes and from the initial idea. In the initial concept the audience could rate the presentation with these two signals or options but it was not clear if it would be a global counter for the presentation or if it would refer to individual parts of it.

In the first user test for the first prototype the question arose quickly. The global counter for the whole presentation could be useful but the information about which part of the presentation was liked was also very valuable. Given the length of a regular presentation it makes a lot of sense that some parts of it are more clear or interesting than others and this information is useful for the presenter.

Also in the first test we saw that the “-1” vote was controversial. It showed up on the screen and all the people in the audience could see that someone did not like that part or slide. This showed to be uneasy for the rest of the audience and to some extend would translate to the presenter. Also because others would see that a negative vote would arrive people tend to use this option less. It would seem too personal and directly against a person so even though people would thing that a part of a presentation or slide is not good it is not easy for them to express it given to social constrains.

The “I’m lost” concept

This part of the concept changed quite a bit thought the process, from the initial concept to the second prototype. In the initial rough concept it meant that someone in the audience was not really following the presentation. Maybe a concept just explained by the presented was not fully understood or it maybe sounded contradictory with the previous concepts. It was a way to let the presenter know in a subtle way that there was something not working. Sometimes it is quite hard for people to admit that they are lost or that they would like the presenter to repeat something so this signal was anonymous. Neither the presenter nor the rest of the audience would know who sent the signal but they would be aware of the problem due to the sound notification.

There was also discussion during the first test regarding the label of this signal. The labels “Elaborate more” and “Explain more” were suggested by a colleague as more accurate terms. I thought that people in the audience would be more willing to use this signal than the rather negative ‘I’m lost’ one, although I did not collected enough evidence
of this. The new label “Elaborate more” sounded like more adequate to me and also influences in the dialogue as it represents a direct question to the presenter (please elaborate more) than just letting him know that they are lost.

Audible feedback

In the first prototype when someone in the audience would push the ‘I’m lost’ button the main computer running the score screen would play a sound to let the presenter know so he could react to this. This showed to be quite disturbing for the presenter as it could make him lose his focus. Another kind of less disturbing modification would be needed. This is why for the next iteration of the prototype I decided to use a less intrusive vibration notification.

Also this raised the debate of the size of the audience and how this would impact on the reaction of the presenter. It would make no sense for the presenter to reach to a single person when the audience would be big enough. For larger audiences of more than 50 persons probably the threshold should be raised.

Second prototype

New voting devices and information display

This was the biggest change from the first prototype. As the first prototype was meant to be quick and rough the solution adapted was the minimum one to be able to run a quick and small test. For the second prototype it was clear that the way the devices worked had to be changed. Not only it was quite uncomfortable to use wired devices but also it would not escalate much in terms of cost. Also the more devices the more wire and the more material to move from one place to the other in order to run tests.

I looked at some options related to wireless devices and other technologies that could help me to design and implement the functionality that I needed for my prototype with the level of fidelity that I wanted to have.

I considered two options. The first one was using some sort of wireless communication technology for the devices. In this case no wire would be connecting the devices with the station but again new devices would have to be made with the complexity and the associated costs. This would mean devices with at least a micro controller board, a battery system and a wireless technology system adding up to at least 50€ per device. As I would need around 5 or 6 the costs were too much.

Also the complexity of designing such devices would be important. I explored a little bit the wireless technologies that I could use such as Wi-Fi, Bluetooth and simple RF (radio frequency) links. All of them would need an important learning time that I would rather spend in areas more relevant to the topic of my thesis. So I discarded this option without spending much time on it.

The final option was the selected one. I decided to design a small web app with a framework called Django. This is a technology I am a little familiar with and I could estimate in a much more reliable way the amount of time that I would require to get the prototype working.

For the appearance and the interface of this web app I used the frontend framework called Bootstrap. This allowed me to have default styles for the web interface and I could easily integrate with the web development framework.

For the labels or name of the functions I decided to use “+1” for the positive vote and “Elaborate more” for the homonymous signal. The first button will be green to show a positive effect and the other one would be orange. I thought about red but that might have been seen by the users as too aggressive as red is often use to notify errors.
Vibration notification

Another big change respect to the first prototype was the inclusion of a vibration notification instead of the sound one used to notify the presenter that someone in the audience might be lost. Based on the first test I decided to change this concept. Now it would be labeled as “Elaborate more” and it would mean that someone in the audience would like the presenter to review the point in more depth. It might sound like a small change but psychologically meant a lot.

In the second test for the second prototype I found out in the interview with the presenter that he had some issues recognizing when a vibration notification had arrived or not. Maybe a stronger vibration or a longer vibration pattern would help to fix this issue.

Statistics for the presenter

This feature was added for the second prototype. Although it was an idea that I had from the beginning it showed to be quite difficult to implement in an automatic way. The idea was to show useful statistics information at the end of the presentation to the presenter in order to allow him to improve his presentation performance. It was relatively easy to track the “likes” from the audience at a given time but in order to get a simple graph showing the number of likes per slide I would need to track when and for how long was a slide on screen to do the matching with the likes.

I could not come up with a lot of ideas for solving this. One option that I considered was to allow only PDF presentations. Then I could load them slide by slide in Processing as images and track internally the transition between them. With that and having access to the “likes” information from the web server I could do the matching before showing the statistics screen in the end. I did not want to force the presenter to adapt his presentation format much so I discarded this option.

The final approach that I took was to use a hardware device to detect keystrokes, left and right, which are the ones normally used to navigate through any presentation software.

This way the system would be independent to the platform although it could be misleading if the presentation has animations and then each key press would be accounted as a new slide while it is only an animation trigger (for example think about a bullet list that gets fired one item at a time).
Method reflections

In this chapter I would discuss and reflect about the method that I follow for this thesis.

General approach

My approach was to first research about the general topics that I wanted to address in my thesis to see what had been done before. This also helped me to orientate myself and decide where I wanted to go, as the initial idea was quite broad.

Once I got a theoretical background I decided to develop a design that would address some of the factors that I found in the literature that might boost engagement and conduct a design experiment with it.

I decided to follow an iterative process where I would develop a quick prototype, test it and then improve it to get a second prototype with the feedback gathered from the test. Then I would run a second test with the second prototype with a bigger set up to finish with a “real life” test in a conference type environment. Afterwards I would analyze the results and draw my conclusions.

Exploring

For this phase I used online resources and research papers to dive into the concepts around audience engagement and other related concepts. In this phase I also spent some time exploring some concepts and ideas about gestural interaction that could be used by the presenter to control in a more natural way his or her presentations. Finally I discarded this path for the thesis and focused on the final voting system that I prototyped.

I also tried to organize my ideas and elaborate a small concept map to orientate myself in the field and I also tried to define the concept of engagement and related concepts.

First quick prototype

The first prototype was meant to be a quick test to refine the concept. It was my intention to do this as earlier as possible so that could help me frame and define my final concept. Although it was quite rough I think it definitely help me to see that that was the path I wanted to follow. This was also the first part of the thesis where I had to get myself to the workshop and start working with electronics and programming.

First test

The objective of the first test of the prototype was to explore the concept and refine it. At that point I had the feeling that I could use some testing and discussion to make sure that the concept was improving. It helped me to find some things that could be changed and were core to the concept such as the labels or names for the signals.

Second prototype

The second prototype was way more polished than the first one. In this one the main objective was to fully illustrate the selected concept and have a higher fidelity prototype to conduct the final round of tests. Here I spent quite some time dealing with prototyping. Selecting the technologies, learning about them and implementing the prototype itself.
Second test

My intention with the second test was to get as close as possible to a real environment. I manage to get quite some people for the test but the main problem was that I needed them at the same time in the same place, to act both as presenters and as audience. Therefore the size of the group was limited to 6 people being two of them presenters and audience at different times. After the test I conducted some small interviews to try to gather some information about their feelings regarding the system.

Third test

In the third test I tried to get as close as possible to a real life situation in a conference set-up. Although it was not a full conference it had a lot of the aspects of what a presentation during a conference would look like. The audience was big enough (34 people) that did not know each other beforehand. The presentation lasted for around 20 minutes and I had time to take notes during it and also to conduct interviews afterwards with a good part of the audience and the presenter.

Things to improve

I think that I could have used some more time to decide on the topic proposed for the thesis. I did not have a clear idea of what I wanted to do so I formulated two questions that were broad enough to leave some room for decision later one. This made me lose some time in the exploration phase and I think I could have tried to come up with a much more clear idea from the beginning.

I could also have had a broader exploration phase to cover more areas of knowledge to focus in one afterwards.
Conclusion

After the whole research process and test I think that the procedure was adequate for the topic. Audience engagement is a field that can benefit from user test techniques and analysis. Once a theory is formulated it can be tested though user tests and a prototype to see if it stands or not. For my thesis it was very helpful to be able to test my prototypes to find out about the qualities that would make a good system that would foster audience engagement.

An engagement experience depends on a variety of factors. One of the most important ones is the variety of the experience. Introducing a voting system added some of this variety to the global experience that boosted engagement as a side effect although this factor should be boosted by using different media and techniques within the presentation itself; this is a responsibility of the presenter. Also the sense of feedback takes an important role in engagement and in my prototype it was present on the idea that the audience could see the likes on the main display but also on the idea that they could ‘give feedback’ to the presenter.

The factor of control was the other factor that the prototype tried to address in order to boost audience engagement. This factor was achieved by allowing the audience to send a signal to the presenter to let him or her know that more clarification was needed. This would give a sense of control over the flow of the presentation to the audience.

The experiments described present moderate evidence through the results of the interviews with the audience that participated in the experiments that the system developed fosters audience engagement. All the four subjects of the first test with the second prototype said that the system helped them to be more engaged and in the second test 4 out of 5 concluded that the system helped or helped a little. The other said that it did not help and that it just changed the experience.

Question: How can we create bigger audience engagement through interactive methods during a presentation?

Using methods that would improve feedback and control aspects of the presentation environment. Different methods could be used but they should be aimed to foster at least one of these qualities. Giving some sort of control to the audience helps to make them feel that they are taking part of the event and feedback gives a sense of ‘conversation’ with the presenter.
Perspectives

Now I would like to discuss different use perspectives of the knowledge in this thesis. Also some questions that could use some further research are discussed and left open for interested people.

Knowledge perfectives

The content in this thesis might be relevant for anyone researching in the fields of audience engagement and academic/conference type presentations. The findings here are quite general as the tests were conducted with a small amount of people but also in a bigger set up that is a valid representation conference set up, but meaningful and useful.

Questions left open

Better and more interesting visualization

The last screen that shows statistics to the presenter is quite simple in the actual stage. It definitely could be improved. Further exploration and tests could be run to see which features and visualization options are interesting for a presenter using the information gathered by the prototype. It was not explored much as the impact of this does not fall much in the field of audience engagement as it targets more the presenter feedback and the time after the presentation. It could be interesting for someone willing to work in the field of computer graphics and data visualization.
References

Academic references

- Webster, J & Ho, Hayes 1997, Audience engagement in multimedia presentations, The DATA BASE for Advances in Information Systems - - Spring 1997 (Vol. 28, No. 2)

Other references

2. Bootstrap (http://getbootstrap.com)
3. Django (https://www.djangoproject.com)
5. Processing (https://www.processing.org)
Appendix

Arduino™ code

<The code can be found in the following github account: https://github.com/juancolino>

Python code

<The code can be found in the following github account: https://github.com/juancolino>

Interview scripts exploration phase

The organizer view - Interview with Emanuel Alfranseder

Emanuel Alfranseder is the former President of the Erasmus Student Network International and has as such ample experiences in chairing, supervising and speaking at large conferences and events within the youth and European education sector. He has been the Chair of conferences such as the Annual General Meeting of ESN in 2014 in Milano with more than 700 participants and more than 25 speakers or the SocialErasmus project Final conference in Brussels at the EESC (European Economic and Social Committee) in 2013.

1. How long does it take to organize a conference for more than 500 people? What is the most challenging aspect of it?
   a. The general planning takes around a year. Organizing the agenda itself takes 3-4 months, the part before is mainly organizing logistical things such as the venue and other practicalities such as accommodation for the participants. The most challenging thing is to evaluate how much time certain points in the agenda take. It's difficult to foresee the amount of interest and resultant questions the audience has.

2. Could you describe a normal day of conference? How many speakers you have? How long do they talk for? How long is the day? How is the time distribution?
   a. A regular day starts at 8.30 and finishes at 18.00. There are two 30-minute breaks and an hour lunch break. Speakers talk for 5-15 minutes depending on the topic. Some times there are a few presentations that last for more than that, up to 30 or 40 minutes. Some presentations allow questions and comments. There are around 25-35 presentations a day.

3. Can you describe the regular equipment that you have available at a conference hall? How many screens? Do you have a microphone system? Do you have WiFi connectivity?
   a. Generally we have a screen for presenters and a big projector that screens presentations for the audience. Sometimes we also have an extra projector for auxiliary information about the conference such as the agenda or information about the topic being presented. We have single battery powered microphones and stationary ones for speakers. WiFi connectivity is available in general, but not always stable or reliable for everyone.

4. Which resources are available for the speakers?
   a. A fixed microphone in the presenter stand if there is one and a wireless microphone. They also can use MS Powerpoint and a PDF for their presentations and they also have a clicker to navigate through the presentation slides.
5. How is the process of contacting the speakers and scheduling the agenda?
   a. It is rather a submission of topics of speakers that are interested. As the Chair you collect them and make a selection and allocate time to each of the presentations. Presentations need to be sent in advance so the technical helper can set and sort them up and get everything ready in advance.

6. Can you describe the typical presenter? Would it be a full professional speaker?
   a. Typical presenters are at least somewhat experienced. Most of them are not professional, but have spoken in public multiple times. However, for many it’s not usual to speak in front of such a big audience or it might be the first time that they do so. In some other conferences you have more professional speakers that are more used to present in public about topics related to their job or expertise field. This includes from politicians and bureaucrats to policy experts and others.

7. What is in your opinion the most challenging thing that speakers have to face when speaking in a conference?
   a. It is very challenging to catch the attention of the audience. It’s also almost impossible to get feedback from such a large audience. Some times there are evaluation forms about the presentations and topics but it is complicated to get people to fill them and it also requires an important amount of effort from both sides, participants and speakers. Nervousness is also an issue for quite many especially in the non-professional set-ups.

8. How many questions does a presenter get after his or her presentation? Does he or she get questions while presenting?
   a. This depends on the presenter most of the times. In some very formal set-ups questions are only allowed in the end. Most of the speakers allow some interaction during the presentation as well. There are no strict rules for this.

The speaker view - Interview with Victor Alonso

Victor Alonso is a ... he has been a speaker in various events such as ...

1. How do you prepare for a conference talk?
   a. It would depend if it were the first time I do that specific presentation or not. If I have done the same presentation. If it is not the first time I do it then I just refresh it the day before. Sometimes I introduce some changes and update my slides so the presentations are never the same. I also never use a very strict script so my presentations are also unique in that sense. If it is the first time I do the presentation the process is longer. It takes me a few days to get the presentation ready and to rehearse it. I normally try it in front of friends before to get the timing right as well and to see the parts that might not work entirely. There is also some formalities that you have to fix with the organizers to make sure that you will have the things that you need so you get no bad surprises when you get to the venue.

2. Which tools do you use to prepare you presentation and also for doing the talk itself? Any special software or device?
   a. I use Keynote from Apple for my presentation software. I do use some image editing software if I need to, mostly Adobe Photoshop. I always go with my laptop and a USB stick with my presentation ready in as many formats as I can always including PDF, which runs on virtually any machine. I also bring along adaptors and a clicker. Once I get there I always make sure I have water available for my presentation. I tend to have all my materials off-line in case there is no connectivity and to have a plan B for every aspect of my presentation just in case IT problems happen.

3. What is the most challenging part of a presentation in a conference?
   a. Getting a presentation ready on a topic that you a proficient with is not that hard once you know how to present but getting to the point where your presentation is rounded and well polished takes time. That is quite challenging. Also depending on the size of the event or its relevance it might be a little
overwhelming to present but you get used to it the more you do it. Depending on the conference or event getting the audience to listen to you might be challenging as well. If your presentation is the last one of the day you might have troubles getting people to pay attention to you.

4. How do you evaluate your performance after a presentation?
   a. Well sometimes you just feel how it went comparing the reaction that you get from the people to previews times. Normally if you do a good job you will also get a lot of questions in the end that show that people were actively engaged and following what you were saying. Some conferences ask for feedback for the sessions to the participants and they share it with me afterwards. It is nice to have it but not something I can not live without.

Interview scripts for the first prototype test

First user:

5. Did the device interfere with your interaction with the presentation?
6. Do you think the use of the device provides a more engaging experience?
   a. Yes, a little.
7. Would you change something?
   a. Maybe the sound effect for the “I’m lost” signal is too much. I would also name it “Explain more” or “Elaborate more”.

Interview scripts for the second prototype test

Presenter subject #1:

1. Was using the system a different experience from a normal presentation? Why?
   a. It was in a way. It was funny to know that people were rating the presentation all the time. It was also a little bit annoying that people were with their phones all the time in their hands.
2. Did you find the vibration notification useful?
   a. It was nice to have it although it felt a little bit unnatural. I’m much more used to people just raising their hands.
3. Was the vibration notification disturbing?
   a. It was ok. Of course it disturbs your flow, as you have to repeat the thing again or go back a little.

Presenter subject #2:

1. Was using the system a different experience from a normal presentation? Why?
   a. The part about the notification was. The part of the likes was funny as you could see the screens and the like arriving.
2. Did you find the vibration notification useful?
   a. It was cool. Maybe it does not make that much sense with so few people.
3. Was the vibration notification disturbing?
   a. Not really, I almost did not feel it. It was hard to know which part to repeat or elaborate more. It helps with the dialogue with the audience I guess.

Audience subject #1:

1. Was it adequate to use your phone during the presentation?
a. It was. I liked that it worked on everybody’s phones. It also looked nice. Maybe the buttons could be a little bigger so you could click without looking much at the phone’s screen.

2. Do you think the system provides a more engaging experience?
   a. I think it does. It makes you get more involved in the experience.

3. Did you use the “Elaborate more” button? Why?
   a. No. I understood everything.

4. Did you use the “+1” button? Why?
   a. Yes. Because I think it was good to express my opinion.

Audience subject #2:

1. Was it adequate to use your phone during the presentation?
   a. Yes. It was weird to see how the likes would show on the screen. I loved it.

2. Do you think the system provides a more engaging experience?
   a. A little. It is something more than a regular presentation.

3. Did you use the “Elaborate more” button? Why?
   a. Yes. I did not get one slide so I pushed it to see if the presenter would help.

4. Did you use the “+1” button? Why?
   a. Yes. Just to like some moments of the presentation.

Audience subject #3:

1. Was it adequate to use your phone during the presentation?
   a. It worked very well. I was sending quite some likes.

2. Do you think the system provides a more engaging experience?
   a. Yes but it is just a small change. I mean it helps but it does not change the whole thing or change the presentation in any way.

3. Did you use the “Elaborate more” button? Why?
   a. No. I don’t really know why. I guess I just did not need to.

4. Did you use the “+1” button? Why?
   a. Yes. To show the parts that I liked.

Audience subject #4:

1. Was it adequate to use your phone during the presentation?
   a. Yes. It was easy to use.

2. Do you think the system provides a more engaging experience?
   a. It does.

3. Did you use the “Elaborate more” button? Why?
   a. No. I did not feel like I needed to.

4. Did you use the “+1” button? Why?
   a. Yes, a lot. Just to like some slides that I liked.

Audience subject #5:

1. Was it adequate to use your phone during the presentation?
   a. Yes. I did not mind.

2. Do you think the system provides a more engaging experience?
   a. In my opinion yes. It gets you more engaged.

3. Did you use the “Elaborate more” button? Why?
   a. No. I did not need to interrupt.

4. Did you use the “+1” button? Why?
   a. Yes, to show that I liked some ideas.
Interview scripts for the third test

Presenter:

1. Was the experience of using the system very different from a normal presentation?
   a. At the beginning I thought it would be because I was paying a lot of attention to the vibration sensor but then I forgot about it.
2. Was it useful the vibration notification?
   a. It was useful. At the beginning I got a lot of notifications but it was obviously people just testing it. Then I just got one or two.
3. Was the vibration notification annoying?
   a. It was fine. A little too much subtle at times.
4. What did you think when the first notification arrived?
   a. I thought that I had to stop and ask what was not clear, so I did that. Then I answered the question and moved on. The second time I was not sure if I had got one or not so I did not do anything and continued with my presentation.

Audience subject #1:

1. Did you use the “+1” button? Why?
   a. Yes, I used it to note that I was understanding the things being said.
2. Did you use the “Elaborate more” button? Why?
   a. No, I did not feel I needed it.
3. Was it adequate to use your phone during the presentation?
   a. Yes, the page was quite simple and easy to understand.
4. Do you think the system has helped you to be more engaged with the presentation?
   a. Yes, I think it would be useful for a classroom environment as well.

Audience subject #2:

1. Did you use the “+1” button? Why?
   a. Yes, I used it to note that I liked a particular slide.
2. Did you use the “Elaborate more” button? Why?
   a. I did not and I do not really know why.
3. Was it adequate to use your phone during the presentation?
   a. It was something new but I have my doubts about it.
4. Do you think the system has helped you to be more engaged with the presentation?
   a. Not in a conscious ways. It changes the experience.

Audience subject #3:

1. Did you use the “+1” button? Why?
   a. Yes, to evaluate the presentation.
2. Did you use the “Elaborate more” button? Why?
   a. No, I did not need to.
3. Was it adequate to use your phone during the presentation?
   a. Yes, it should be used more.
4. Do you think the system has helped you to be more engaged with the presentation?
   a. Yes, it encourages you to find points to evaluate. It boosts your attention.

Audience subject #4:

1. Did you use the “+1” button? Why?
   a. Yes, I pressed it in the most interesting parts.
2. Did you use the “Elaborate more” button? Why?
   a. No, I did not feel that I needed, as the presentation was not very long.
3. Was it adequate to use your phone during the presentation?
   a. Yes, it was easy to use. It was also nice to see the counter going up on the screen.
4. **Do you think the system has helped you to be more engaged with the presentation?**
   a. *I think it is the same. It does not influence much.*

**Audience subject #5:**

1. Did you use the "+1" button? Why?
   a. *Yes, to show that something was interesting.*
2. Did you use the "Elaborate more" button? Why?
   a. *Yes, I did use it. I wanted to ask something.*
3. Was it adequate to use your phone during the presentation?
   a. *Yes, because everybody has one and it does not disturb anyone.*
4. **Do you think the system has helped you to be more engaged with the presentation?**
   a. *Yes, I think it does help a bit.*